

## COAL

*John Knight  
Harworth Mining Consultancy*

The year 2003 has been remarkable for a strong turnaround in the market trend and sales prices of coal in international markets. The early part of 2003 was characterised by low prices for thermal coal, compounded by the weakening US dollar; a trend which, particularly in the Asia Pacific region, was also driven by growing Chinese exports and deregulation of the electricity industry in many Asian countries, giving rise to flexible, shorter term contracts. However, by mid-2003 a sharp reversal was under way. Domestic power demand in China forced a cut-back in export tonnages, which, with resurgence of the leading Asian economies, and constraints on supplies from Indonesia due to heavy rains, swiftly led to rising demand and prices. By the latter half of 2003, the market for thermal and metallurgical coal was experiencing strong demand at a time of record high ocean freight rates, resulting in delivered prices to consumers in North Asia at levels not seen for over ten years. Allied to this has been a firm market for coal in North America and Europe. During the course of 2003 the delivered price of steam coal doubled in the European market.

Underground coal mining in some parts of the world remains characterised by unacceptably high levels of accidents. High profile multiple-death accidents were reported in China, India, Russia and Ukraine. In China, where there was a succession of explosions in Shanxi Province, amongst other numerous incidents, a total of 6,702 fatalities were reported in 2003 by the State Administration of Work Safety, stated to be a fall of over 4% from the previous year. Of these deaths, 1,035 were related to over 50 'large-scale' disasters. The Chinese statistics indicate some 4.2 fatalities per million tonnes of production, somewhat improved from the level of 4.7 recorded in 2002. In contrast in the US, in an industry of nearly comparable size, deaths in mines fell to an all-time low, with 29 recorded in the coal sector in 2003, representing 0.03 fatalities per million tonnes.

Total world trade in hard coal in 2003 has been estimated at 662 Mt by the Australian Bureau of Agricultural and Resource Economics (ABARE). Seaborne trade of thermal coal in 2003 has been estimated by AME Mineral Economics as totaling 430 Mt. International trade in thermal coal is dominated by the demands of the Asia Pacific region, with over 40% of this market comprised by Japan, Taiwan and South Korea.

The two largest private coal producers, Peabody Energy (184.0 Mt) and Rio Tinto plc (148.8 Mt), are to a large extent supported by high production and domestic consumption in the US. In contrast, it is the next largest group of companies which dominate international trade and source their production

from a range of international operations: third largest BHP Billiton Group (116.3 Mt), fourth Anglo American Group (105.6 Mt) and seventh Xstrata plc (69.3 Mt). The fifth and sixth largest companies, Arch Coal Inc of the US (91.3 Mt) and Siberian Coal Energy Co of Russia (79.0 Mt), respectively, are primarily supplying their domestic markets. The export of thermal coal is dominated by four producers: Xstrata plc, BHP Billiton, Anglo American plc and PT Bumi Resources of Indonesia. The largest exporter of coking coal is BHP Billiton.

### **World coal production**

Detailed returns for annual world coal production are available from the latter half of the following year and a full reference list can be accessed from the BP Statistical Review of World Energy. A significant increase in growth of world production, from the 4,714 Mt recorded for 2002 (3,837 Mt of hard coal; 877 Mt of brown coal/lignite), can be anticipated on the basis of the returns of the major producing nations, amongst which China, India, Russia and South Africa have indicated substantial increases in production (Table 1).

### **Regional Summaries**

#### **Asia Pacific Region**

The Asia Pacific region remains by far the most important in terms of production, export trade and consumption. Nearly 45% of world coal production is sourced in the region, which includes three of the top four coal-producing nations, China, India and Australia having the top, third and fourth national production levels respectively.

Of these, Australia and China are respectively the largest and second most important coal-exporting countries. The region also includes the most important coal-importing countries, of which Japan is the largest, followed by South Korea and Chinese Taipei.

Redirection of coal production in China to feed its internal requirements created a shortage of exports from China in the latter half of 2003, at a time when northern Asian utilities were more reliant than ever on Chinese suppliers. This had a rapid effect on other regional coal exporters as a number of major consumers, including Taipower and Korean generators, were forced to tender for emergency supplies from Indonesia and Australia. Prices for steam coal were pushed above US\$30.00/ t for coals of 6,200 kCal/kg GAR, and at a time of record freight costs, delivered prices reached levels not experienced for over ten years.

#### **China**

China is the world's largest coal producer and coal consumer and is also one of the economies most reliant on coal for its primary energy needs. Significant increase in demand and reduction in exports during 2003 have impacted globally on coal markets and prices.

Underpinning the impact of the Chinese economy on world trade and markets is its consistent rate of growth. According to Wen Jiabao, the Prime Minister, speaking in March 2004, the economy grew by 9% in 2003 and growth of 7% is expected during 2004. However, growth has been uneven and largely concentrated on the prosperous cities on the coast. Policy pledges for 2004 focus on improving the lot of the hundreds of millions of rural poor.

The pattern of production and export has been largely dictated by the continuing growth in demand for electrical power. In 2003 national annual energy production was anticipated to reach  $1.88 \times 10^{12}$  kWh, an annual increase of over 15%. Coal-burning power plants account for more than 70% of China's total installed generating capacity and at the end of 2003 they were still some 3 Mt short of the pre-set goal for coal stocks. In 2003 the coal burn for power generation has been quoted by the Chinese Society for Coal Industry as 826 Mt. According to State Grid Corp in the first nine months of 2003 a total of 21 power grid zones nationwide resorted to electricity blackouts to prevent system collapse, only the northeast coal-mining regions reporting a slight energy surplus.

The priorities to satisfy domestic demand have imposed expedient reversal of policy commitments for management of the coal industry in two specific respects. In the first, the government response to a number of widely-reported explosions in poorly regulated mines was a vigorous campaign of shut-down, rectification and inspection of all but state-owned mines in Shanxi Province. However the overwhelming demand for production led to an apparent compromise and re-opening of the majority of closed mines. In the autumn of 2003 the loss in production resulting from this safety policy, and the simultaneous power shortage, prompted the State Development Planning Commission to decree that "to ease the demand of coal and to strike a balance between production and safety, the most direct solution is to increase the amount of coal production".

The second policy reversal has been to cut back on coal exports, leading to default on some committed sales at the end of the year. Through the early part of 2003 export sales rose steadily but at a slower rate than previous years. The slow-down was interpreted to reflect the continuous rise in domestic coal prices and a decision, in August 2003, to reduce the price of coal exports to Japan. As a result many enterprises began selling coal earmarked for export on the domestic market. Furthermore, reform of the export tax rebate system, applicable from January 2004, reduced the tax rebate for coal exports from 13% to 11% and for coke exports from 15% to 5%, signalling reduced government support to exports.

China is by a considerable margin the largest national steel producer in the world and its steel production rose 21.2% in 2003, producing 220.1 Mt of steel, continuing the growth trend of recent years. Corresponding demand for metallurgical coal has grown to around 240 Mt.

National raw coal production in 2003 is quoted as 1,608 Mt, up 16% from 2002, an all-time national production record. However, inconsistencies in the recording of coal production in China has been a long-running problem and this has now been officially recognised by the State Development and Reform Committee, which has announced a thorough investigation to verify the 2003 statistics and projections for 2004, covering not just the major coal production companies but also provincial and township-owned operations. Of total national production, some 177 Mt is reported as coking coal, and this is forecast to grow in 2004 to a level of 200 Mt/y. It is apparent from the national demand for metallurgical coal, and reported levels of exports and imports, that there are inconsistencies in identifying adequate coal sources for supply of national steel production requirements, and it is therefore correspondingly difficult to predict future levels of export.

The structure of the Chinese coal industry continues to evolve. At the National Coal Industry Reform and Development Conference in December 2003 it was announced that the government will promote the formation of up to 10 giant state coal companies that will control 60% of national production as part of its strategy to guarantee future coal supplies and eliminate power shortages. Through the merger of smaller companies, the aim will be to create companies producing more than 50 Mt/y, with a number producing in excess of 100 Mt/y. In parallel, the objective is also to try to reduce the number of small and inefficient coal mines. This, however, is reconfirmation of policy stated in 2002 and continuously evolving since then.

The ratio of production between the major state-owned mines, local or provincial mines, and township mines, as stated for the first quarter of 2004, is 59.3% : 17.5% : 23.2%. This indicates that the percentage of national production from "key state-owned companies and mining bureau" continues to grow, having been reported to be 50% - 55% in 2002.

The largest state-owned companies operate as Western-style corporations and amongst these, the largest is Shenhua Group Corp, followed by Datong Coal Mine Corp, recently increased in size due to mergers, and then Yanzhou Coal Corp.

Shenhua Group Corp is the largest coal-production company in China and is reported to have produced 102 Mt of coal in 2003. In March 2004 it was announced that Shenhua Group will list on the Hong Kong Stock Exchange with an initial public offering worth as much as US\$2 billion. Around 25% of the state-owned company will be offered to the public through the IPO. Shenhua Group had earnings of US\$266 million (Yu2.2 billion) for the first half of 2003, up nearly 60% from the year earlier, according to the company's website. This followed a 34% increase in coal sales to 48.4 Mt in the half-year.

The major coal production unit of Shenhua Group is Shendong Co, created for the operation and management of the enormous Shenfu Dongshen Coalfield, located in adjoining areas of Shaanxi Province and the Inner Mongolia Autonomous Region, with quoted proven reserves of 224,000 Mt. The principal underground mines in the coalfield came into production in 1996 and

have since undergone further upgrading to incorporate leading western technology. The Shenua Group appears committed to sourcing best available international technology. During 2003 Joy Mining Machinery secured further orders for its most powerful shearer, the 7LS6 model with 1,860 kW of installed power, plus a wide range of corresponding longwall equipment and continuous miners. The new orders increase the Joy Mining fleet at Shenua to 11 shearers, 14 AFCs, 39 continuous miners, two miner bolters and 14 JOY shuttle cars. In addition Shenua operates three sets of JOY roof supports.

The commitment to best international technology also extends to the company's surface mining operations. Bucyrus has announced an order from Shenua for a Bucyrus 8750-D3 walking dragline for its Zhungheer open-pit coal mine in Inner Mongolia. This dragline, with latest AC technology, will have a 109.7 m boom and 91.8 m<sup>3</sup> bucket and has an expected life of 30 years, to correspond to the expected life of the Zhungheer mine. The mine also employs a fleet of Bucyrus drills and shovels, acquired over the past seven years, and is currently out for tender for further shovels. Shenua currently operates five Bucyrus 395 shovels.

Development of the Shenfu Dongshen coalfield is the biggest coal project in the world, and includes a dedicated rail link of over 1,000 km to new port facilities at Huanghau (Hebei Province), just north of the delta of the Huang He (Yellow River). Although coal production and an export business are core elements of the business plan, Shenua has embarked on a programme to become an energy and chemicals conglomerate. Its operations include mine-mouth power generation such as that linked to the Zhungheer surface mine operation. In addition construction continues on the direct coal liquefaction plant, at Majiata, Inner Mongolia, with project management by ABB Lummus Global, which is planned to come on-stream in 2005. Three additional similar plants are also planned, which together will consume 15 Mt/y of coal for the direct liquefaction process.

Datong Coal Mine Group announced at the end of 2003 a merger with the smaller Shuozhou and Xinzhou coal companies, also in Shanxi Province, in a move which will reportedly raise its asset value by a third and create a group with coal reserves of 89,000 Mt. Datong Coal Mine Group Co is based in the traditional coal-mining area of northern Shanxi Province and in recent years a number of its older mines have closed due to exhaustion. Over the past decade reported production levels have been around 34 Mt/y, but the recent merger now reportedly offers the prospect of annual production in the order of 90 Mt/y. The Shuozhou operations produce thermal coal from the Carboniferous-Permian sequence with annual raw coal production rated in the range 25-30 Mt/y. The Xinzhou operations contribute reserves in the Ningwu and Hedong coalfields, from strata of Carboniferous and Triassic age, with both thermal coal and coking coal production. Reported raw coal production is of the order of 10 Mt/y from numerous relatively small mines, geared primarily for regional consumption.

Datong Coal Mine Group has sought, in recent years, to establish itself as a major producer of export coal via the Qinhuangdao export terminal. Coal exports of 8.2 Mt were reported in 2002, and this is unlikely to have increased significantly in 2003 due to the soaring national demand for thermal and metallurgical coal. Furthermore, concerns have been expressed as to the robustness of the rail link from the Shanxi export coal producers and Qinhuangdao port, which is up to 800 km in length. In early 2004 it has been reported that railway repairs have severely disrupted coal supplies to the port from the Datong mines, which is estimated to have reduced monthly shipments by up to 30%.

Yanzhou Coal Mining Co was the second-largest coal production company in China in 2003. Company shares are traded on the Hong Kong and New York Stock Exchanges, although some 58% ownership remains in state hands. Based in Shandong Province the company produces low sulphur coal from five modern underground mines, using longwall technology. The company sold 39.4 Mt in 2003, of which 25.8 Mt was consumed in the national market and 13.6 Mt was dispatched for export through the port of Rizhao. Of the export tonnage, thermal coal accounted for 60% and metallurgical coal 40%. Some 80% of all export tonnage was despatched to Japan. The company reported an expected overall gross profit margin for 2003 of 46.2%, corresponding to net profits of Yu1.35 billion or approximately US\$162.8 million. For 2004 it is expected that export quotas and the reduced export tariff rebate will restrict the export tonnage, which is targeted as 12 Mt, from an overall target coal production of 40 Mt.

The investment in modern technology is apparent not only in the largest coal companies but also in the middle-ranking companies, where there is a willingness to consider investment in modern Western technology. Siemens reports an important order to supply a whole new shaft-winding system for the Tunliu mine of Shanxi Lu'an Coal Mining (Group) Co. The project requires the supply and commissioning of two high performance winders. Shanxi Lu'an Mining operates five coal mines with a production capacity of 12 Mt/y, producing thermal coal and some metallurgical coal, and the business also extends to a range of business activities including chemicals processing and cement production. In Liaoning Province the Tiefu Xiaonan mine has installed a fully automated DBT Gleithobel plow system which has set national longwall production records for a seam of less than 1.8 m height. Between mid-August and mid-September the system produced a daily average 5,818 t run-of-mine, with a total face advance of 236 m (daily average 9.08 m).

Shanxi Province in north China is by a large margin the largest coal-producing province, producing nearly 30% of all national production, with estimated production in 2003 of approximately 480 Mt. The province is characterised by the presence of some of the largest state-owned coal producers, including the Datong, Xishan and Pingshuo corporations, with also an important contribution to production coming from large mines owned by the provincial administration, mines owned by individual county and city administrations, and also numerous smaller township mines. After the efforts to improve

safety and to shut down small unregulated township mines, there were reported to be 4,122 coal mines operating in 2003 in Shanxi Province.

Shanxi is also the largest province for production of export coal, but during 2003 there was a rapid decline in the rate of growth of exports. In the nine months to September 30, 2003, Shanxi Province reported total exports of 34.37 Mt, including anthracite, coking coal and steam coal. The greater part of Shanxi exports pass through Qinhuangdao port and only Shanxi Coal Import Export Group Corp has a licence to export coal produced in the province.

It is predicted by the Inner Mongolia regional coal industry bureau that this autonomous region will produce 500 Mt/y of coal by 2010, replacing [Shanxi](#) as China's top regional coal producer. Inner Mongolia is reported to contain reserves totaling 225,600 Mt and the region turned out 150 Mt of coal last year, a record high, and was second only to Shanxi by coal output. The coal production target for 2004 has apparently been set at 200 Mt/y.

In Henan Province the new Chengjiao mine came on stream, with annual raw coal capacity due to reach 4 Mt/y within the next three years. Investment in the mine is a joint commitment by Yongcheng Coal and Power Group and Baosteel Group, with a later participation by CVRD of Brazil. The project includes a railway with a delivery capacity of 10 Mt/y and a coal washery for 2.4 Mt/y.

Coal exports in 2003 were 93 Mt, according to a survey of licensed export organisations by McCloskey's Coal Report. However the sharply declining level of exports in the latter half of 2003 indicates that these levels are unlikely to be repeated in 2004. The expectation of the Chinese authorities for exports in 2004 is 80 Mt. Coking coal represented some 15% of coal exports in 2002 (13.3 Mt), but the corresponding figure for 2003 registered an apparent fall, and reports of a proposed cut-back of 50% of coking coal export quotas in 2004 has aroused anxiety and formal representations from the EU to the Chinese Government. Exports of coke in 2003 were 14.7 Mt, but export licences issued thus far in 2004 indicate that this level will be sharply reduced in the current year. The tightened supply of coke has become a critical issue for steel manufacturers around the world and is reflected in fob prices approaching US\$400/t reported in early 2004.

The turnaround in policy to restrict growth of coal exports is reflected in the demand for coal imports, particularly in the southern provinces which have no indigenous coal production and are remote from other national supply sources. Imports of coal are not regulated, and customs returns commonly include coal imports within the general category of combined dry imports. Reported imports of 10.8 Mt in 2002 marked a fourfold year-on-year increase; a more modest increase is likely to have occurred in 2003. In the longer term, industry observers (AAA Minerals) suggest that imported coal will be carefully regulated by government at less than 10 Mt/y.

In 2003, coking-coal import levels are anticipated to have grown from the figure of 0.25 Mt registered in 2002, to meet the urgent demands of the steel industry. In the same period thermal coal imports are likely to have remained at a consistent level, with deliveries particularly from Australia and Indonesia, to meet the requirements of coal-fired power plants and the cement industry in the south of the country. The deep-water port of Zhanjiang, in Guangdong Province, has become the leading import location for the southern region and also relies on imports to maintain its port-side power generating plant.

The gradual opening of the coal industry and related sectors to international investment has continued. The only foreign company to hold a coal-mining licence in China is Asian American Coal Inc (AACI), which has a 56% stake in the Daning mine in Shanxi Province. Coalbed methane production also is being developed, with recent investors in this effort including BP, Texaco, and Virgin Oil, which was awarded a concession for exploration in Ningxia Province in January 2001. ChevronTexaco is the largest foreign investor in coalbed methane, with activities in several provinces.

### **India**

India is the second coal consumption giant of the Asia Pacific region and vies with Australia for the position of third-largest coal producer in the world. In the period 2003-04, hard-coal production (raw coal) was approximately 353 Mt, up some 5.4% on the preceding period. Lignite production was on target for production of close to 24 Mt, generally in line with the previous period. The total coal product range shows an annual growth of approximately 5%.

India is highly dependent on coal, which supplies some 63% of national primary energy requirements. There are very limited identified resources of oil and natural gas, environmental restraints limit the potential for hydroelectric schemes and geopolitical sensitivity constrain plans for nuclear power generation. Against this backdrop the Indian economy registered year-on-year growth of 10.4%, well in excess of growth in China, and the manufacturing sector grew by 7.4%. Current projections are that, for the foreseeable future, coal will be central to India's energy supply and consumption is targeted to continue its pattern of growth.

Proven and indicated coal resources, reported as of January 1, 2003, to a depth of 1,200 m are in excess of 200,000 Mt, of which approximately 15% are coking coal and the remainder non-coking thermal grade coal. Hard-coal deposits are largely confined to the east and south central regions of the country, primarily from the Gondwana coal sequences of Permian age, with only minor tonnages of Tertiary age coal in the northern and northeastern states.

Lignite resources, quoted at around 34,600 Mt, are primarily located in the southern state of Tamil Nadu, with 90% of quoted reserves, although some lignite production is also obtained in the northwest of the country from Gujarat and, to a lesser extent, Rajasthan.

The structure of the coal industry still essentially reflects that of a command economy, dominated by the state-owned coal producer Coal India Ltd (CIL), the subsidiaries of which produce over 85% of national hard-coal production. The greater part of the balance is produced in Andhra Pradesh by Singareni Collieries Co Ltd (SCCL), a joint venture between the federal and state governments. Other coal production by private operation of captive mining blocks totalled 14 Mt in the 12-month period to October 31, 2003, or 4% of national hard-coal production. After speculation in the late 1990s on privatisation of the coal industry, this has been definitively excluded under the current administration.

Under current legislation, foreign investment is effectively restricted to projects in which coal production is linked to captive consumption. Private Indian companies may set up or operate power projects with up to 100% foreign equity but all coal or lignite production must be dispatched exclusively for use by the project. Similarly, foreign equity may be 100% in Indian companies or subsidiaries engaged in coal processing, but on the condition that they do not undertake coal mining and do not sell the washed product on the open market. Indian companies engaged in exploration or mining of coal and lignite for captive consumption in iron and steel in the production of cement may be allowed foreign equity up to 74%.

Since 1996, legislation has been in place, which prevents direct budget support of CIL from government funds. In the financial year 2003-04 the company has reported a provisional profit, before tax and dividends, of Rs37 billion, representing a 29% increase on the previous period. Coal production for the financial year 2003-04 was 306 Mt, an increase of 5.4% compared with 2002-03.

CIL operates through eight coal-production subsidiaries and an engineering, design and exploration consultancy. There is significant variation in the profiles and performances of the various CIL subsidiaries and SCCL, reflecting the structural complexity of the coal sector. Chronically loss-making companies are Bharat Coking Coal Ltd (BCCL), Eastern Coalfields Ltd (ECL) and SCCL, which are the companies with the highest percentages of underground mine production (respectively 33%, 42% and 43%). They are characterised by numerous small underground mines and low productivity levels. In contrast, high profitability is characteristic of Northern Coalfields Ltd (NCL), operating only eight large surface mines. During the period April-October 2003, 17% of all CIL production was from underground mining.

Loss-making ECL has announced plans to commit to mechanisation of its underground mines to increase underground production from the present 10.76 Mt/y to 14.5 Mt/y by 2010-11. ECL plans to introduce continuous mining in Khottadih, Jhanjra and Sarpi, and new longwall operations at Jhanjra. Two new underground projects are also planned. However, experience of recent years is that such commitments in principle are severely constrained by available investment.

In the case of ECL, its heavily indebted position will also require clearance from the Ministry of Coal to close off existing projects in the first place.

A model which has been promoted primarily by South Eastern Coalfields Ltd (SECL) and Western Coalfields Ltd (WCL) is for risk-sharing with suppliers of new production equipment. In principle this involves a substantial down-payment and then deferred payment of the balance, recovered over a five-year period in which responsibility for operation, training and maintenance remains with the supplier; the cost of services, spares and the balance of the price is recovered against production to agreed targets. Experience shows that such agreements have a very long gestation period to bring on-stream.

Nevertheless, in 2002, Joy Mining Machinery negotiated a contract under this tender model to supply the first complete continuous-miner system in India to SECL at the Chirimiri mine. During 2003 this system made a major impact on output from this group. The complete system consists of a 12CM15 continuous miner, two 10SC32 shuttle cars, a Stamler feeder breaker and Quadbolter mobile roofbolting machine, with the corresponding electrical distribution system. The system has averaged over 40,000 t/mth on the development of a five-entry room-and-pillar system in a 4.5 m seam and has achieved over 50,000 t/mth on de-pillaring. To date, the de-pillaring operations are the only approved mechanised de-pillaring system in India. Production from this system in 2003-04 is on target to exceed 500,000 t/y.

In the financial year 2003-04, CIL dispatched 233 Mt to the power sector, up 4% from the previous period and representing some 77% of all CIL sales. The power sector consumes around 93% of all coal disposals in India (141 Mt in the period April – October 2003), 5% goes to the cement sector and some 2% to steel and coke production.

There is considerable flexibility for coal supply to the power sector, reflecting high domestic production, low internal transport costs and also unrestricted access to imports. However, in contrast, the level of domestic coking-coal production and the availability of coking coal for import have generated widespread anxiety for the steel-production sector. In early 2004 the global shortage of coking coal was threatening to limit steel output in India, and the Steel Authority of India Ltd (SAIL) was claimed to have only sufficient supplies for two days at its flagship Bhilai plant. Reduction in monthly production of steel by up to 20% was predicted against a background in which global steel production could be constrained by the soaring freight rates and fob prices. SAIL has been forced to increase the intake of domestic coal for its steel plants and it is reported that at the Bhilai steel plant the ratio of imported coking coal to domestic coal is now 60:40, as opposed to the design ratio of 80:20, and at the Rourkela steel plant it has changed from 50:50 to 24:76 in favour of domestic coal.

CIL is the only significant domestic producer of coking coal, primarily from its two subsidiaries, Bharat Coking Coal Ltd (BCCL) and Central Coalfields Ltd (CCL). A smaller but significant quantity is produced by Western Coalfields

Ltd (WCL) and very small amounts by Eastern Coalfields Ltd (ECL) and South Eastern Coalfields Ltd (SECL).

In the period 2002-03, imports of coal were on target to be some 21 Mt, of which coking coal represents some 58%. Thermal coal imports are destined primarily for power generation by the state electricity boards of the western and southern states, of which Gujarat and Maharashtra have placed orders in the 2002-03 period, and intent has been expressed by the Rajasthan, Tamil Nadu and Karnataka state electricity boards. The import figures exclude coke, for which an import demand of some 3 Mt/y exists, dependent on availability of international sources, largely subject to supply from China. Coke is imported mainly by manufacturers of pig-iron and steel producers using mini-blast furnace technology.

The costs of production of Indian coal remain relatively high and productivity is low in international terms. For CIL operations the overall output per man-shift (OMS) is estimated, on provisional figures for 2002-03, to be 2.57 t. The corresponding OMS figure for SCCL was 1.80 t.

Lignite mining in India is dominated by production from Neyveli Lignite Corp (NLC) in the southern state of Tamil Nadu, with a production in the 2002-03 period of approximately 17 Mt, marginally reduced from the two previous periods when it exceeded 18 Mt/y. Smaller operations in Gujarat and Rajasthan together contributed around 6.7 Mt to the 2002-03 exercise. This total annual lignite production of around 23.7 Mt was somewhat lower than the high of 24.8 Mt/y achieved in 2001-02, but is, nevertheless, higher than all other previous years. The 10th five-year plan foresees expansion of lignite production to 56 Mt/y by 2007, but this must appear optimistic on current performance. It is planned that some 88% of lignite production is destined for the power-generation industry.

### **Australia**

Australia maintains its position as arguably the third-largest coal producing country in the world, and in the financial year to June 2003 produced 338.7 Mt, comprising 274.1 Mt of saleable hard coal (351 Mt run-of-mine) and 64.6 Mt of lignite (ABARE statistics). In comparison with India, which has a closely similar level of production, it should be noted that Indian statistics for hard coal refer to run-of-mine production. Australia is, however, indisputably the largest coal exporting country in the world and despatched 207.7 Mt in the financial year to June 2003, a 5% increase on the previous year; exports in the calendar year to December 2003 were 214.6 Mt.

The value of coal exports in the 2002-03 financial year fell in comparison to the previous year but, nevertheless, still represented over 10% of the value of total national export merchandise. The Australian economy therefore remains heavily dependent on the performance of its coal export trade.

Australia accounts for nearly one-third of coal supplies to the world market and also supplies almost 60% of the imports to the world's largest importing nation, Japan. On the international stage, Australia has a high profile by virtue of its exports of coking coal and thermal coal, but the economy is also reliant on coal-fired and lignite-fired power generation as the major contributor to the total national electricity supply. For example, in New South Wales (NSW), approximately 90% of electricity is generated from coal, and in Victoria 85% of the state's electricity is from lignite-fired plant.

Coal production is dominated by the states of Queensland (153.3 Mt for 2002-03) and NSW (111.1 Mt for 2002-03), with much smaller amounts produced in South Australia, Tasmania and Western Australia. Export sales are exclusively from Queensland and NSW. In Victoria, 64.6 Mt of brown coal was mined in the Latrobe Valley, and virtually all of this was consumed for power generation.

Queensland and NSW both produce coking coal and thermal coal qualities. Total export sales from Queensland were 134.6 Mt in calendar 2003, a record export tonnage, of which 67% (90.3 Mt) was coking coal and the balance (44.4 Mt) thermal coal. Total export sales from NSW were approximately 79.9 Mt in the same period, of which 26.5% (some 21.1 Mt) was coking coal and the balance (some 58.8 Mt) thermal coal.

In Queensland the total annual production showed a 2.8% increase over the previous year, largely reflecting increased production from the large open-cut mines. Underground production has always been the minor component (only 10% in 1992) but the level of production has almost quadrupled over the period and in 2003 comprised 22.7% (35.4 Mt saleable) of annual production. At the end of 2003 Queensland had 41 operating mines, 31 open-pit mines and ten underground.

The open-pit mines produced 120.6 Mt, and major contributors to the growth in production were the massive operations of BHP Billiton Mitsubishi Alliance (BMA) at Blackwater, Goonyella/Riverside and Peak Downs, together contributing some 28 Mt. The largest single export mine is the Blair Atholl thermal coal open-pit mine operated by Rio Tinto Coal with a 12 Mt/y capacity. Underground mines contributing significantly to overall increased production were Moranbah North, majority-owned by Anglo Coal Australia and Oaky Creek No 1, majority owned by Xstrata. Longwall mine production was 25.0 Mt in calendar 2003, down nearly 4 Mt from 2002, reflecting operational difficulties at a number of underground mines towards the end of 2003.

Queensland coal exports are despatched through the ports of Brisbane, Dalrymple Bay, Gladstone, Hay Point and Abbot Point. Principal export destinations in 2003 were Japan (50.7 Mt), South Korea (21.0 Mt), India (13.6 Mt), UK (6.1 Mt), Brazil (4.7 Mt) and China (3.1 Mt).

In NSW, the contribution of underground and open-pit mining was approximately equal throughout the first half of the 1990s, but from 1996, open-pit production has shown a dramatic growth and now comprises over 61% of annual production. At the beginning of 2003 NSW had 56 operating mines, 24 open-pit mines and 32 underground. NSW coal exports are despatched through the coal terminals of Newcastle, Port Kembla and Port Waratah. Principal export destinations are Japan, Taiwan and South Korea.

After the frenetic restructuring of the previous few years, the Australian coal industry, as represented by the export-led operations in Queensland and NSW, entered a period of relative consolidation in 2003. Production is dominated by the Big Four, companies which together now control some 75% of hard-coal production in Australia: Xstrata (22%), BHP Billiton (21%), Rio Tinto (18.5%) and Anglo Coal Australia (13.5%). In mid-2003 Xstrata Coal announced that it had completed its acquisition of MIM Holdings, bringing its attributable coal production capacity to around 44 Mt/y. At the close of 2003, Rio Tinto announced that it would merge its wholly-owned Pacific Coal subsidiary and its majority owned Coal & Allied subsidiaries into a new unit, Rio Tinto Coal Australia (RTCA), which will manage all corporate and service functions of the companies.

BHP Billiton reported attributable production of metallurgical coal of 35.1 Mt from its operations in Australia in calendar 2003 and a further 7.8 Mt of thermal coal. The greater part of its attributable production comes from the metallurgical coal operations managed by the company in the Bowen Basin of Queensland. The company has a 50% stake in the BHP Billiton Mitsubishi Alliance (BMA), on behalf of which it manages seven mines and the Hay Point coal terminal in Central Queensland. These operations produced 45.2 Mt in calendar 2003. In addition the company has an 80% stake in BHP Mitsui Coal (Australia) which produced around 6.75 Mt of metallurgical coal in calendar 2003 from the Riverside and South Walker Creek mines in Queensland. BHP Billiton's wholly-owned Illawarra operations, comprising five underground mines, produced 6.0 Mt of coal from the Hunter Valley of NSW, of which the greater part of production is sold as coking coal; thermal coal represents less than 10% of sales.

In the Bowen Basin, further consolidation of the Blackwater surface mines was signaled by the BMA announcement in January 2004 that it is to build a new US\$234 million coal handling and processing facility with the capacity to process more than 14 Mt/y of high-quality coking and thermal coal. Located adjacent to the current North preparation plant at Blackwater, BMA said the plant will enable processing of Blackwater mine's entire production through one centrally located facility, and will replace the existing high cost North, South and Thermal coal plants. Engineering contractor Barclay Mowlem announced in April 2004 that it had been awarded the turnkey design and construct contract for this plant, described as the largest contract of this type ever in the Australian coal industry.

In mid 2003 BMA also announced plans for a new punch longwall underground coal mine, the Broadmeadow mine with 3.6 Mt/y capacity, to produce high quality coking coal using the existing Goonyella open-pit for longwall panel access; in the second quarter of 2004 DBT announced the sale of 116 special roof supports for the Broadmeadow operation, purpose-designed for thick seam, single pass operation with working heights 2.4 – 5.2 m.

In NSW, construction continued at the BHP Billiton Illawarra Coal Dendrobium underground mine project, planned with a capacity of 5.2 Mt/y of metallurgical coal, to come on-stream in 2005. At the company's West Cliff Colliery, a contract was awarded to Joy Mining Machinery for a new JOY longwall mining system, for delivery in late 2003 and full production in the first quarter of 2004, geared to increase longwall output to 3 Mt/y. The new system includes 170 two-leg 1,000 t supports, with working height in the range 2.4 – 3.3 m, with a rebuilt JOY 4LS5 shearer, AFC, stage loader and supporting electrical and electronic systems. The increased production in 2003 by BHP Billiton of thermal coal reflects the ramp up at the Mt Arthur North mine project (Hunter Valley, NSW), which came on stream in late 2003; when fully operational it will be the largest hard coal open-pit mine in Australia, with a design capacity of 12.1 Mt/y of thermal coal.

The consolidation of the Rio Tinto interests means that RTCA will operate the Blair Athol, Tarong, Hail Creek and Kestrel mines in Queensland and, in NSW, will manage the Coal & Allied operations at Bengalla, Mt Thorley/Warkworth and Hunter Valley mines. The total production of coal under the management of the RTCA components in 2003 was 50.5 Mt: Coal & Allied 27.2 Mt, former Pacific Coal 23.2 Mt. The tonnage attributable to Rio Tinto was 34.3 Mt, down slightly from the 35 Mt of 2002.

In 2003, Coal & Allied Industries had a difficult year and at the close showed a 26% fall in revenue and remained barely in the black. Adverse impacts were ascribed to lower market prices for thermal coal, the appreciation of the Australian dollar, demurrage costs that averaged around US\$1/t and a rise in premiums for workers' compensation insurance. In June 2003 the company made the decision to scale down production in response to market demand, reflected in a decrease in annual saleable product of some 2 Mt. In the latter half of the year, in response to the changed market, the company was able to ramp up production from its Bengalla operation, which increased production by 80% between the third and fourth quarters of the year, to achieve 6.2 Mt in the year. Identified threats for performance for 2004 remain the recurrent problems of rail and port congestion and the new system of royalty charges to be introduced by the NSW Government; the 7% royalty figure for open-pit production would translate to a 45% rise in the royalty paid by Coal & Allied.

The Queensland interests of the Rio Tinto group, operated by Pacific Coal, include Blair Athol, Australia's largest exporting mine, which produced some 12.5 Mt of thermal coal in 2003 and Tarong thermal coal mine, which produced 6.5 Mt in 2003.

Kestrel mine produces a mixture of thermal, semi-hard coking and coking coals, with an overall production of 3.3 Mt in 2003. In 2003, the new Hail Creek mine in the Bowen Basin, came on stream in the third quarter of 2003 and produced 0.9 Mt in the year, from which it will build up to the design production of 5.5 Mt/y of prime hard coking coal. Overall attributable production to Rio Tinto in 2003 from its managed Queensland operations was 18.9 Mt, of which 12% was metallurgical coal and the balance thermal coal.

Xstrata Coal is the world's largest producer of export thermal coal and a significant producer of coking coal. Company-controlled production from Australia is in excess of 60 Mt/y, of which attributable production was 44 Mt in 2003. In 2003 the company posted a slump in profits which, to a large extent, it attributed to poorly performing coking coal mines formerly owned by MIM Holdings in Queensland. The company reports that an experienced management team was deployed to reduce the risk of frictional ignition events and address strata management issues which had combined to reduce production in 2002. Measures introduced included modification of equipment and mining sequences, underground in-seam drainage and the implementation of surface in-seam gas drainage; cutting speeds are reported to have returned to prior levels.

The company took the decision to go ahead with the 8 Mt/y Rolleston surface mine project for thermal coal in the Bowen Basin; initial production is planned from 2005, building to full production in 2008, with 6 Mt/y designated for export and the balance for domestic sales. Other developments in 2003 were the integration of the Ravensworth East and Mount Owen mines (NSW), the completion of the low-cost high productivity Beltana longwall punch mine (NSW), replacement of the truck and dozer fleet at the Bulga open-pit mine (NSW) and purchase of a new dragline and development of the Newlands mine complex (Queensland). Xstrata Coal has an interest in the two principal NSW coal export terminals (Port Waratah and Port Kembla) and in Queensland owns the Abbot Point port, which exclusively handles Newlands and Collinsville production.

Anglo Coal Australia reported attributable saleable coal production of 26.1 Mt in 2003 (25.0 Mt in 2002), of which 17 Mt was thermal coal and 9.1 Mt metallurgical coal. The company managed to maintain its operating profit at the same level as the previous year, despite the impact of appreciation of the Australian dollar, a performance attributed to improved production from its export mines. The Dartbrook (NSW) and Moranbah North (Queensland) mines both achieved record production for longwall mines in early 2003, but production slowed in both during the second half owing to longwall moves and technical problems. A number of the Queensland mines suffered production setbacks during late 2003 following sporadic industrial action. A significant fall of ground in January 2004 at Moranbah North will reduce production in 2004 by some 10% compared with 2003 levels.

The new Theodore operation in Queensland commenced production in September and a feasibility study is under way regarding the balance of the Dawson complex, incorporating both the Moura and Theodore mines. The Moura thermal/coking coal mine is a 51% owned joint venture with Mitsui. Work also commenced on the pre-feasibility studies for Lake Lindsay, adjacent to the German Creek complex, and continues on the development of the new Grasstree and Kayuga projects. Grasstree remains on schedule for start-up of production during 2006. Small volumes of coal are being produced at Kayuga during initial development and full production should be reached in 2004. Total attributable sales declined by 6% to 26.4 Mt; domestic sales were reduced by some 2.5 Mt, mainly as a result of new generating capacity being added to the network and start-up of competitor mines. Export sales were constrained by port capacity and congestion at the ports of Newcastle and Gladstone.

In other developments, Centennial Coal has progressively integrated the Powercoal mines purchased in late 2002 from the NSW Government. Centennial operations now include the Angus Place, Springvale, Newstan and Mandalong longwall mines, with production capacity of 8.1 Mt/y. Centennial has endeavoured to improve production performance and during 2003 introduced ABM 20 and ABM 25 continuous miners to the Newstan and Mandalong operations to achieve a new consistent high rate of roadway development. The market for Centennial coal is primarily to major domestic power generators and 85% of all sales for 2004 are destined for the domestic market. Centennial's managed run-of-mine production for the 2002-03 financial year was 13.5 Mt. Another unforeseen development was the decision of RAG Coal International to withdraw from Australian coal production and to sell its operations to Peabody Energy, which had previously sold its Australian interests to Rio Tinto in 2000. Completion of the sale in the first half of 2004 is expected to see transfer to Peabody of the North Goonyella longwall and the Burton open-pit mines, in the Bowen Basin, together representing an export capacity of 7 Mt/y of high-quality metallurgical coal.

Brown-coal production is devoted almost exclusively to power generation. The state of Victoria claims to have the thickest and most extensive brown-coal seams in the world and production is dominated by the electricity generating companies in the Latrobe Valley. The Loy Yang mine is the largest open-pit mine in Australia, operating four bucket-wheel-excavators to mine approximately 31 Mt/y to feed directly to the 4 x 500 MW power station of Loy Yang Power. The mine and power plant supply 24% of the electricity consumed in Victoria. An agreement was announced in mid-2003 that the Loy Yang mine and its power plant would be sold for A\$ 3.5 billion to the Great Energy Alliance, comprising a consortium of Australian Gas Light, Tokyo Electric Power and a group of investors led by Commonwealth Bank of Australia. It is estimated that the mine has a life span of 50 years at current levels of production. In another development in the Latrobe Valley, in early 2003 it was announced that Anglo American Corp would take a 20% stake in an ambitious coal-to-oil and electricity project. The concept is to convert

brown coal at a rate of some 26 Mt/y to gas and oil, producing 52,600 bbl/d of low-sulphur diesel and generating hydrogen to fuel a captive power plant.

### **Indonesia**

Indonesia is the world's third-largest exporter of thermal coal, after Australia and China. Indications are that coal production in Indonesia has continued the rapid growth of recent years with estimated production in 2003 of 109.3 Mt (2002: 103 Mt) and exports in 2003 are estimated to have been 88 Mt and are expected to rise further in 2004 by approximately 10%.

Indonesia has abundant identified coal reserves, of which the majority (68%) are located in Sumatra, primarily in the south of the island, and the remainder are in Kalimantan. The greater part of the reserve base is brown coal or lignite (around 75%: 18,000 Mt) and sub-bituminous coal (20%: 4,400 Mt) with lesser amounts of higher rank coals (some 774 Mt).

The most noteworthy development of 2003 has been the resolution, at least in part, of the long-running saga of the sale of Kaltim Prima Coal (KPC). In October 2003, PT Bumi Resources Tbk (Bumi) purchased 100% of KPC for US\$500 million from the original owners Rio Tinto and British Petroleum. Bumi has, however, inherited the obligations of the original mine developers and is required by Indonesian law to sell 51% of the mining operation to local companies and governments. Bumi has agreed to sell an 18.6% stake in KPC to the East Kutai regency in East Kalimantan, but, as experienced by the previous owners, this now raises the problem of how the local stakeholder will raise the funds to pay a realistic price for its holding. In the meantime, Bumi has now become the largest coal production company in Indonesia, controlling KPC and Arutmin, the second- and third-largest coal operations in the country.

Bumi was established in 1973 as a trader in oil, gas and mining investments and was listed on the Jakarta and Surabaya Stock Exchanges in 1990. In 2001 Bumi acquired an 80% stake in PT Arutmin Indonesia from BHP Billiton. With control of KPC, Bumi controlled production of 33 Mt of thermal coal in 2003. It is reported that Bumi raised part of the finance for the KPC purchase by means of a loan of US\$40 million from Theiss, a subsidiary of Leighton Holdings. Under the deal Theiss has been awarded a five year contract worth US\$1.7 billion to operate the Kaltim Prima mine on behalf of Bumi. It is planned to raise output from KPC to 30 Mt/y within the next three years, from 18 Mt in 2003.

The Arutmin operation, majority owned by Bumi, produced over 10 Mt/y from two mining complexes, Senakin and Satui, in South Kalimantan, linked to the port facility of North Pulau Laut Coal Terminal. The Arutmin product is primarily for export and BHP Billiton continues to provide market services for 75% of the product. It is reported that Swiss-based trading group Glencore has agreed to play a role in the coal marketing operations of Bumi and will be responsible for marketing the KPC product, including major bulk charter contracts. Bumi has also concluded agreements with several major Japanese

companies, including Mitsui and Mitsubishi, to sell coal into the Japanese market.

The single largest coal production operation in Indonesia remains PT Adaro Indonesia (Adaro), with a large surface mine operation in South Kalimantan, producing in 2003 over 22 Mt/y. Adaro mines thick seams, up to 50 m thick, of exceptionally good quality coal, marketed with 0.1% sulphur and 1% ash. The company supplies both the domestic (approximately 35% of its sales) and export markets.

The position as fourth-ranked producer is occupied by the Thai energy group Banpu, of which the consolidated holdings in Indonesia represent a production capacity of around 12 Mt/y from three operations in Kalimantan. The company operates the Indominco (65% owned) mine, which was on target for a production of 6.6 Mt in 2003; stripping ratio is 7.6:1 and the coal product is exported through Bontang Terminal in East Kalimantan. The Jorong and Kitadin mines together produced some 5.2 Mt; a new bucket-wheel system was introduced at Jorong at the end of 2003. The new Trubaindo mine project, also in Kalimantan, is due to come on stream in late 2004, ramping up to 5 Mt/y in 2006. Banpu reports that it controls reserves of over 155 Mt in Kalimantan and also holds two important resource blocks in Sumatra. Banpu markets bituminous and sub-bituminous grade coal, for which its two principal markets are Thailand and Japan with the greater part of the balance going to other Asian destinations; sales within Indonesia represent less than 10%.

PTBA, the majority state-owned coal mining company (government holding of 83.7%) is now ranked the fifth-largest coal producer in Indonesia, with coal sales in 2003 of 10.4 Mt. The company is based in South Sumatra and owns four surface mine operations, only one of which it operates directly, the others being worked under contract. The company has focused on supply to power plants and the local market which it considers a more lucrative business than the export market: currently the company exports 22% of its output with the remainder of sales to the local market, comprising power generators and the cement industry. In pursuit of this vision, PTBA is engaged with PT Indonesia Power in the development of a 2 x 100 MW coal-fired power plant at Banjarsarsi, South Sumatra and in a second project for a 2 x 250 MW plant at Pranap, Riau. Together, these plants, planned to start operating in 2008 and 2009 respectively, would consume some 4 Mt/y of PTBA production. It is reported that previously expressed aspirations to acquire part of the equity in KPC now appear unlikely to be pursued, although the company reports that it is evaluating the purchase of up to nine production companies in Kalimantan and Sumatra.

Other significant producers include the South Korean-owned Kideco Jaya Agaung company, which operates the Pasir open-pit mine in East Kalimantan, with a production capacity of 11 Mt/y by truck-and-shovel mining. Kideco is obliged to gradually divest its shares and is currently in the process of offering 34% of the equity but is facing legal hurdles similar to those suffered by KPC.

Interest to acquire this tranche has been expressed by PT Indonesia Power, which purchases 2 Mt/y from Kideco for its Suralaya Power Plant. Another important producer is PT Berau Coal which produced 7.47 Mt in 2003 (2002: 7.12 Mt), with domestic sales of 2.3 Mt and exports of 5.4 Mt; projections are for the company to build up to produce 8 Mt/y from its Lati mine and 5 Mt/y from its Binungan mine.

Underground mining has played an insignificant role in the growth of Indonesian coal production. However, a number of companies are now looking at underground options as open pits reach their economic limits. Auger high-wall mining has been undertaken by Thiess contractors at KPC and Indominco. In West Sumatra PT Allied Indo Coal has started a deep mining operation in its Perambahan site near Sawahlunto, but progress has stalled due to financial difficulties and increasing illegal mining on its concession. This is in a neighbouring area to the Ombilin underground mine of PTBA, which remains on care-and-maintenance status, despite speculation over a number of years that an operating partnership could be created to resume operations.

Despite the continuing growth of production, Indonesia remains a difficult working environment for coal producers. Heavy rains are a perennial problem for surface mine operators and constrained production in the first half of 2003. More intractable are continuing social and labour problems, particularly in South Kalimantan. In early 2004, both Banpu and Adaro declared *force majeure* on coal shipments owing to demonstrations at mine sites and loading facilities.

### **Other Asia Pacific**

**Bangladesh** will become a coal-producing nation when the Barapukuria mine officially comes into production at the revised date of October 2004; development coal has already been raised. Development of the Barapukuria mine is being undertaken by China National Machinery Import and Export Corp (CMC). The mine is scheduled to produce 1 Mt/y run-of-mine (bituminous high volatile coal; ash 12.4%, 25.68 MJ/kg) from two multi-slice longwalls. A 250 MW mine-mouth power plant is under construction and due for commissioning in early 2005, with the potential to expand to 375 MW. It is reported that CMC is now in negotiation to undertake a second coal mine project in the country. In a separate development, UK-based Asia Energy Corp is proceeding with further studies and plans to raise about £15 million through an IPO on London's AIM for development of the Phulbari Coalfield, near Dinajpur in northeast Bangladesh. The coalfield was originally discovered by BHP and initial studies have estimated an initial in situ resource of 370 Mt and have established the potential to develop a 9 Mt/y surface mine. The project concept is that production will be used primarily for electricity generation through a power plant with generating capacity of up to 2,500 MW.

**Iran** maintains annual production at around 1.5 Mt, from relatively small underground mines in the Kerman Coalfield and from even smaller operations in the Alborz coalfields. Virtually all production is from underground, from relatively thin, locally steeply-dipping seams, and is destined for the steel industry. Development of the Tabas Coalfield is the major coal-sector investment aiming to produce 1.5 Mt/y of coking coal from a new longwall operation. Twin inclines are under construction and during 2003 tender awards were announced for four new roadheaders from Dosco, a mine monitoring and control system from Davis Derby of UK and longwall roof supports from Fazos of Poland.

**Japan** is the largest single coal importing nation and its demand for both thermal and metallurgical coal is one of the major drivers of the Asia Pacific coal trade. The country no longer produces indigenous coal and electricity generating units in near-coastal locations are dependent on imported coal. Coal imports in 2003 totalled 63 Mt; high import levels were experienced in mid-2003 ahead of the introduction of a steam coal import tax in October. The country is also heavily dependent on nuclear generating capacity but while a substantial part of the country's nuclear capacity has been offline in 2003, demand for thermal coal imports has soared.

The coal industry in **New Zealand** is dominated by the state-owned company Solid Energy. There are a number of smaller private sector producers but these together represent less than 15% of national production. Solid Energy achieved a production of 4.09 Mt in the 2002-03 financial year (2001-02: 3.35 Mt), of which it exported 2.13 Mt (2002: 1.8 Mt). The company aims to increase coal production to 7 Mt/y by 2008 and, subject to competition from other fuels, foresees potential production of 10 Mt/y by 2010. Sales volumes within New Zealand reached a record 1.96 Mt (2001-02: 1.55 Mt).

The major domestic consumer is New Zealand Steel Ltd, with its Glenbrook Mill, south of Auckland consuming 0.83 Mt in 2002-03. However growth in domestic demand is expected to be driven by increased sales to Genesis Power Ltd, the operator of Huntly Power Station (North Island). Only 5% of New Zealand's electricity is generated from coal, and sales to the power-generation industry were only 0.65 Mt in 2002-03 but demand is anticipated to rise to 1.7 Mt/y by 2006-07.

Mines in South Island produced 2.4 Mt, primarily from the Stockton open-pit mine (1.57 Mt in 2002-03), where production capacity, potentially of 2.5 Mt/y, is constrained by the aerial ropeway as the off-site delivery system. Underground mining in South Island is being continued, after closure of the Strongman No. 2 Mine, by development of the Spring Creek mine, with target capacity of 0.8 Mt/y, and by the small Terrace underground mine at Reefton. In North Island the Huntley East underground mine produced 0.45 Mt and the Rotowaro surface mine produced 1.13 Mt, primarily for the Huntley Power Station. Solid Energy export sales are primarily of coking coal and semi-hard coking coal, together representing 73% of export volume.

Japan is the principal export destination, taking 47% of all export sales. In the private sector Pike River Coal Co, 72% owned by New Zealand Oil and Gas Ltd, has received approval for a new underground mine with a capacity of 1.1 Mt/y of semi-hard coking coal; production of 0.5 Mt/y is scheduled for the end of 2005.

**Pakistan** has a small coal industry based on low technology underground mining operations in Baluchistan, Punjab and Sindh. Markets are the cement industry and small industrial applications such as brick kilns, with the exception of a number of small mines in the Lakhra Coalfield in Sindh, which supply the Kanot Power Plant. The Kanot Power Plant, built in the early 1990s by the Chinese company CMC, comprises 3 x 50 MW units, of which only one is intermittently functional. The role of coal in Pakistan's power generation mix is only around 1%. However, the giant Thar coalfield, in the desert area of south-east Sindh province, is under evaluation; lignite reserves have been assessed as 175,000 Mt. Rheinbraun Engineering has been engaged to undertake evaluation for a large scale surface mine and reports that it has completed the exploration phase and is currently undertaking mine design to a timetable for submission of a feasibility study to the Government of Pakistan in September 2004.

Coal production in the **Philippines** rose to its highest level for five years in 2003. According to the country's energy department, some 2.03 Mt of coal was produced compared with 1.67 Mt in 2002. The bulk was bituminous coal produced by the open-pit operations on Semirara Island, Province of Antique, which produced 1.86 Mt compared with 1.52 Mt in 2002. The Philippines has very limited coal resources, quoted as 300 Mt of recoverable reserves, but these are dispersed and mostly of lignite or sub-bituminous coal. Although coal has a declining share of the national fuel mix, there are still some small mines under development, mainly in the southern island of Mindanao. The country still relies on a significant amount of coal-fired power generation. Mirant is the Philippines' largest IPP, operating five power plants in the country, of which the coal-fired 1218 MW Sual plant is the nation's largest and lowest-cost producer. The National Power Corp (Napocor) is the sole purchaser of power from Sual. Coal imports to Philippines are largely dictated by Napocor and current import levels are around 7.1 Mt/y, primarily for power generation.

**South Korea** has a small national coal industry producing under 4 Mt/y of anthracite for power generation and domestic use. However, South Korean energy utilities consumed 43.1 Mt of coal in 2003, marking a rise of 3.2% from 2002. The annual rate of increase has slowed from the 12% increase seen in 2002 and the jump of 17.6% in 2001. Coal consumption by South Korean generating companies has more than doubled since 1995. The Korea Energy Economics Institute (KEEI) predicts a 6.6% increase in coal imports in 2004, assuming a 5% rise in energy demand this year, and forecasts an annual average growth rate between 2003-08 of 5.8%, as a result of increasing demand from power plants.

**Thailand** is a significant producer of brown coal, which is used almost exclusively for power generation. The 2,400 MW lignite-fired Mae Moh power plant is the largest source of electricity generation in the country and also one of the largest point sources of atmospheric pollution in Southeast Asia, generating around 13% of Thailand's electric power production. The Mae Moh mine produces around 18.3 Mt/y, feeding directly to the power plant. Other smaller producers include Banpu plc, Thailand's largest private coal production company, which produced 2.5 Mt of lignite in 2003, with sales to the cement industry and power generation utilities. Total national lignite production is around 21 Mt/y. The country currently also imports some 5 – 6 Mt/y of bituminous coal and some coke for industrial use. Banpu has a 50% shareholding in the new 1,434 MW BLCP coal-fired power plant in eastern Thailand, due for completion in 2006, and which will be supplied by imported coal.

**Vietnam** produced around 20 Mt of coal in 2003 and figures quoted in May 2003 illustrated an 18% increase over the previous year. Exports for 2003 were on target for 5.5 Mt, comprising mainly anthracite. Domestic consumption has shown a 27% year-on-year increase and is largely used for the production of electricity and paper. Government policy is to promote the construction of coal-fired power plants and the 100 MW Na Duong plant is due to come on stream in 2004. In late 2002, Vinacoal, the state coal company, signed a contract with Kopex of Poland with a US\$90 million credit line, to equip three new underground mines, with construction commencing in 2004.

## **North America**

### **US**

According to preliminary data from the US Energy Information Administration, coal production in the US, in the calendar year 2003, fell by over 2% from the 2002 level and was recorded as 1,07 million short tons (970 Mt). However, overall exports reversed the falling trend of recent years and showed a 8.5% rise from 2002, and stood at 43 million short tons (38.9 Mt) for 2003. This comprised 18.9 Mt of steam coal and 20 Mt of metallurgical coal. Imported coal totalled 22.7 Mt, an increase of nearly 50% over 2002.

US coal consumption increased during 2003, reflecting the economic recovery. The US Energy Information Administration reports that almost 92% of all coal consumed in the US is for power generation. Exceptionally hot summer weather was reflected in increased power generation and a major blackout in August caused the shutdown of nine nuclear reactors in the northeastern states, a combination which strongly favoured coal-fired plant. The producers also identify a two-year trend of stockpile reduction by the coal-based power plants, although by late 2003 utility stockpiles had approached more normal levels and a strong rally for thermal coal was experienced; spot prices for eastern low sulphur coal increased by more than 50% in a period of just a few months. In 2003 there was increased demand for steel, resulting in increased coal consumption at coking plants, reflected in the continuing strong prices experienced since 2002 for metallurgical coal.

On a regional basis, production from the Appalachian Region fell for the second year in succession, producing 340 Mt, while the Interior and Western Regions remained essentially constant, producing 132.6 Mt and 496.5 Mt respectively. Wyoming in the Western Region was, by a large margin, the state with the highest production of coal and registered an annual record of 340.6 Mt, an increase of 0.6% over the previous year. This was 35% of all national coal production and was greater than the sum of the next four largest coal-producing states (West Virginia, 125.5 Mt, Kentucky 102.6 Mt, Pennsylvania 57.8 Mt, Texas 43 Mt). Around 45% of national coal production was produced by just four major coal companies.

Peabody Energy is the world's largest private-sector coal company, and has 29 operating units in nine US states — the Powder River Basin (PRB), the Southwest, Midwest and Appalachian regions. In 2003 the company sold 184.3 Mt an increase of 2.6% over the previous year and representing 19% of national hard-coal production. Company coal sales fuelled approximately 10% of US electricity generation; of total sales some 2.5% are of metallurgical grade coal and 5% of sales were destined for non-US markets. Peabody has an enviable record of managing its production costs and reports an overall productivity of 97.7 short tons per man-shift. Peabody's controlled coal reserves are stated as 9,100 million short tons.

The greater part of 2003 production came from Peabody Energy's Powder River Coal Co, in the PRB of Wyoming, in which the company is the single largest producer. The three PRB mines operated at peak levels to ship a record 96.6 Mt. The largest of these, the North Antelope-Rochelle surface mine is the largest mine in North America and produced 72.7 Mt. Also in the PRB, the Caballo mine produced some 20 Mt and the Rawhide mine some 2.7 Mt. In the Midwest, Peabody began production at its new 3.6 Mt/y Highland No. 9 mine using advanced continuous miner technology. Peabody is also active in the development of new coal-generating plant, of which the 1,500 MW Prairie State Energy Campus in southwestern Illinois is the most advanced; a second project in Western Kentucky is also in development.

The most significant change for future company direction is the acquisition of the Twentymile mine in Colorado from RAG Coal International AG, a transaction finally closed in the first quarter of 2004. Twentymile produces some 7.25 Mt/y of steam coal and was the most productive mine in the southwestern US in 2003, and one of the largest and most productive underground mines in the US. At the same time as the purchase of Twentymile, Peabody also purchased from RAG two metallurgical coal mines in Australia and is in the process of purchasing a 25.5% stake in the Paso Diablo Mine in Venezuela, marking Peabody's return to international investment in coal production.

Kennecott Energy, part of the Rio Tinto Group, produced 108.2 Mt (2002: 105.3 Mt) of thermal coal from six operations in Wyoming, Montana and Colorado, making it the second-largest producer.

The company operates three major surface mines in the PRB of Wyoming, Cordero Rojo (2003: 32.7 Mt), Jacobs Ranch (2003: 32.4 Mt) and Antelope (2003: 26.8 Mt) and two smaller operations in Montana, one of which is 50%-owned, together giving attributable production of 11.7 Mt. Kennecott also operates the Colowyo surface mine in Colorado, which produced 4.5 Mt in 2003. After closure of the Colowyo East Pit in November 2003, the ADD-CAR highwall mining system has been contracted and is extracting panels up to 335 m long and 3.5 m wide, using a conventional continuous miner cutting head, with web pillars of 2 m between panels.

Arch Coal Inc is the third-largest coal producer nation-wide, with a strategy to concentrate on production of low-sulphur, clean-burning thermal coal. Coal sales in 2003 were 91.3 Mt, down from 96.8 Mt in 2002. The greater part of production comes from the PRB where Arch operates the Black Thunder surface mine, using four large draglines, one of the largest mines in the US with a capacity of around 61 Mt/y. During 2003, Arch reached agreement to purchase the coal holdings of Triton Coal, the seventeenth largest coal producer in the US, which in 2003 produced 38.2 Mt from its two large PRB mines: Buckskin and North Rochelle. However, the Federal Trade Commission intervened to review the transaction and in early 2004 ruled against the acquisition; closure of the agreement is now subject to appeal. The Triton purchase would increase Arch's PRB reserve base by about half.

Arch also is considering reviving its idle Coal Creek surface mine in PRB, which has infrastructure in place for a 16.3 Mt/y operation. Arch also operates in the Western Bituminous Coal Region which includes its highly productive underground longwall West Elk Mine in Colorado. In the central Appalachians, Arch operates surface and underground mines in West Virginia, Kentucky and Virginia.

Consol Energy is the largest producer of high calorific bituminous coal in the US, with 19 mine complexes in seven states, of which 14 mines were operational during 2003 to produce 54.8 Mt (2002: 58.8 Mt). It is the largest producer of underground coal and is the largest exporter of US coal. It is also one of the leading producers of coal-bed methane, with daily gas production of approximately 146 Mft<sup>3</sup>, and generates electricity from coalbed methane at a joint-venture generating facility in Virginia. All the company mines are underground operations with the exception of Mahoning Valley in eastern Ohio and Mill Creek in eastern Kentucky, which employs both underground and surface mining; over 90% of company production is won by underground mining.

Consol Energy operates eight of the top 20 largest underground coal mines in the US in terms of production, including the Enlow Fork and Bailey longwall mines in Northern Appalachia, with 2003 production respectively of 8.98 Mt and 8.53 Mt, making these the two highest-producing underground coal mines in 2003. Substantial production was lost due to a fire in the Loveridge mine in West Virginia in early 2003 and full production was not resumed until the first quarter of 2004.

The major new coal preparation plant at McElroy mine, installed at a cost of US\$57 million, became operational in late 2002, and is planned to support expansion of McElroy to a production capacity of around 10.9 Mt/y for 2004. The company sold its remaining overseas interest, the Glennies Creek mine in Australia, in early 2004.

A name which has disappeared from US coal production is RAG American Coal Holding, which between 1999 and 2002 grew to be one of the major coal producers in the US, at its peak producing some 64.5 Mt (2002) from operations spread between Wyoming, Colorado, Illinois, West Virginia and Pennsylvania. The large Twentymile underground longwall mine in Colorado has been sold to Peabody Energy. It was announced in early 2004 that the remaining US operations would be sold to a consortium of three US companies, consisting of First Reserve Corp, Blackstone Group and American Metals & Coal International (AMCI). This latter sale includes two large open-pit, truck-and-shovel operations in the PRB of Wyoming, Eagle Butte and Belle Ayr, together producing around 38.5 Mt/y, and high performance underground mines in the eastern US, including the Cumberland and Emerald longwall mines in Pennsylvania.

Following the pattern of 2002, it is expected that surface-mined coal represents around 68% of total annual coal production. The surface-mined total includes some 79 Mt of lignite, produced primarily from just two states, Texas (43.7 Mt) and North Dakota (27.9 Mt), with much smaller quantities from Louisiana, Mississippi and Montana.

A potentially important development in the US market is the growth of the coal synfuel industry. Preliminary information indicates that there were 55 synfuel plants operating in the US at the end of 2003 and 104.6 Mt of coal was processed for this purpose, although typically coal-preparation reject coal and run-of-mine coal may be used.

### **Canada**

Hard-coal production in Canada continued its pattern of general decline during 2003, with total annual coal production of 62.1 Mt (2002: 66.6 Mt), a fall of 6.7%, following the 5.5% decline experienced in 2002. This decline is largely attributable to falling production of bituminous coal, because coal production for the domestic market for power generation, comprising sub-bituminous and lignite, remains largely unchanged from 2002 levels. Despite the fall in production, exports showed an increase of around 6.5% over 2002, with despatches totalling 28.3 Mt (2002: 26.8 Mt), of which 23.7 Mt are attributable to metallurgical coal.

Complex negotiations between the leading coal producers of western Canada during 2002 resulted in a fundamental realignment of ownership and management of the industry. Two major coal groups have emerged, one focused primarily on metallurgical coal production and export markets and the other on thermal coal production and supply to national utilities.

In February 2003, Elk Valley Coal Corp (EVCC) emerged as a partnership between Fording Canadian Coal Trust (Fording) holding a 65% interest, and Teck Cominco Ltd with a 35% interest, focussed on the integration of the metallurgical coal mines of western Canada. In addition to the metallurgical coal interests of Fording and Teck Cominco, the consolidation of the sector had incorporated also the metallurgical coal assets of Luscar Ltd and Consol Energy. In parallel, Luscar Ltd, a partnership between Sherritt International Corp and Ontario Teacher's Pension Plan Board, consolidated its position as Canada's largest producer of thermal coal, acquiring the thermal coal interests of Fording.

EVCC now comprises the second-largest exporter of metallurgical coal in the world. During 2003, six mines were operational consisting of the Fording River, Greenhills, Coal Mountain, Elkview, Line Creek and Luscar operations. With the exception of Luscar, all these operations are in southeastern British Columbia. Full year figures are not available for 2003, but production levels reflect a capacity of 24 Mt; the fourth quarter figures for 2003 were some 5.7 Mt. This level of production is also predicted for 2004, although closure of the Luscar mine in Alberta is planned for this year owing to depletion of reserves. However, overall production is planned to be maintained by increased production at other units and EVCC also has available for future development the proposed Cheviot Creek project adjacent to Luscar mine. In early 2004, EVCC announced its intention to proceed with development of the Cheviot Creek mine, to come on stream in the last quarter of 2004 with a capacity of 1.4 Mt/y and the potential to achieve 2.8 Mt/y from 2005.

On average, the metallurgical coal for export in Canada has to be transported by rail for distances of over 1,100 km to one of two coal terminals on the Pacific Coast, Westshore and Neptune, both near Vancouver. EVCC retains a 46% interest in Neptune Bulk Terminals. The survival of the Canadian export coal trade has been the subject of wide speculation as its efforts to compete, particularly with lower cost Australian product in the Asia Pacific market, were constrained by the enormous rail haul distances to the ports, the difficulties of relatively complex geology which limits low-cost production options, and the extreme winters. The recently soaring demand for coking coal and the closure of higher-cost operations as part of the consolidation of EVCC now suggest a much more promising future. At the end of 2003 it was reported that more than 80% of EVCC's production available for sale for the 2004 fiscal year had been contracted and priced at levels which represent an average sales price over the course of 2004 of US\$48/t, an increase of 13% over 2003 prices; in particular this is reported to reflect negotiations with the major Japanese steel corporations.

Luscar Coal Ltd, owned by a partnership between Sherritt International Corp and Ontario Teacher's Pension Plan Board, is Canada's largest producer of thermal coal and operates ten mines in Alberta and Saskatchewan. Luscar-operated mines include seven wholly-owned units, two contract mining operations and a 50% share in one operation, together contributing a reported 2003 production of approximately 37 Mt.

Production is located in Alberta and Saskatchewan, exploiting bituminous, sub-bituminous and lignite coals which are primarily sold under long-term coal supply agreements to adjacent power generating stations. Lignite production in Saskatchewan, from three mines, apparently fell somewhat compared with 2002, with a production of approximately 10.7 Mt. Coal sales attributable to Luscar in 2003 comprised 22.2 Mt of domestic disposals and 1.6 Mt of export thermal coal.

The bulk of all coal production in Canada comes only from the two provinces of British Columbia (2003: 23.1 Mt) and Alberta (2003: 28.2 Mt), the former comprising primarily metallurgical coal and the latter primarily thermal coal. Virtually all production is from surface mines, although the Coal Association of Canada records one underground mine in British Columbia. Other production comprises lignite from Saskatchewan and very small quantities from the eastern provinces of New Brunswick and Nova Scotia, where operations currently comprise only some small surface mines.

Through 2003 there have been reports of a number of proposed new coal projects in Western Canada. Pine Valley Mining has reported that it has the finance facility to commence production from the new Willow Creek mine in northeast British Columbia during June 2004, with the objective to produce pulverised coal-injection and coking-coal product at an annualised rate of 1.1 Mt by the end of 2004, building to at least 2 Mt/y by mid-2005. Western Canadian Coal Corp announced in June 2004 that it had raised capital to continue exploration and development planning for two new metallurgical coal mines, Burnt River and Wolverine, in northeast British Columbia, targeted to commence production in late 2004, building to 2.5 Mt/y by 2006.

While the prospect of Canada retaining a position as a 'swing' supplier of metallurgical coal is positive, and there appears to be supply capacity to meet demand, the potential for thermal coal exports appears to be small and reducing. Canada remains a significant consumer of coal (2003: 60 Mt), primarily for power generation. Imports of coal remained essentially unchanged from 2002 at 22.4 Mt, of which 19.4 Mt was sourced from the US.

### **Mexico**

Coal-fired power generation plants supply around 16% of Mexico's electricity (2002: 15.8%), and although this share is reported to be programmed to fall in the face of preferred use of natural gas, new projects are in the pipeline for new coal-fired capacity.

Coal production reported by the Government Secretariat of Economy, has shown a steady decline from 8.2 Mt in 2000 to 6.4 Mt in 2002, with a slight increase to 6.6 Mt in 2003. Production of coke has shown a similar pattern of decline and stood at around 1.46 Mt in 2003. Figures for coal production are commonly quoted by the US Department of Energy (US DOE) at a somewhat higher level (2000: 11.3 Mt), and in part reflect the difficulties of incorporating production figures from numerous small producers.

Almost all production and resources are in the State of Coahuila in the northeast of the country bordering the US, although a very small production is also recorded in the State of Sonora. The principal producer is Minera Carbonifera Rio Escondido (Micare), a subsidiary of Altos Hornos de Mexico (AHMSA), which operates a complex of three underground mines and two surface mines producing sub-bituminous thermal coal primarily to supply two adjacent thermal power generation plants (Carbón I and II), of 1,200 MW and 1,400 MW capacity respectively; these apparently also need to import some low-sulphur coal from the US as a blend to help meet environmental constraints. The Micare operations have a production capacity of approximately 7.0 Mt/y, around 50% of which is from the surface mines, operated as a large dragline operation. Operations in the surface mines are reported to have been temporarily suspended in the face of accusations that inadequate site rehabilitation has damaged important local aquifers.

Also owned by AHMSA, the second important mining complex is Minerales Monclova SA (Mimosa) which operates five underground mines in the Sabinas area, also in Coahuila State. These extract a coking coal which after washing is largely consumed as metallurgical product by AHMSA, although a portion is classified as thermal coal. The future of AHMSA, which is heavily indebted, is under review and the potential closure of local steel-making places a question mark on the future of the Mimosa mines.

There are also a considerable number of smaller, privately-owned operations in the Coahuila area, who sell their product, often through intermediary agents who prepare a blended coal, to the Comisión Federal de Electricidad (CFE) for power generation. Political pressure has dictated that CFE will continue to supply its thermal power plants in Coahuila with Mexican coal for at least another two years, but the generator claims that this makes the cost of coal 38% higher than if they used imported coal. In a separate development, in May 2003 CFE announced that it intends to build a new 2,100 MW coal-fired power plant, Pacifico II, in Michoacan State, to come on stream in 2009 and to be supplied by imported coal. A new coal import terminal will be located close to CFE's existing coal terminal at Lazaro Cardenas. A further coal-fired thermal plant is also under consideration of Mexico's Gulf Coast.

Mexico has traditionally imported relatively small quantities of both metallurgical and thermal coal, mainly from the US, to meet an annual national consumption of the order of 13.5 Mt/y (2001: 13.4 Mt quoted from US DOE). However, in 2003 imports of over 10 Mt are reported, of which the greater amount is believed to be thermal coal from Australia. During the year, Glencore International announced that it had been awarded a contract to supply 2.8 Mt to CFE, the second of two contracts in a six-month period.

### **South America**

The northern part of South America has become an important source of thermal coal exports, primarily supplied to Europe and the US. Together, in 2003, Colombia and Venezuela exported some 53 Mt of low-sulphur thermal coal (2002: 43 Mt).

Colombia also sustains a significant level of domestic utilisation but in general coal utilisation in South America is very limited. The exception is Brazil, which is the largest coal consumer in the continent, but despite reportedly extensive resources, domestic production has fallen to a very limited level and the country is now a significant importer of metallurgical coal.

### **Colombia**

Since taking office in August 2003, President Alvaro Uribe has enacted political, fiscal and social reform policies and there are encouraging signs of increased stability and economic growth. In 2003 the GDP grew by nearly 4% (2002: 1.5%), but Colombia still continues to face many challenges. Coal remains the second most valuable export commodity after oil and above coffee, and is set to overtake oil.

Colombia is an important exporter of thermal coal on the world scale and in 2003 exported approximately 45 Mt (2002: 35.4 Mt), a major increase over the previous year. The major export destination is Europe, with total sales of over 25 Mt, and secondly, the US, to which Colombia exported 14 Mt in 2003.

National coal production in 2003 showed an increase of nearly 25% to 49.3 Mt (2002: 39.5 Mt). Only a relatively small proportion (approximately 10%) of national production is consumed internally (2002: 4.6 Mt), primarily for power generation, with much smaller quantities for metallurgical and other industrial use. Coal accounts for only 10% of national energy consumption, and around 63% (2002) of electricity generation is hydroelectric. However, in the longer term, national plans are to increase the coal-fired share of electricity generation.

All coal production in Colombia is in private hands. Major export operations are limited to the two northern states of Guajira and Cesar. However, coal deposits are widely scattered through the northern and western sectors of the country. There are widespread small and medium-scale coal operations, particularly in the states of Norte de Santander, Córdoba, Santander, Antioquia, Cundinamarca, Boyacá, Valle del Cauca and Cauca. These small operations are mainly underground mines and together represent less than 5 Mt/y, sometimes using relatively primitive mining methods. Metallurgical coal in Colombia is produced only in the states of Boyacá, Cundinamarca and Norte de Santander. The greater part of production from these interior regions is for local industrial use, although export tonnage attributed to the interior regions (2001: 1.3 Mt), particularly from Norte de Santander, is known to be transported across the border to Venezuela, from where it contributes to coal shipped from the port of Palmarejo on Lake Maracaibo.

The greater part of coal export volumes, over 80%, comes from the two main producers, Cerrejón Coal Co (CCC) and Drummond Coal. The balance is covered by two other well-established exporters, Prodeco and Carbones del Caribe, plus one or two other smaller producers. Fundamental to the performance of these companies is their access and transport routes to ports with adequate coal-handling capacity on the Caribbean coast.

CCC was created in 2002 as the unitary operator of the Cerrejón coal resources, operations, transport and port infrastructure, under the ownership of a three-partner consortium comprising Glencore, BHP Billiton and Anglo American. During 2003 CCC achieved increases in production and reductions in unit costs but this was offset in part by low sales prices in the early part of the year and operational difficulties due to heavy rainfall during the last quarter. Production in 2003 was 21.9 Mt (2002: 18.5 Mt), in line with projections, and the company has now embarked on expansion to a capacity of 28 Mt/y, in part through development of the Patilla resource area, to the west of Cerrejón, with capacity to contribute an additional 3 Mt/y from 2004. It is envisaged that production of up to 32 Mt/y can be achieved by 2010. The company exports its coal through its own port of Puerto Bolivar along an approximately 150 km rail link. This link has been vulnerable to periodic attack by guerrillas and in September 2003 suffered temporary dislocation.

Drummond Coal operates the second-largest mine in Colombia, the Mina Pribbenow open-pit operation near La Loma in Cesar State. Drummond's exports from this operation in 2003 were on target for 16 Mt (2002: 12.8 Mt). To the south and adjacent to La Loma, the major El Descanso deposit, with reserves quoted as 800 Mt proven, is planned to come on stream in some 3-4 years, and this in conjunction with La Loma, will support Drummond's planned expansion to 26 Mt/y by around 2008-09. Coal production from La Loma is transported by rail to the dedicated port facilities of Puerto Drummond at Ciénaga, on the Caribbean coast. This 200 km rail route has been susceptible to guerrilla attacks, although the threat appears now to be declining.

The third-largest coal producer in Colombia in 2003 was Carbones del Caribe, controlled by Cementos de Caribe, part of the country's largest conglomerate, Grupo Empresarial Antioqueño (GEA). Carbones del Caribe owns and operates La Jagua Mine in Cesar State, a surface and underground mining operation, for which the last published production figures were 2.3 Mt in 2002. The company also handles transport and marketing for other smaller operators, and specifically for the Carboandes operations. After a poor year for export sales in 2002, when exports were only 1.4 Mt, in 2003 these are estimated to have been 2.5 Mt. In 2003, Carbones del Caribe had committed to expenditure to boost its own coal production to 4.5 Mt/y and to continue with construction of its dedicated port facility at Rio Córdoba, near Puerto Drummond, due to be operational by late 2003. However, in an apparent reversal of company policy, in early 2004 it was announced that La Jagua and the Cerro Largo prospect, together with reserves quoted as 130 Mt, plus other assets, would be offered for sale.

The other significant exporter (2002: 1 Mt) is Prodeco, which handles tonnage from small underground and surface mines in La Jagua area of Cesar State, which is trucked to its port facilities near Ciénaga, a distance comparable to that of the Drummond rail link. Access to port facilities on the Caribbean coast remains a major constraint for smaller operators and therefore for diversified sources of export. Only two ports are currently capable of handling Capesize vessels, Puerto Bolivar, owned by CCC, and the Ciénaga-Santa Marta facility.

Development of the Rio Córdoba facility is expected to ameliorate the situation.

### **Venezuela**

Venezuela is the second largest coal producer in Latin America. After a period of modest growth in 2000 and 2001, the Venezuelan economy entered recession in 2002, compounded by political unrest, leading to a national strike which continued into early 2003. The strike, together with the introduction of currency controls, caused severe contraction of the economy, with the GDP falling by 9.2% over the course of 2003. Despite the economic and political difficulties, coal production and export levels appear to have held up relatively well. The Ministry of Energy and Mines (MEM) reports that national coal production grew by 16% in 2003, although this is unsupported by detailed figures and appears optimistic with respect to production performance of the larger producers, who were certainly affected by the strike in the early part of the year. National production in 2002 was 8.1 Mt and exports were recorded as 7.7 Mt. Independent assessments have indicated that exports for 2003 were approximately 8 Mt.

There are only two large-scale mining operations in the country, both of which are joint ventures with important participation held by Carbozulia, a subsidiary of the state-owned petroleum company PDVSA. This position is likely to change in 2004 as PDVSA endeavours to concentrate on core business, and it is reported that the shareholdings held by Carbozulia in these major joint ventures will be transferred to Corpozulia, responsible for regional development on behalf of the State of Zulia. These mines are both truck-and-shovel surface mines in adjacent blocks in the Guajira Peninsula, Zulia State.

Carbones del Guasare is the largest coal producer in the country and operates the Paso Diablo mine, which produced some 5.7 Mt in 2003 (2002: 6.4 Mt), although overall exports are believed to have been over 6 Mt. The share structure of Carbones del Guasare has been just over 50% held by Carbozulia, with two equal partners, Anglo American and RAG Coal International, each holding 24.9%. However, in late 2003 it was announced that RAG would sell its participation to Peabody Energy of the US. Carbones de la Guajira is the second-largest coal producer and operates Mina Norte with production capacity of around 1.5 Mt (2002: 1.4 Mt). Carbones de la Guajira is a joint venture between Carbozulia and Interamerican Coal Inc. The Paso Diablo and Mina Norte operations each truck their coal over 100 km to independent port facilities on Lake Maracaibo, in each case requiring barge transfer and floating cranes for loading in the main shipping channel of the lake.

There are a number of additional coal blocks in the Zulia region reported to be under evaluation and permitting. Of these, the most imminent for development and production is Las Carmelitas, situated in the Guajira coal area, west of Maracaibo, which will be operated by Complejo Siderúrgico del Lago CA (Cosila), a subsidiary of Tomen America, which already owns the coal export port of Palmarejo on Lake Maracaibo.

Planned to become operational in 2003, with an initial production level of 1 Mt/y, this appears to have been held up owing to the political and economic situation. Coal production will be transported by truck over a distance of some 120 km to Palamarejo. Development of further coal blocks in the Zulia region is largely dependent on a solution of access to export port facilities; development is currently constrained by poor infrastructure and available outlet routes only through Lake Maracaibo.

Other than in Zulia State, there is a small level of production from the Andes region (2002: 150,000 t), generally comprising small underground mines producing coking coal for local consumption, and also in the northeastern region (2002: 80,000 t). In 2002 a tender was invited for development of coal deposits in Anzoátegui State, in the northeastern part of the country and another tender process was commenced for development of concessions in Falcón State, in the west of the country, but in neither case has significant development progressed, perhaps as a reflection of the unsettled political and economic climate.

Coal use in Venezuela has until now been minimal and largely limited to the use of coking coal in small local foundries in the Andes region and other small-scale industry elsewhere. Electrical power generation has been dominated by hydropower, which currently represents over 65% of capacity, with the balance represented by thermal plants using oil and natural gas. After frequent electricity shortfalls throughout 2002 and 2003, those in 2002 being due to low water levels for hydropower generation, the MEM has unveiled plans for future investment in power generation, including a potential coal-fired plant of some 300 MW in the San Cristóbal region of western Venezuela, although this must be identified as a long-term development objective.

### **Other South America**

In **Argentina** coal is a minimal component of the country's fuel mix. There is a wide expanse of Patagonia in which brown coal deposits are known, and historically a number of small mines have operated, although the remote location and indifferent coal quality have inhibited any greater development. The only significant coal mine is at Rio Turbio in Santa Cruz Province, close to the border with Chile, producing around 200,000 t/y, with a workforce of around 1,100. The mine has been subject to labour unrest and political agitation following its transfer to private ownership in recent years. Latest headlines are of a fire and fall of ground in June 2004, leading to at least seven deaths. Local sources comment that the continuation of mining here rests upon continued state support and investment in a mine-site power generation unit.

**Brazil** maintains a small private-sector coal industry with a run-of-mine production capacity of around 10 Mt/y (2002: 10.0 Mt), with saleable product of 4.64 Mt in 2003 (2002: 5.1 Mt). The leading coal producer is Copelmi Mineração, in which Rio Tinto Brasil has an interest, which operates the Recreio mine in Rio Grande do Sul, producing 1.9 Mt in 2002.

During 2002 the state government of Rio Grande do Sul leased Mina Leão II to the company Carbonifera Criciúma and production will supply the Jacui coal-fired power station. Coal provides only around 2% of the total national energy supply and currently operating coal-fired thermal plants comprise three units in Rio Grande do Sul, of which two are very small, and the Jorge Lacerda plant (1 x 482 MW, 1 x 350 MW) in Santa Catarina. Coal consumption for these plants is around 4.5 Mt/y.

The country is a significant coal importer, with imports of the order of 20 Mt, of which the greater part is metallurgical coal. An important influence in the future is likely to be the move of CVRD, the giant iron ore producer, to take a more direct interest in steel-making and to use its strong trading links with China to source coke as part of recent sales contracts and also to invest in international metallurgical coal joint ventures. In addition to coal production-sharing agreements in China, CVRD is also reported to be participating in coal project developments in Mongolia, Mozambique and Venezuela.

**Chile** currently has minimal production capacity based on the brown coal deposits in the south regions of the country; in 2002 a total of 321,000 t were recorded as produced in the Magallanes region. A number of very small private underground mines reportedly continue to operate in this area. Larger surface mine operations have been intermittently operated only. It is reported that an exploration programme is under way at the Estancia Invierno prospect on the Isla Riesco, to determine reserves of sub-bituminous coal for surface mine operation; this exploration prospect was awarded to Minera Otway in 2002. Chile continues to utilise a number of older coal-fired power generating plants, and 9% of national primary energy requirements in 2001 were met by coal. The country remains a regionally significant importer of thermal coal.

A very small production of coal is reported in **Peru** (2002: around 30,000 t) from underground exploitation of anthracite-grade coal for local industrial use. Peru also imports small amounts of thermal coal.

### **Africa**

The regional production of coal is dominated by South Africa, which obtains virtually all its production from the Karoo sediments of Permian age. The widely scattered coal deposits elsewhere in southern and eastern Africa (Botswana, Malawi, Mozambique, Tanzania, Zambia, Zimbabwe) are part of the same depositional sequence but owing to local conditions and development strategies, no other national coal industry approaches the significance of the South African operations. Isolated coal-bearing sequences in Niger (Carboniferous), Nigeria (Cretaceous), Morocco (Upper Carboniferous) and Egypt (Jurassic) represent only regionally significant coal-bearing potential.

### **South Africa**

The year 2003 was generally considered a difficult year for coal producers, primarily related to the increasing strength of the rand against the US dollar. Export prices are set in dollars while operating costs are incurred in rand.

Despite the rise in export coal prices in the latter part of the year, the benefits have been offset by the rand/dollar exchange rates. The difficult trading conditions have been reflected in the results of the major international operators which dominate the South African industry.

A continuing theme through the year was progress towards black empowerment targets which has driven further realignment of ownership of the major assets. Early in 2003, a long-awaited 'scorecard' was published providing the basis of evaluation of progress to a wide range of empowerment targets. The response of the major mining companies was generally one of relief that a clear road-map was in place for the future. Under the Mineral and Petroleum Resources Development Act, coming into force in May 2004, 15% of assets, by production, must be owned by "historically disadvantaged South Africans" within five years and 26% within ten years.

Overall coal production of 238.7 Mt, which included 1.2 Mt of anthracite, showed a significant increase of around 8% over 2002. Exports in 2003 reached a record 71.5 Mt (2002: 69.2 Mt), primarily through Richards Bay Coal Terminal (RBCT), which handled 68.3 Mt (2002: 66.1 Mt). Much smaller quantities are handled through Durban, which exported 2.1 Mt in 2003, with some tonnage also passing through Matola in Maputo.

Coal production in South Africa is very much a tale of two markets. Export coal production is essentially constrained by the transport infrastructure and port facilities, while the market for domestic power generation coal is governed by the long-term supply contracts to the national power generation company Eskom. A second important domestic component is the synthetic fuel industry, also governed by long-term production planning and operated by a dominant giant consumer Sasol.

Export coal capacity handled through RBCT is largely to the benefit of the three major shareholders, Anglo Coal, Ingwe (a BHP Billiton subsidiary) and Xstrata, which together hold 86% of the equity. Smaller shareholders include Eyesizwe, Total and Kangra. After lengthy discussions it was announced in the first quarter of 2004 that agreement had been reached between RBCT and South Africa's national rail operator Spoornet, which controls the transport capacity to the terminal, clearing the way for the planned 'phase five' expansion of RBCT to start in the mid-part of the year. The expansion will boost the terminal's export capacity from 72 Mt/y to 86 Mt/y by the 2007-08 financial year. The expansion will take place over a three-year period and will be contingent on black-owned companies being allowed proportionate access to the terminal.

For 2004, it is anticipated that black-owned collieries will despatch some 2 Mt through RBCT and this is expected to double by 2006. Despite the optimism for expansion, the first quarter of 2004 was once again marked by under-target throughput levels; in the quarter exports of 15.2 Mt were around 12% or 2 Mt below target. During 2003, Spoornet announced increased rail tariffs of 60% on coal deliveries to the Durban and Matola terminals, which has

resulted in the closure of some smaller export coal mines, although the small producer Metorex increased its despatches through Matola to 0.5 Mt.

Eskom, which generates approximately 95% of South Africa's electricity, has a generating capacity of 35,200 MW, most of which is coal-fired. In 2003 the coal burn was around 92 Mt. Against a background of impending privatisation, Eskom appears also to be developing options to enter the local and export coal market.

The company maintains extensive stockpiles, estimated at 20 Mt, and has expressed interest in developing a new mining venture and taking a share of the expansion tonnage of RBCT. Government proposals for the privatisation of Eskom envisage that 10% of generating capacity will be privatised by the end of 2004 and most of Eskom's activities, with the exception of power transmission, will eventually be privatised. The company also has an expressed policy of encouraging coal supply from black empowerment companies, although this is always constrained by the linkages between specific collieries and power plants. For example, Anglo Coal sold 31.3 Mt to Eskom in 2003, up 9% on 2002.

The Anglo American Group is now, by a significant margin, the largest coal producer in South Africa. Anglo Coal posted significantly increased attributable production and sales of 52 Mt (2002: 48.8 Mt) despite several production sections being closed to reduce costs. Production efficiencies contributed to saleable production at export collieries being 4% above the previous year. Growth in electricity production by Eskom, combined with low stocks, resulted in increased production and sales from collieries producing power station coal. Major expansionary capital projects, including the Kriel South project and the Greenside and Kleinkopje expansions. The Kriel South project is a collaborative venture with Sasol, in which Anglo Coal will establish a new 5 Mt/y open-pit operation in the northern part of the coalfield for supply to Sasol, while the latter will expand underground production from its Syferfontein in the southern part of the reserves.

During 2003, the Anglo American Group increased its holding in Kumba Resources, the iron ore and coal producer spun off from steel producer Iscor, to 66.6%, so that Kumba now reports as an Anglo American subsidiary. This brings significant additional coal production capacity within the group. In 2003 Kumba produced 19 Mt of coal production from three mining units, comprising 13.9 Mt of power station product for sale to Eskom, 2.2 Mt of coking coal and 2.9 Mt of thermal coal. Of the three mines operated by Kumba, by far the most important is the large Grootegeluk surface mine near Ellisras in the Northwest Province, which is a multi-product operation, with the greater part of production sold to the adjacent Eskom Matimba power plant.

Eyesizwe Coal is the largest black-owned, controlled and operated coal-mining company in South Africa, although Anglo Coal holds an 11% equity stake in this company which it helped to create. Eyesizwe is now the fourth-largest coal producer in the country with a production base of 25 Mt/y (2002: 23 Mt).

Eyesizwe operates four mines, Matla, Arnot, New Clydesdale and Glisa, and in early 2004 acquired a fifth, Strathrae, close to Arnot. All are underground mines with the exception of a new surface mine venture at New Clydesdale and Glisa.

Matla Colliery is the largest operation, working one longwall and thirteen continuous miner sections, with production capacity of up to 15 Mt/y run-of-mine coal primarily for the power generation market. The company is keen to expand its export business but currently holds only 1.2% of RBCT equity, although expecting to be a major beneficiary of the 6.5 Mt capacity to be freed up for black empowerment companies as part of the RBCT expansion. Eyesizwe formed a joint venture with Kumba in mid-2003 to develop the Kalbasfontein project near Witbank in Mpumalanga Province, planned as a surface mine to produce 1 Mt/y of high-grade steam coal for the export market. Eyesizwe has also been named as the selected black empowerment partner for Sasol, and could emerge with a 26% stake in Sasol Mining, although the partnership is expected to be reflected not only in equity participation but also through operational involvement of Eyesizwe in the running of current and new ventures with Sasol Mining.

Ingwe (100% owned by BHP Billiton) is the largest single company coal producer in South Africa, reporting attributable production in 2003 as 54.3 Mt. Sales in the period were 22.8 Mt of energy coal despatched to the export market (2002: 27.5 Mt), 31.0 Mt sold to Eskom for power generation (2002: 29.4 Mt) and 1.3 Mt sold to the domestic industrial market (2002: 4.3 Mt). The largest operation managed by the company is the Douglas/Middleburg complex (Ingwe 84%; Xstrata 16%), as a unit with underground and surface mine production together totalling 24.4 Mt in 2003 (2002: 25.4 Mt). The other major operations are the wholly-owned Khutala complex and the Optimum surface mine. Early in 2004 it was announced that Ingwe and Anglo Coal would undertake feasibility studies on the creation of a joint venture for development of a new operation, the Western Complex, which would incorporate also development of Ingwe's proposed Klipspruit Project. If this development proves viable, it will undoubtedly require participation with suitable black empowerment partners and will provide long-term power station fuel to Eskom and thermal coal to the export market.

Sasol Mining supplies coal to Sasol Synfuels at Secunda and Sasol Infrachem at Sasolburg. The mining operations produced approximately 52 Mt in 2003 (second half-year of 2003: 26 Mt) most of which is sold to its parent company but with a small but significant export component; Sasol Mining holds a 5% stake in RBCT. Sasol Synfuels consumes nearly 40 Mt/y. Sasol Mining has two regional operations, one based around Sigma Colliery near Sasolburg, comprising the Sigma-Mohlolo underground and the Wonderwater surface operations, and also the Secunda Collieries complex. More than 90% of Sasol Mining production now comes from the Secunda mines, which consist of five underground operations at Secunda and the Syferfontein surface and underground operation near Trichardt. Export coal is produced from the Twistdraai underground mine at Secunda.

Sasol Mining undertook a major infrastructure expansion project in 2001 at the Secunda complex, requiring the construction of nine new ventilation shafts over a two-year period. The contract was awarded to Murray & Roberts and is noteworthy for the shaft construction by raise-boring for shaft diameters in excess of 7 m at the Bosjesspruit and Middelbult collieries. During 2004 it is anticipated that natural gas from Mozambique will be supplied to Sasol Infrachem, and at that stage coal production from the Sigma Colliery operations will no longer be required, coinciding also with exhaustion of reserves. Closure of the Sigma operations is therefore anticipated in 2004.

Xstrata appeared as a major coal operator and exporter only in 2002, when the company took over the coal assets of Glencore, which retains a 40% ownership stake in Xstrata. Production of saleable tonnage in 2003 was 16.8 Mt (2002: 16.3 Mt), and sales increased to 18.0 Mt (2002: 16.8 Mt), reflecting a major reduction in stocks. In 2003, 13.8 Mt of attributable sales were despatched to the export market and 4.2 Mt were sold to the domestic thermal coal market. During 2003 the company undertook operational developments which increased production capacity by 1.4 Mt/y at its on-going operations. The Boschmans underground upgrade project was commissioned in January 2004, in addition to work undertaken on expansion of both the WitCons and Tavistock underground operations and coal beneficiation plants.

The Tavistock Colliery expansion raised production capacity to 1.8 Mt/y and included the conversion of a conventional cut, drill and blast section to a continuous miner section, the addition of a new continuous miner section and an upgrade to the conveyor system. The WitCons colliery expansion increased production capacity by 50% and has included the addition of a new continuous miner section and an upgrade to the conveyor system. In the surface mine operations, development commenced at the new Goedgevonden colliery, which will initially be operated as a small contractor open-pit operation and will utilise beneficiation capacity at the South Witbank mine. There was also a major relocation of the dragline to the North Pit at the ATCOM operation. However, the continued strengthening of the rand relative to the US dollar during the year and the corresponding heavy impact on costs is quoted as the reason for postponement of a number of previously planned capital projects, including the South Witbank 5 Seam project and the project to replace the current 4 Seam operations at Waterpan Colliery. Nevertheless, the purchase of two new higher-capacity continuous miners at South Witbank is planned for 2004.

Among the black empowerment companies, Kuyasa was founded in 1995 by ex-Ingwe middle managers, initially working the Ikhwezi surface mine. At the end of 2002, Kuyasa purchased the Delmas colliery from Ingwe, bringing annual saleable capacity to 2.5 – 3.0 Mt/y. Delmas is relatively isolated from the other Ingwe operations although located in the largely untouched Leandra resource area; future development of this significant resource block would in any event require the participation of a black empowerment company.

Kuyasa is noteworthy as the company which has purchased the moribund Maamba Colliery operations in Zambia.

A small amount of anthracite is produced in KwaZulu-Natal Province. Springlake colliery produced 740,800 t in 2003, by a combination of surface and underground mining. However, congested railway and distribution routes are claimed to have reduced the business to a barely break-even position and AfriOre Ltd, of Toronto, one of two partners in a 50:50 joint venture, is now seeking to sell out to a local black empowerment group.

### **Other Africa**

**Botswana** has only one coal mine, Morupule, supplying Botswana's only coal-fired power station as well as the mining operations at Selebi Phikwe and the Sua Pan soda ash plant. The reported level of production is around 1.06 Mt/y, and the Morupule power station, of net capacity 118 MW, supplies almost half of national electricity demand. Although there are reportedly extensive coal resources in the eastern part of the country, in the Morupule and Mamabula deposits, this is only of thermal coal quality and there are no apparent plans to expand production.

**Egypt** has one small coal mine, the Maghara underground mine in the Sinai Peninsula. Production is reported to be around 360,000 t/y, and this contributes to a national demand for hard coal of around 1.2 Mt/y, which is primarily for the Helwan steel works. Maghara production, which is non-coking, contributes to a blend with imported metallurgical coal and otherwise is used for small industrial processes.

Heavy rains and flooding in **Malawi** at the beginning of 2003 reduced production from the small Mchenga mine, in the northern district of Rumphi, from 300 t/d to 100 t/d. Malawi has a number of identified, relatively small coal deposits and there is considerable interest to develop these to meet local industrial demand for kilns, steam-raising and drying, and also, perhaps optimistically, as an option for thermal power generation. A small mining operation in the southern district of Nsanje started production in 2003; Mwabvi coal mine announced plans to increase its annual production from 60,000 t to 200,000 t in 2003. Current national demand is only some 100,000 t for industrial use, and sales of additional production will be focussed to export sales to adjacent countries.

**Morocco** no longer has any significant coal production but the country has committed to the building of coal-fired power generation plants on the Atlantic coast. The Jorf Lasfar 1,356 MW power plant has been constructed as a private sector independent power facility and the fourth unit came on stream at the end of 2001. The plant provides approximately one-third of the country's electricity supply and benefits from a 30-year power purchase agreement from the national power utility. Coal supply agreements envisage imports of 4 Mt/y for Jorf Lasar and the government-owned Mohamedia thermal power plant. Imported coal is reported to be sourced primarily from South Africa.

**Mozambique** continues to explore means to revive coal production from the Moatize coalfield, in which formal production ceased during the civil war. Invitations have been issued in early 2004 to selected mine operating companies to develop and operate the mines. An integral part of any rehabilitation must be reinstatement of the Sena-Beira railway to allow exports of coking coal via the port of Beira; removal of explosive mines dating from the civil war was only completed along this route in 2003. Current estimates of the cost of the rehabilitation project are in excess of US\$1.3 billion, but participation from International Finance Corp (IFC) may be available as it is supportive of related infrastructure and gas development projects. Serious interest in development of the project has been expressed by a number of groups, including the Brazilian mining and energy group CVRD and a number of South African industrial and financial institutions. Identification of the selected developer should be apparent in the course of 2004.

Coal production in **Niger** takes place at the Tefereyre mine, 75 km northwest of Agadez, operated by Sonichar, which runs a mine-mouth thermal power station comprising two 18.8 MW units. In 2001 the plant consumed all the mine production of some 160,000 t of coal from the surface mine. The corresponding over-burden removal suggests a stripping ratio of 9.5:1. During 2003 the government commenced an energetic campaign to persuade the population to use coal for cooking in order to reduce use of diminishing fuel-wood supplies. It is reported that new coal resources have been discovered at Takanamat in central Niger. Thus far no processing of coal to briquettes has been undertaken but it is reported that Sonichar is intending to build a plant to process coal supplies for national distribution.

**Nigeria** has a small coal industry in the east of the country. State-owned Nigeria Coal Corp currently runs four mines: Okpara and Onyeama underground mines in Enugu State, Okaba surface mine in Kogi State and Owukpa underground mine in Benue State. Annual production is estimated to be around 100,000 t. Efforts have been made in recent years to develop the Lafia-Obi deposit, southeast of Abuja, in order to contribute to a coking coal blend which will be required by the long-delayed Ajaokuta steel works project. It is reported that exploratory shafts for bulk sampling have been undertaken during 2002, but results are not encouraging and future development of Ajaokuta will undoubtedly require significant imports of coking coal. In mid 2004, after much discussion, the coal industry has entered the privatisation process and the Bureau of Public Enterprises is evaluating specialist advisors for the process.

The only operating coal mine in **Swaziland** is the Maloma colliery, producing anthracite from operations with a capacity of some 480,000 t/y (2002 production: 310,000 t). Operation of the mine is under Xstrata of South Africa, which holds a 75% share of the equity, and all production is currently exported to South Africa. Proposals to open the Mpaka Colliery, after years of suspension but with reported reserves of around 30 Mt, have not yet materialised and are dependent on availability of financial investment.

**Tanzania** has a number of coalfields, but formal mine development has only taken place in the Songwe-Kiwira coalfield, south of Mbeya. The Kiwira underground mine appears no longer to be able to supply other than to its own small 6 MW on-site power plant. Potential local industrial customers, such as Mbeya Cement, have in recent years sourced their requirements from Malawi.

The only coal-mining operation in **Zambia** is Maamba Collieries in the Southern Province. The operation, reportedly very run-down, consists of two open pits with a production capacity of up to 800,000 t/y. The company was part of the privatisation exercise which in 2002 put on offer a 70% stake, reportedly purchased by Kuyasa Mining of South Africa. In early 2003, production was reported to be only 9,000 t/mth and the potential market for tobacco drying, cement manufacture and breweries was being met largely by imports from Zimbabwe.

**Zimbabwe** has one coal producer, Wankie Colliery Co, which operates near Hwange in the Zambezi Valley in the northwest of the country. The company has been loss-making and struggling to meet production targets due to a shortage of foreign currency with which to purchase spare parts. Production in 2003 was only 824,600 t, down 29% from 2002 and far below rated capacity of around 3.4 Mt/y. When running at near-capacity, some 90% of production was from the open pit, but in this the prime earth-mover, the dragline, has suffered from poor availability and lack of spare parts. However, in September 2003 the company secured a financing facility of US\$5.3 million from the Africa Export Import Bank. As a result, Joy South Africa has secured a contract to supply a 12HM15 continuous miner and three shuttle cars to Wankie; this will support an operation with two sections, with a planned output of 120,000 t/mth. A significant surge in production tonnage was reported for the early months of 2004, with prospects to hit 80% of capacity during the course of the year.

### **Former Soviet Union**

The countries of the Former Soviet Union (FSU) have traditionally been highly dependent on coal as a primary energy source. With the break-up of the FSU a number of countries were able to configure their energy utilisation to local resources, such as for example, Turkmenistan with hydrocarbons and Tajikistan with hydro-electric resources. For most of the others, coal remains an important element of the energy mix and there is an important cross-border coal trade across much of the region. Three countries dominate coal production based on the historic coal production areas of the FSU: Russian Federation, Ukraine and Kazakhstan.

### **Russia**

According to Rosinformugol, Russia's coal output rose in 2003 to 274.7 Mt (hard coal and lignite) up some 8% on the previous year (2002: 253 Mt). Coal exports also rose to 57.8 Mt (2002: 51 Mt) and included some 10.3 Mt of coking coal. In the first half of 2003, 65% of all coal production was produced by surface mining, a figure likely to be valid for the full year.

While the privatisation process of the coal industry has continued, the overall picture of industry ownership remains complex. A large proportion of production remains tied to the domestic market and the housing and utility sectors which commonly receive coal supplies at large discounts. The other social pressure is that mines are often the only source of employment in the area in which they are located. The privatisation process has followed a route of restructuring groups of profitable mines for sale, which means that there remain a number of the least profitable companies outside of the restructuring and investment process and there are still state-owned companies which have not yet entered the restructuring process. It is still commonly reported that in some areas miners remain for long periods without wages payments. The government aims to complete its programme of privatisation of the coal industry by 2005.

The most successful mining units are those that are part of major vertically integrated companies, particularly those in the energy sector, which is growing and is the principal coal consumer. The recently privatised sector is also undergoing consolidation as smaller groups are purchased by larger players.

The Kuznetsk Basin (Kuzbass) is the most important coal-producing area in the Russian Federation and once again accounted for 52% of all production, posting production for 2003 of 143.4 Mt (2002: 130 Mt) from 48 deep mines and 33 surface mines. In December 2003, Rosinformugol published a list of the 20 most efficient coal companies in Russia, in which 17 were from the Kuzbass (Kemerovo Region), one, the Siberian Coal Energy Co (SUEK) was an integrated interregional energy producer and two other mining companies figured, one from the Tuva and Novosibirsk Regions respectively.

The underground coal mines of the Kuzbass are controlled by five joint stock companies: Kuzbassugol, Kiselevskugol, Prokopievskugol, Kuznetskugol and Yuzhny Kuzbass. In addition one independent mine, Raspadskaya, operates in the Kuzbass. Raspadskaya mine, which is one of the most modern in Russia, set a monthly coal production record from a single longwall face for Russia in November 2003 of 512,955 t of coal; the previous record, also set by Raspadskaya was of 359,000 t in February 2003. These levels of production were obtained from a single face, equipped entirely by Joy Mining Machinery, including a Joy 6LS3 shearer. Other underground mines in the region have achieved improved production, but in general the underground mines have to deal with high methane levels and increased use of methane drainage systems is foreseen as an integral part of improved performance. Surface mines in the Kuzbass represent some of the most commercially attractive operations and Kuzbassrazrezugol, which controls about one-third of the output from the Kuzbass, produced 40 Mt in 2003 (2002: 37.8 Mt) from 12 surface mines; of this, over 5 Mt was coking coal.

The largest corporate coal company in Russia, SUEK, is part of the MDM industrial group and one of the companies most aggressively engaged during 2003 in the consolidation process of privately-owned coal production.

In 2003 SUEK produced 79 Mt of coal or some 28% of all Russian coal (2002: 65 Mt). The company owns and operates coal mines in Siberia and the Russian Far East. In a recent press statement the company stated that it had gained control over an additional two surface mines and eleven underground mines in the Kuzbass as well as some enterprises in the Far East.

It is reported that SUEK controls Sokolovskaya Investment Co, with important coal holdings in the Kuzbass, and recently acquired the Kiselevskugol company, also in the Kuzbass, which produced 4.3 Mt in 2003. In Siberia, the group includes the Krasnoyarsk Coal Co, one of the largest producers of energy coal in Russia and the VostSibUgol and Chita Coal companies. In the Far East the company also owns Sakhalin Coal Corp, Sakhalinugol and other operations. It is in the process of taking control of the Urgal coal deposit in Khabarovsk Krai, having purchased Severny Urgal which produced 1.2 Mt in 2003, and now positioning itself to acquire a controlling stake in Urgalugol which produced 2.8 Mt in 2003. During 2003 the company purchased control and is aiming for full ownership and management of the east coast port of Posyet, from which it is targeting exports to Japan and Taiwan.

Access to export markets is vital for companies to participate in the profitable export trade. At the end of 2002, Kuzbassrazrezugol purchased from the Sokolovskaya company its 45% stake in Rosterminalugol at Ust Luga port in the Leningrad Region, controlled by Kuzbassrazrezugol, became active from May 2003, with despatch of a cargo of 9,000 t of coal; dredging has been undertaken to allow loading of vessels of up to 20,000 t in 2003, with the objective ultimately to accommodate panamax size. It is also reported that Kuzbassrazrezugol is planning a second outlet, to be available in 2005, at the Estonian port of Tallinn Muuga.

Kuzbassugol was privatised only in late 2001, through the merging of coal companies in the Kemerovo region, and had a stormy ride in 2002 as shareholding groups struggled to assert control. Control now appears to be shared between SUEK, which controls the energy coal mines, and Severstal, the large steel producer, which controls the coking coal production. At the beginning of 2003 the company was operating 12 mines in the Kuzbass.

Elsewhere in Russia the picture of coal production is much more mixed. Coal production continues to fall in the eastern regions of European Russia and the Donbass. In particular major decreases in production were recorded in the brown coal operations south of Moscow. A modest increase in production was recorded for the Pechora coal basin and there is an expectation that Severstal will take a controlling stake in operations as it needs the coking coal mined at Vorkuta for its steel business. The Vorkuta and Inta coal enterprises were in the restructuring process in 2003 and the sale of tranches of state-owned shares by the Russian Property Fund is planned, with Severstal being the expected purchaser.

Critical to the competitiveness of Russian exports, in particular, are the rail freight charges which apply over the huge haulage distances. Business plans for export coal enterprises are dependent upon locating and controlling sea terminals at economically feasible distances from the point of production. Modernisation of coal handling capacity is under way at several eastern and northern ports, including Vostochny, Vanino and Murmansk. Russia also has a significant level of imports, primarily related to the power plants in the Southern Urals, specifically Sverdlovskenergo and Chelyabenergo, which take the greater part of coal exported from the Ekibastuz basin of Kazakhstan.

### **Ukraine**

Ukraine produced 79.3 Mt of coal in 2003, reportedly reduced 3.2% from 2002, although this suggests a higher figure for the previous year than expected during that year. In recent years there has been considerable confusion regarding reliable production figures as opposed to targets, which have been around 80 Mt.

At the end of 2003, 190 coal mines, including open-pits, were reported to be operational, of which the majority were in the Donets Basin (Donbass) in the eastern end of the country. After the major restructuring exercise of the late 1990s there were 173 underground mines operational in 2001, of which only four were profitable and surviving without financial assistance. The state has continued to subsidise the industry heavily and continues to invest in new production capacity. The Ministry of Fuel and Power announced in March 2003 that it would continue construction of three new mines in the Donbass and modernise and expand production at others and also bring in additional capacity at the Kostinatynivsky lignite openpit. 74 new longwall faces were to be commissioned for power generation coal and 11 faces for coking coal. The results in the first quarter of 2004 indicated that of the quarterly production of 20.5 Mt, coking coal production had fallen by 1.4% year-on-year while power generation fuel production increased by 9.4%.

Coal remains central to the national economy in terms of the employment it creates and its contribution to primary energy needs, which is around 30%. The coal industry still employs around 450,000 people. The principal coal-fired power generation plants are in the east of the country adjacent to the hard-coal mines in the Donestsk Basin. In contrast, lignite and peat play a minor role in overall coal production and easily accessible lignite reserves are more or less exhausted. Despite the efforts to maintain or expand coal production, Ukraine remains a net importer of coal. Imports from Poland have fallen, but Russia reports that in 2003 its exports to Ukraine doubled. The overall level of imports is assumed to be broadly in line with those of the previous year, approaching 4 Mt.

Reform of the coal sector has been for a long time a priority government objective, but it continues to be dogged by political sensitivity and about-turns in policy.

At the end of 2002, the government announced its plan to group the mines into seven production associations for mining coal and to establish 21 open joint-stock companies in the coal sector which would then be privatised. However, in June 2004 it was announced that Ukraine has suspended privatisation of the energy and coal mining industries in order to retain governmental control. Subsequently, the government has decreed the setting up of a state company, Ugol Ukrainy (Ukrainian Coal) to encompass all existing and potentially profit-making coal mines and non-profit-making units will be closed down. Apparently the decree excludes the Pavlogradugol company, the privatisation of which had been already authorised by the President, but so far has been blocked by court hearings.

### **Kazakhstan**

Kazakhstan includes some of the major coal-producing regions of the FSU and has now overtaken Ukraine as the second-largest producer in the region. In 2003 coal production reached 84 Mt (2002: 73 Mt), of which 80 Mt were bituminous coal and 4 Mt of lignite. This indicates soaring production of lignite, up 41% from 2002, primarily for internal power generation. In contrast, the growth in bituminous coal production is largely linked to export sales to Russia, and the increase of 14% in 2003 should be seen against the previous fall of 9% in 2002, from the 2001 figure of 76.5 Mt of bituminous coal.

There are a number of significant coal basins, and 86% of the quoted reserves are from six coal basins. However, the greater part of Kazakh coal production is centred upon the Karaganda and Ekibastuz coal basins. The Ekibastuz basin in the Pavlodar administrative region produces thermal coal from thick seams which support large-scale, low-cost surface mines. The largest production company is Bogatyr Access Komir (BAK), a Kazakh-US joint venture, with production in 2003 of around 32 Mt, primarily from its two large surface mines, Bogatyr with capacity in excess of 24 Mt/y, and Severny with capacity of some 12 Mt/y. BAK supplies some coal to ten power plants and other users in Kazakhstan, and also to nine power plants in Russia. BAK apparently owns the Bogatyr mine, but leases its operating rights to Severny mine and the Bogatyr No. 9 Block from the Russian power giant, Unified Energy System.

The Karaganda basin is characterised by underground mines producing high-quality coking coal and thermal coal. The greater part of production capacity in this basin is under the ownership of Ispat Karmet, which operates eight underground mines. Together, they produced 12.5 Mt of coal in 2003 (2002: 10.6 Mt). Among the principal mines of the group, Kazakhstanskaya which was commissioned in 1969, achieved a production of 1.55 Mt in 2003. Planned production from the Ispat Karmet mines is planned to be 13.7 Mt in 2004 and increasing to 20 Mt by 2007. Currently the greater part of production is consumed by Ispat Karmet, although significant export sales of coking coal are despatched to Russia.

Some 60% of national energy consumption is derived from coal and overall national coal consumption is around 55 Mt/y (2001). Coal exports are primarily thermal coal; export sales increased by 11% in 2003 to a level of 27 Mt, representing a 36% increase in sales value to US\$250 million. The largest export customers are the Russian power utilities Sverdlovskenergo and Chelyabenergo, taking product from the Ekibastuz basin.

### **Other Former Soviet Union**

**Belarus** and **Georgia** reportedly have some identified resources of coal or lignite. However, in neither of these countries is there any significant production. Belarus has a hydrocarbons industry which reduces reliance on coal, while, in contrast, Georgia is more reliant on coal imports from other FSU countries, primarily Russia.

**Tajikistan** reported coal production in the first six months of 2004 of some 23,800 t, reflecting a momentum built up in 2003 to develop indigenous coal production. The Energy Ministry aims to introduce production from up to 12 sites and indicates that Tajikistan hosts some of the largest coal deposits of Central Asia, quoted at around 4,000 Mt. Interest in coal production may be seen as a means of diversifying energy sources although Tajikistan has significant hydro-electric generation capacity.

**Kyrgyzstan** has a small coal industry and virtually all production is from the Kara-Keche surface mine in Naryn Region in the north of the country. During the latter years of the Soviet Union, Kyrgyzstan had a substantial mining industry with 14 state-owned mining operations, although by 1992 production had declined to 2.4 Mt and only four of the operations were considered profitable. In the south of the country production has officially ceased and there are no formal operations although there are apparently many illegal miners extracting quantities of coal from abandoned underground mines. At the Kara-Keche mine, capacity is reported to be in excess of 1.5 Mt/y, but reported mine production for 2002 was less than 250,000 t and a government objective for 2004 was announced as raising coal production from Kara-Keche to 300,000 t/y. The Kara-Keche mine is operated by the state enterprise Razrez Ak-Ulak JSC through a joint-venture private-sector management contract, and plans for expansion are subject to the participation of investment partners. However, it is reported that at least four other private operators exploit coal from the deposit. Reserves for surface mining have been quoted as 192 Mt. National production in 2002 was reported as 500,000 t and the main market is for district heating schemes in the capital Bishkek. Reportedly in 2003 there was continued development of shafts and infrastructure for an underground operation at the Besh-Burkhan mine, for which no production is yet reported.

**Uzbekistan** has extensive proven reserves of coal and lignite of some 3,000 Mt, of which 1,000 Mt are bituminous coal. National production is undertaken by the state monopoly AO Ugol, which, in 2002, produced some 2.7 Mt of lignite and 80,000 t of bituminous coal.

Production levels in 2004 are projected to be of this order and some 20% higher than production levels experienced in 2003. Lignite production is based on the Angren coal deposit, where in 2003 Thyssen Krupp Fördertechnik completed the first stage of a major project, worth US\$19.6 million, to introduce a continuous production system using bucket-wheel technology. This investment will increase production capacity to 7.8 Mt/y by 2010, with an annual stripping task of 62.7 Mm<sup>3</sup>. Bituminous coal deposits at Shargun and Baisun contributed the small amount of hard-coal production. The national coal requirement in early 2004 is estimated at around 4 Mt/y, but planned increases in production will return the country to self-sufficiency in the near future.

### **Europe (including Turkey)**

While Western Europe, in particular, has suffered the inexorable decline of the traditional hard-coal mining industry, based predominantly on underground mining, much of the region, especially Eastern Europe, remains heavily dependent upon utilisation of indigenous lignite and brown coal for a significant component of primary energy supply. The region includes the world's largest lignite producer, Germany, and a number of the principal lignite producers and consumers, including Greece, Poland and Turkey. The largest hard-coal producer in the region is Poland, and the contraction of this industry and its export share is having a marked effect on the dynamics of regional markets. Reflecting the former importance of hard-coal production, Western Europe continues to be a major importer of steam coal for power generation. Colombia and South Africa dominate coal imports into Europe.

### **Germany**

Germany produced a total of 205.5 Mt of coal and lignite in 2003 (2002: 208.5 Mt), a decrease due primarily to a reduction in the lignite burn for power generation. Germany is the world's largest producer of lignite, in 2003 producing 179.1 Mt (2002: 181.7 Mt).

Hard coal, however, makes an important contribution to power generation and in 2003 contributed 25% of national net power generation as opposed to the 29% contributed by lignite. However, production of hard coal has continued to fall very gradually and 26.4 Mt were mined in 2003 (2002: 26.8 Mt) of which 21.1 Mt was consumed for power generation (2002: 20.8 Mt). Germany is now a significant importer of power-generation coal in addition to requirements for metallurgical coal. In 2003 overall use of hard coal rose, and in the first nine months of 2003 was up 5.3% on the previous year, at 49.2 Mt, representing an annual consumption of around 65 Mt and requiring imports of around 39 Mt (2002: 37.0 Mt).

In 2003 total lignite deliveries to power stations was 165.3 Mt (2002: 167.4 Mt), representing 92% of lignite production. The largest lignite producer is RWE Rheinbraun, which produced 97.5 Mt (2002: 99.4 Mt) from four lignite mines in the Rhenish mining area of western Germany using bucket-wheel technology.

In the east of the country, in the Lausitz mining area, the Laubag company produced 57.3 Mt (2002: 59.3 Mt), and in the Central German mining area the Mibrag company produced 22 Mt (2002: 20 Mt). Although bucket-wheel technology predominates, smaller operations in the east of the country use surface miners and trucks.

The hard-coal sector managed to maintain a largely unchanged profile in 2003, despite the pressures for further contraction. During 2003 ten underground collieries remained in production in the ownership of Deutsche Steinkohle (DSK). However, in July 2003, the German Government ruled that, in line with its EU obligations, hard-coal production must be reduced to 16 Mt/y by 2012. In response, the RAG and DSK supervisory boards selected two mines to be scheduled for future closure, probably before the end of 2007. These were the Warndt/Luisenthal mine in the Saar and the Lohberg/Osterfeld mine in North Rhine-Westphalia. The latter mine (formerly Heinrich Robert) is one of only two mines producing coking coal and in 2002 DSK commissioned a new 1.4 km shaft at Ost mine, creating access to more than 30 Mt of coking-coal reserves. The hard-coal mining industry continues to be heavily subsidised and the terms of the subsidies, set through to 2005, envisage production remaining at the 26 Mt/y level through to 2005, but thereafter there must be a reduction of 3–4 Mt of annual capacity before the end of 2007.

### **Poland**

Poland is one of the most coal-dependent countries in the world. Coal accounts for over 97% of all electric power (2001), the balance being from hydroelectric generation. The greater part (55%) of coal-fuelled power generation is based on hard coal and the remainder is from lignite-fired capacity at mine-mouth captive power plants.

There are substantial lignite resources, mainly of Miocene age, located in the central and western parts of Poland, with quoted reserves of 14,000 Mt. Four large mines are in operation: Adamów (5 Mt/y), Belchatów (35 Mt/y), Konin (15 Mt/y) and Turów (10 Mt/y). Together they contributed some 60.0 Mt of product directly for power generation. The Patnów-Adamów-Konin power complex controls over 10% of Poland's generating capacity and lignite supports some 35% of national power generation. The current level of lignite production, and its contribution to power generation, can be expected to be maintained in the foreseeable future, although the Belchatów plant is aging and scheduled for replacement.

The hard-coal mining industry remains politically sensitive to reform. The new law on coal mine restructuring became effective at the beginning of 2003, providing for cancellation of debt to a value of some US\$4.8 billion, reduction in production levels and closure of certain collieries. Some 28,000 miners must be laid-off in the period 2003–06, while progressive contraction of production from the 2002 level of 102.1 Mt was projected at an annual level of decline of some 12 Mt/y to 14 Mt/y over the same period.

The reform programme had, at the end of 2002, implemented a formal restructuring of the existing production entities and the setting up of a new company, Kompania Weglowa, which would incorporate the operations of the five coal-mining companies, Bytom, Gliwice, Rybnik, Ruda and Nadwislanka. At the time of this restructuring exercise it was envisaged that seven of the worst-performing mines would be closed in 2003, comprising five mines from Kompania Weglowa, and two others in the other remaining operating groups. This was envisaged as a reduction in production of 12.7 Mt in 2003, with a net reduction of personnel employed in the industry of some 27,000 by 2006.

In the event, 2003 proved a year of widespread unrest in the mining communities as the political power of the mineworkers endeavoured to halt or mitigate the closure programme. After much debate, a formal procedure was instituted for objective assessment of the economic merits of each coal mine. In August 2003, the four mines scoring lowest in these assessments were named as Centrum, Bytom II, Boleslaw Smialy and Polska Wirek, and were listed for closure. A range of social support instruments were put in place to assist the 8,500 people who would be affected by the closure. In the final quarter of 2003, the debate continued to rage and the government proposed remedies such as merging the poorly performing mines with more successful ones. The process of restructuring and its effect on production remains unresolved.

The operational structure remains dominated by Kompania Weglowa, which now operates 24 mines and nine service companies in the Upper Silesian Basin. The company employs approximately 80,000 people. Other independent operating companies include Katowicki Holding Co (KHW), Jastrzebska Coal Co (JSW), specialising in coking-coal production, Bogdanka Mine Co operating in the Lublin Basin, Budryk Mine Co and Sobieski-Jaworzno III mine and power plant complex.

JSW has five operating mines (Borynia, Jas-Mos, Krupinski, Pniowek and Zofiowka). All of the mines are located in Silesia and have a combined nominal production capacity of 15.4 Mt/y. All the mines produce metallurgical coal although Krupinski mine produces some steam coal.

The continuing pattern of mine closures will reduce the level of exports of thermal coal, from 21 Mt in 2003 to around 14 Mt in 2004 (McCloskey Group). The level of coking-coal exports appears more robust and the export total of 2002, of 2.9 Mt of both hard and soft coking coal, is expected to have held up in 2003. Total coal exports from Poland are anticipated to have been 23 Mt, which is considerably higher than was anticipated at the beginning of 2003, when figures as low as 15 Mt were quoted by Weglokoks. By far the most important sales destination of Polish exports is Germany, which had imported 3.6 Mt in the first six months of 2003. Poland has also been importing small quantities of coal in recent years, principally from Russia, the Czech Republic and Ukraine, and together these are estimated to have been 1.6 Mt in 2003.

## Turkey

Coal, and in particular lignite, continues to make a significant contribution to the energy mix in Turkey although there is an explicit focus on increased natural gas use for electricity production. Coal and lignite, together, account for some 25% of national electricity generation. In 2003 lignite production showed a major reduction of 11% from 2002; official statistics commonly show a difference from industry annual figures, but in comparison with a production of 48.4 Mt in 2002 (industry figures being 51 Mt), the 2003 figure, based on official statistics was 42.9 Mt. The small hard-coal industry showed a fall of some 9%, to a level of about 2.0 Mt saleable (2002: 2.2 Mt).

The fall in lignite production and consumption, when power generation increased 8% between 2002 and 2003, reflects its decreasing share of electricity generation in the face of natural gas. A related influence is the increasing private sector participation in lignite mining and power generation, the restructuring of the state-owned Turkish Coal Enterprises (TKI) and the closure, in 2002, of a number of high-cost loss-making mines, representing 1.8% of the production volume in that year.

Lignite deposits are widely spread across the country but are generally of low calorific value and the quality of 56% of all reserves is under 1,500 kcal/kg. Some 40% of quoted economically exploitable reserves are located in the Afsin-Elbistan basin in south-central Turkey, where lignite quality is generally poor. The greatest concentration of lignite mines is, however, in the northwest region around the towns of Soma, Seyitömer and Çan. Approximately 90% of all lignite production is from surface mines. A number of underground mines operate longwall systems, with significant operations at Tunçbilek and Soma, both worked in conjunction with surface mines, and at the privately-owned Cayirhan mine operated by Park Holdings. Surface mining is performed using a variety of methods, including bucket-wheels at the large Afsin-Elbistan mine, with capacity in excess of 18 Mt/y, and draglines at smaller operations such as the 3.5 Mt/y Kangal mine. TKI is responsible for approximately 60% of all national lignite production, and the state-owned electricity company TEAS for a further 32%. Currently the private sector produces only 8% of the total. The large lignite mines are directly linked to captive power stations, and under government plans for privatisation of the power industry, the mines will be sold as part of power generation packages. In 2004 the Elbistan B power plant will come on stream, with four 350 MW units, and this will bring the total national installed lignite-fired capacity to 8,120 MW.

Production of hard coal is centred on the Black Sea region of Zonguldak, where the Hard Coal Enterprise (TTK) operates five underground mines. Estimated production for 2003 was around 2.0 Mt. The washed product comprises coking coal and high ash, thermal coal supplied to the Çatalgazi power complex. In addition, a number of small private mines in the area are also seeking to supply low-quality coal to this power complex. Less than a third of Zonguldak production is coking coal and this constitutes only a small component of national coking-coal demand. The two major steel works, Erdemir, based at Ereğli in the north, and Isdemir, based at Iskenderun on

the south coast, together, have an annual demand for coking coal of some 3.5 Mt (2002).

The annual value of coal imports increased 30% between 2002 and 2003. This increase in part reflects increased coal sales prices in the latter half of 2003, but also reflects an increased demand over the import level of 12 Mt in 2002, to meet demand for coking coal and cement works. The new 1,300 MW Iskenderun power station in southern Turkey was completed at the end of 2002 and is designed to be fired entirely by imported coal; it came on stream only in November 2003 and will create a significant rise in imports of thermal coal.

### **Czech Republic**

The Czech Republic is heavily dependent on coal for its energy needs and is able to count on extensive reserves of brown coal or lignite in north Bohemia, in the northwest of the country, and of hard coal in the east of the country, where the Upper Silesian Basin falls within Czech territory. In 2001, 70% of installed power-generation capacity was based on coal-fired plant, but this has fallen substantially since the commissioning of two new units at the Temelin nuclear power station.

The status of the various components of the energy and mining sector has become complex since the implementation of privatization strategy from early 2002. The first public tender in early 2002 for sale of a 67.6% stake in the state-owned power utility CEZ, was cancelled, when the requirement that the company should commit to take deliveries of domestic brown coal over a 15-year period proved unpalatable to prospective purchasers. CEZ remains in the public sector and owns some 65% of installed generation capacity.

Greater complexity surrounds the privatisation of the brown-coal mining industry. Of three Czech producers of sub-bituminous brown coal, one, MUS Most, with annual production capacity of 17 Mt, has already been privatised into ownership by Appian Group. The privatisation of the remaining two companies, Severoceske Doly (SCD) and Sokolovka Uhelna (SU), with production capacities of 10 Mt/y and 20 Mt/y respectively, has been complex and characterised by cancelled tenders and proposals for complex share swaps. The Czech Government came under criticism from the EU when the tender process for the latter two brown-coal producers was designed to exclude bids from energy companies in neighbouring countries and multinational energy companies. This was in an effort to preserve the employment and production levels in the domestic industry. It is reported that, in the first half of 2004, the decision has been made to sell a 50% stake of SU to its management team and to postpone privatisation of SCD.

Also in early 2002 the government drew up plans for the sale of the 45.9% government-held interest in the hard coal company OKD, based in Ostrava. The privatisation process faltered through 2002 and 2003. OKD produces both coking coal and thermal coal, in almost equal proportions, from underground operations.

In 2003 it reported a profitable operation with production of 11.7 Mt, and a workforce of some 18,000. The company is part of the Karbon Invest (KI) holding company. In early 2004 it was reported that the government had finally agreed to sell 46% of the equity to KI.

Domestic hard-coal production is dominated by OKD but two other smaller hard-coal producers operate four underground mines in the Silesian Basin. Production of hard coal in 2003 is anticipated to be in line with the 2002 figure of around 15 Mt. Lignite production in 2003 is expected to remain at the level of 49 Mt achieved in 2002. Exports of about 6 Mt of hard coal to neighbouring countries can be expected to have been maintained.

### **Greece**

Over 60% of the electricity produced in Greece is generated through the combustion of lignite. Exclusive rights for production of electricity from lignite are granted to the state-owned Public Power Corporation (PPC), now a public company traded on the Athens and London stock exchanges, but in which the Greek Government retains a 51% share. In 2003, PPC mined a total of 68.1 Mt (2002: 66.2 Mt), a record level of production, all of which was dispatched to the eight lignite-fired power plants owned by PPC. These lignite-fired plants represent 44% of the country's total installed generation capacity. A small tonnage of lignite, less than 4 Mt, is also produced from privately-owned operations which supply PPC and also produce briquettes or supply lignite for direct use in industry or domestic heating in areas adjacent to the mines. Annual production for 2003 is estimated at some 72 Mt. A small amount of imported coal is used to enhance lignite feed quality and approximately 1 Mt of thermal coal was imported for the cement industry.

The principal lignite production areas comprise the Ptolemais-Amyntes and Florina lignite fields in the north, which contribute 80% of production, and the Megalopolis area in the Peloponnese; lignite production has been increasing steadily since the 1990s. PPC is engaged in the construction of new capacity that should bring the total installed figure to around 13,000 MW in 2005. Power consumption in the Greek market continues to rise swiftly and an annual growth in demand of 4.5% is projected until 2010; a corresponding increase in lignite mining and power generation is foreseen although PPC's market share is expected to fall from the current 95%, expected to be maintained through to 2005, and thereafter to fall to 90% by 2007.

Greece is the subject of an EU infringement procedure, as of May 2004, given that the exclusive rights granted to PPC for lignite mining may be in breach of EU competition rules and distort competition in the Greek electricity market. Although 34% of the electricity generation market was in theory liberalised from 2001, no new major entrants have entered the market. Ultimately, this procedure may result in a restructuring of the lignite-mining industry.

### **Other European**

**Austria** imports all of its coal requirements, comprising in 2002 some 1.8 Mt of thermal coal for electricity generation and 2.3 Mt of coking coal for the

Voest-Alpine steel works. Lignite production and consumption in 2002 was 1.4 Mt contributing only 3% of total national power generation.

**Bulgaria** relies upon indigenous coal and lignite for nearly 45% of its production of energy as opposed to nearly 44% from nuclear power. Bulgaria also imports several million tonnes of coking coal annually. The environmental performance of older coal-fired power stations, and the safety of the nuclear plants, present a dilemma for long-term energy planning. Nevertheless, there is no doubt that indigenous lignite will remain a significant component of energy production for decades to come. There are large deposits of low-quality lignite (reserves 2,500 Mt) and lesser amounts of sub-bituminous brown coal (reserves around 230 Mt). Total coal production remains around 30 Mt/y.

The greatest production in Bulgaria is from the Maritsa lignite field, in which the three main surface mines use bucket-wheel excavators to produce over 80% of total coal production. Sub-bituminous coal is largely produced in the Bobov Dol area, where Pirin is the biggest coal production company. In this area there are a number of underground and surface mines and, with the exception of the Babino underground mine, underground mining technology is only semi-mechanised. Pirin Mines will be privatised in separate parts, of which the Oranovo Mine is expected to be sold first as it is the operation generating the highest profit. All of its production is purchased by the thermal power generator TPP Bobovdol, which supports a guaranteed production of 1 Mt/y of coal.

Proposals are in place for all the major power plants, including the thermal plants at Bobovdol, Varna, Maritsa East 2 and Rousse, to be consolidated into a single holding company, which would retain 67% of the ownership and issue 33% of the equity to be traded on the national stock market. The US\$242 million modernisation and upgrade of the Maritsa East 2 power plant, signed with Mitsui Corp of Japan, has proceeded but the state guarantee on the intergovernmental loan has been decreased to 80% from 100%, to attempt to comply with EU legislation on state support.

**France** has finally phased out significant coal production. During 2003 the last two underground coal mines, in Lorraine, produced some 1.2 Mt. In January 2004, closure of both mines was announced and the last coal mine, La Houve, near Creuzwald, closed in April. Some small surface mine workings in the Massif Central region continue. France imported some 17 Mt of coal in 2002, of which some 9 Mt was metallurgical coal.

**Hungary** closed its last hard-coal mine in 2003, an open-pit operation in the south of the country. Hungary produces a total of some 14 Mt/y of lignite from two surface mines, and an underground operation at the Markushegy underground mine, belonging to state-owned Vértes Co, which mines a seam of thickness up to 3.5 m. Lignite is the most important indigenous fuel and contributed 15% of primary energy consumption.

**Italy** produces almost no coal domestically although in 2003 it imported some 15.5 Mt of thermal coal for power generation; severe electricity blackouts in the summer of 2003 necessitated that the main power-generator, ENEL, brought back into service a number of moth-balled plants. In addition, in 2003 Italy had an estimated demand of 4.5 Mt of metallurgical coal. In Sardinia, investigation and engineering work has continued with the aim of bringing the Carbosulcis underground mine in Sardinia back into production. This will produce sub-bituminous coal from a longwall operation for use in an adjacent coal-fired power plant, but progress to economic production appears slow. In 2003 a licence was let to a joint venture of Heritage Petroleum and Kimberley Oil of Australia to explore for coalbed methane in the area immediately offshore from the Carbosulcis operation.

**Norway** has one coal producer, Store Norske Spitsbergen Kulkompani (SNSK), which operates on the Arctic island of Svalbard. SNSK has been mining on Svalbard since 1916, but since the late 1990s has been developing the new Svea Nord mine which has reserves quoted as 32 Mt in a coal seam of thickness 3.0 – 5.5 m. The new mine is equipped with a single Joy longwall system and is rated to produce 2.5 Mt/y.

The coal industry in **Romania** contributes approximately 30% of power generation. Two state-owned companies are responsible for lignite and brown coal production, National Lignite Co Oltenia (CNL Oltenia) and National Coal Co Ploiesti (SNC Ploiesti), and one company is responsible for hard coal production, National Hard Coal Co Petrosani (CNH Petrosani). Lignite production totals approximately 27 Mt (2002: 27.4 Mt) of which virtually all production is despatched for power generation. CNL Oltenia is the major lignite company and produced around 24.5 Mt from 17 surface mines and seven underground mines. Surface mine technology is predominantly bucket-wheel-based, while the underground mines operated ten modern longwalls.

At the end of 2003 the Romanian Government announced plans for further restructuring and down-sizing of the coal industry, including plans to split CNL Oltenia into five companies, reflecting plans also to restructure the electricity generating industry. This has met with widespread opposition from trades unions, and strikes in early 2004 can be expected to impact annual production. SNC Ploiesti is a smaller company producing approximately 2.3 Mt from open pits. Hard coal is produced primarily from underground mines in the Jiu Valley, of which only four out of the eleven mines are considered to be modernised. Production of hard coal is estimated at approximately 3 Mt (2002: 3.1 Mt), virtually all for power generation.

**The Republics of the Former Yugoslavia** continue the heavy dependence upon lignite-fired power generation of the former federal republic. Only Croatia has no significant indigenous coal or lignite production although there are measured resources in the country. Since 1999 the two coal-fired power plants have been supplied exclusively by imported bituminous coal. Slovenia produces some 3.5 Mt (2002) of lignite from the underground Velenje mine

and around 0.8 Mt of sub-bituminous coal from the underground Trbovlje-Hrastnik mine, all of which production was destined for electricity generation. Serbia, including Kosovo and Montenegro, has extensive reserves of lignite, of around 15,000 Mt, and much smaller resources of sub-bituminous and hard coal. Currently, over 60% of the generating capacity of Serbia is lignite-fired and these plants generated over 70% of total power output in 2003. Production of lignite was 33.4 Mt in 2003 (2002: 31.8 Mt) exclusively from surface mining, of which some 92% was delivered directly for power generation.

**Kosovo** formerly produced over 20% of power generated in Serbia and Montenegro, and work continues on rehabilitating the two lignite open pits which supply the Kosovo A and B power plants. The return to full-scale energy production was set back by the fire in mid-2002 at the Kosovo B generating unit. Bosnia Herzegovina has numerous, relatively small lignite and bituminous coal mines, primarily supplying two thermal power plants. Lignite production is around 5.5 Mt (2002) and bituminous coal production around 3.6 Mt (2002). The underground Raspotocje Mine at Zenica is one of the larger mines and has been the scene of labour unrest in early 2004 as workers agitate for increased salaries. In Macedonia, some 75% of electricity generation is from lignite-fired power plants, primarily the Bitola power plant, consuming some 7.5 Mt/y from two lignite mines in the Suvudol area.

**Spain** has a commitment to reduce subsidies to its coal industry in line with EU policy on restructuring of the coal industry but after the significant reductions in production experienced through to 2002, which recorded a production of 13.6 Mt, no significant further reduction has been anticipated for 2003 although the workforce is reported to have fallen from 13,826 in 2002 to 13,450 in 2003. In 2003 Hunosa, in the traditional mining heartland of Asturias, produced 1.8 Mt saleable (2002: 1.7 Mt) from its eight underground mines, but continued to sustain losses. Other smaller operations in the northern provinces of Asturias, León and Palencia, produce some 2.5 Mt of bituminous coal and 4.5 Mt of anthracite from predominantly underground operations. Two surface mines and one underground operation in the southern provinces of Córdoba and Ciudad Real produce some 1.2 Mt. Sub-bituminous brown coal is produced primarily in the northeast of the country for power generation, mostly from Teruel, producing some 3 Mt, but with smaller amounts from adjacent provinces. Lignite is produced from one operation in Galicia in the northwest of the country, following the closure in 2003 of Lignite de Meirama.

In 2003, Spain is estimated to have imported some 18.3 Mt of thermal coal, primarily for power generation, and some 4.5 Mt of coal for the steel industry. In 2003, Spain submitted its plans to the European Commission to grant aid to its coal industry linked to a restructuring plan for the period 2003-05, including further reduction of activity and aid to access new coal reserves; in early 2004 the Commission opened a formal investigation. The future of a number of mining operations is expected to hinge on an approved aid package.

The contraction of the **UK** coal industry continues. Overall production of coal was 26.3 Mt in the 12-month period to March 2004 (2002-03: 28.8 Mt), in which period 20 underground mines (2002-03: 25) and 40 surface mine sites (2002/3: 48) were operational. Underground production was 14.7 Mt, of which 95% was produced by the principal coal producer, UK Coal. During 2003, the Clipstone Colliery of UK Coal and the independently operated Hatfield Colliery ceased operations and the planned closure of the Selby Complex was confirmed for mid-2004. In the calendar year 2003, UK Coal, produced 17.9 Mt (2002: 19.5 Mt), comprising 14.8 Mt from 12 underground mines and 3.1 Mt from surface mines. Of the underground production, 3.6 Mt was from the Selby Complex of three linked units; this complex is scheduled for closure from mid-2004 with the corresponding loss of this production capacity.

By far the greater part of UK Coal production is destined for the power-generation industry, with only minor sales to other industrial users. Coal fuels over 30% of the total of UK power generation (2002: 32%). In 2003 coal imports to UK for power generation have been estimated at 24 Mt (2002: 22.1 Mt) and imports of coal for the steel industry (metallurgical coal and PCI coal) at 6.7 Mt (2002: 7.4 Mt).

Table following page.

**Table 1: The major coal producers and exporters (Mt)**

	2001	2002	2003	Exports 2003	Imports 2003
<b>China</b>					
(total) <i>all qualities</i>	<b>1,294.0</b>	<b>1,326.0</b>	<b>1,608.0</b>	93.0	<sup>e</sup> 11.0
<b>US</b> (total)	<b>1,021.3</b>	<b>988.0</b>	<b>970.0</b>	38.9	22.7
<i>lignite</i>		73.5	79.0		
<i>hard coal</i>		914.5	891.0		
<b>India</b> (total)	<b>343.5</b>	<b>359.3</b>	<sup>e</sup> <b>376.9</b>		<sup>e</sup> 21.0
<i>lignite</i>		24.3	<sup>e</sup> 23.9		
<i>hard coal (run-of-mine)</i>		335.0	<sup>e</sup> 353.0		
<b>Australia</b> (total)	<b>315.0</b>	<b>339.7</b>	<b>338.7</b>	207.7	
<i>lignite</i>		66.7	64.6		
<i>hard coal (saleable)</i>		273.0	274.1		
<b>Russian Federation</b>					
(total) <i>coal + lignite</i>	<b>269.0</b>	<b>253.0</b>	<b>274.7</b>	57.8	<sup>e</sup> 20.0
<b>South Africa</b> (total) <i>hard coal (inc. anthracite)</i>	<b>224.7</b>	<sup>e</sup> <b>220.4</b>	<b>238.8</b>	71.5	
<b>Germany</b> (total)	<b>202.4</b>	<b>208.5</b>	<b>205.5</b>		<sup>e</sup> 39.0
<i>lignite</i>	175.3	181.7	179.1		
<i>hard coal</i>	27.1	26.8	26.4		
<b>Poland</b> (total)	<b>163.4</b>	<b>160.1</b>	<sup>e</sup> <b>160.0</b>	<sup>e</sup> 23.0	<sup>e</sup> 1.6
<i>lignite</i>	60.4	58.0	<sup>e</sup> 60.0		
<i>hard coal</i>	103.0	102.1	<sup>e</sup> 100.0		
<b>Indonesia</b>					
(total) <i>all qualities</i>	<b>92.6</b>	<b>103.0</b>	<b>109.3</b>	88.0	
<b>Ukraine</b>					
(total) <i>all qualities</i>	<b>83.9</b>	<b>81.9</b>	<b>79.3</b>		<sup>e</sup> 4.0
<b>Kazakhstan</b> (total)	<b>79.0</b>	<b>73.2</b>	<b>84.0</b>	27.0	
<i>lignite</i>	2.5	2.6	4.0		
<i>hard coal</i>	76.5	70.6	80.0		
<b>Canada</b> (total)	<b>70.5</b>	<b>66.6</b>	<b>62.1</b>	28.3	22.4
<i>lignite</i>	11.4	11.3	10.7		
<i>hard coal</i>	59.1	55.3	51.4		
<b>Turkey</b> (total)	<b>65.8</b>	<sup>e</sup> <b>53.3</b>	<sup>e</sup> <b>44.9</b>		
<i>lignite</i>	63.5	<sup>e</sup> 51.0	<sup>e</sup> 42.9		
<i>hard coal</i>	2.3	2.3	2.0		<sup>e</sup> 14.0
<b>Czech Republic</b> (total)	<b>66.1</b>	<b>64.0</b>	<sup>e</sup> <b>64.0</b>		
<i>lignite</i>		49.0	<sup>e</sup> 49.0		
<i>hard coal</i>		15.0	<sup>e</sup> 15.0	<sup>e</sup> 6.0	
<b>Greece</b> <i>lignite</i>	<b>67.3</b>	<sup>e</sup> <b>70.5</b>	<sup>e</sup> <b>72.0</b>		
<i>hard coal</i>					<sup>e</sup> 1.0
<b>Colombia</b>					
(total) <i>hard coal</i>	<b>42.4</b>	<b>39.5</b>	<b>49.3</b>	<sup>e</sup> 45.0	

Figures for 2001 primarily from BP Statistical Review of World Energy; 2002 and 2003 figures compiled from various sources, primarily international and national data releases: <sup>e</sup> indicates estimated figures. Lignite includes brown (sub-bituminous) coal.