CIAB

COAL INDUSTRY ADVISORY BOARD

International Coal Market & Policy Developments in 2004

APRIL 2005

Contents

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Thanks are also due to the IEA for provision of coal data and to The McCloskey Group for coal price data.

1 INTRODUCTION

1. This report is written for the Governing Board, Standing Committees and Secretariat of the International Energy Agency, although it may also be of interest to a wider audience. It draws on contributions from CIAB Associates to briefly describe developments in international coal markets over the last year and highlight policy and other issues that CIAB Members regard as pertinent to the development of coal as a secure, clean and competitive energy source.

2. The review of world coal supply and demand draws on a consistent data set provided by the IEA. At the time of writing, the latest such data available refers to 2003. More recent data from other sources is used to illustrate specific points where appropriate.

2 SUMMARY

3. 2003 again saw significant growth in world primary energy demand (2.9%) and greater growth in world hard coal demand (4%), reinforcing the continuing role of coal in world energy markets. Strong demand continued in 2004.

4. Coal demand growth continues to be driven substantially by Chinese economic development and its need for electricity and steel. This highlights the role that coal is being required to play in developing economies.

5. The evidence from many coal producing economies is that the rapid increase in world hard coal demand of 158 million tonnes in 2003 is starting to put pressure on coal production and logistics infrastructure, which have suffered from a degree of under-investment during a period of low international market prices. Safety and operational disruptions during the year affected particularly exports from China and Indonesia and contributed to coal market price volatility. Nevertheless, the international coal markets remain fundamentally competitive, with the potential to continue contributing to world energy security provided that governments and industry together address the challenge of reducing CO_2 emissions per unit of coal use in the future.

6. Both Asian and European seaborne, delivered, steam coal market prices peaked in the $75-80 range in mid year 2004, compared to the $60/tonne seen at the end of 2003 for prices delivered to Europe – itself then the highest price for the last 20 years.

7. Policy initiatives aimed at electricity market reform, environment and climate issues continue to provide an uncertain climate for investment in coal supply and use. Countries including the USA and Australia recognise that such investment is needed to maintain the necessary role of coal in the future energy mix. There is evidence of initiatives to encourage the Research, Development and Demonstration of clean coal technologies, but progress is often slow.

8. In its concluding remarks, the CIAB highlights the potential future energy security issues that may arise from the tension between the continuing need for coal and for climate protection initiatives, points out that technical options to address this do exist and highlights the need for joint government/industry action ensure that these technologies are developed in the necessary timescales.

3 OVERVIEW OF WORLD COAL SUPPLY AND DEMAND

9. According to BP statistics, world consumption of **primary energy** grew by a relatively strong 2.9% in 2003. Within this total, EU15 countries' consumption grew by 1.8%, North America showed virtually no growth and the Asia Pacific region increased its energy consumption by 6.3% (13.8% in China and 1.8% in the remainder of Asia Pacific). China now accounts for very nearly one eighth of world primary energy consumption.

10. Thirty years ago, coal accounted for roughly one quarter of world primary energy and it maintains a very similar position today. It accounts for about 60% of energy requirements in China, whose economy is has been growing at about 8% annually since the mid 1990s.

3.1 Synopsis of Coal Market Developments

11. During 2003-2004, coal demand rose strongly by and supply from domestic sources and imports responded well despite localised difficulties. Although demand grew throughout the world, growth in China was particularly important and also contributed to tight supply by limiting the volume of Chinese surplus production that might otherwise have been available for export. Rising ocean freight rates resulting from a shortage in bulk shipping and competition for space from other commodities, including for iron ore destined for China, contributed to higher delivered coal prices. Freight costs and exchange rate movements absorbed much of the coal price increases that might otherwise have been passed to exporters. Nonetheless, there are signs that growth in demand and higher prices will stimulate investment in supply in leading exporting countries and underwrite supply security for some time to come.

12. Demand growth in Asian markets is consistent with longer-term trends. Commitment to coal in China, Japan, Korea, Chinese Taipei, India and other Asian markets is strong and likely to remain so provided coal remains competitive with nuclear energy and LNG. The market in Europe generally is less predictable although demand noticeably recovered in 2003 from the slump seen in 2002. Competition with gas, nuclear, and domestically-produced coal in some cases, is the fundamental short to medium term explanation for volatility in European markets, but EU energy-environment policy impacting on coal is also a factor.

13. Developments in the international coal market during 2003 and 2004 are consistent with underlying trends in the international market that have been apparent for some years. Growth in demand reflects the strong world market for coal, and is at variance with longer-term expectations held by some governments. The relatively low cost of coal as a fuel for generating electricity underlies growth in demand. Coal remains competitive despite higher prices because of the general rise in energy commodity prices, led by oil. Coal prices will be limited by competition between current and potential coal producers in many countries, and ultimately by competition with other energy sources.

14. In general, government environmental policies often have the effect of encouraging fuel substitution and so might be expected to slow growth in demand for coal and lead to an eventual decline in coal use. Certainly, coal producers are currently wary of the trend in government policies and are likely to continue to match growth in supply with actual demand growth. This trend has been evident in the market since the late 1990s, when unexpected reversals in Asian economies brought to an end the practices of expanding supply in anticipation of growth in demand and increasing production to maintain cash flow when prices fell. Despite the downturn of the late 1990s, Asian markets are generally predictable because the security benefits of coal are recognised by governments. The impact of closely

matching supply and demand is most likely to be felt in European markets, where prospects for coal in the longer-term are uncertain despite clear evidence in the last 12-18 months that coal demand is strong. Paradoxically, government environmental policies impacting on availability from the international market are in some countries stimulating interest in higher-cost domestic sources of coal supply to maintain security of supply.

15. In the coking coal market, blast furnace technology for iron and steel-making remains dominant; and supply sources of high-quality coking coal are more limited than for steam coal used for electricity generation. Prices for coking coal have risen as demand for iron and steel has risen with world economic growth. Australia is by far the largest supplier to the world market and Japan the largest importer.

16. Perhaps the most fundamental change in the international coal market, after growth in Chinese demand, has been the withdrawal of the US from the market as higher domestic demand continues to absorb production. Traditional exporting regions in the east, where internal transport costs to ports are relatively low, are experiencing depletion of reserves and tighter environmental restrictions on production. Growing western US production is located further from ports and higher margins are made on domestic sales. Importantly, the US has acted as swing producer to the world market because its exports have always accounted for a relatively small proportion of production, and production and port capacity has been available to respond quickly to movements in international prices. In the absence of US exports in recent years, coal prices have been less restricted by coal-to-coal competition and able to correspond more closely to movements in prices of competing fuels.

17. At present, there is no country positioned to replace the US as swing producer in the international market. Nonetheless, supply remains flexible because of the number of major cost-competitive exporters that are capable of expanding production in line with growth in demand. Significant rationalisation of international steam coal supply has occurred during the past five years, particularly in Australia and Indonesia. Despite this, the share of production that is controlled by individual companies remains relatively low and a global price leader has not emerged. No producer controls more than 10% of supply and the top ten producers control less that 50% of supply. The geographical diversity and substitutability of steam coal, the low levels of ownership concentration and low barriers to entry will ensure the steam coal market continues to operate competitively and efficiently. High-quality coking coal is less widely available than steam coal and concentration of supply is far greater than in the steam coal market. Reliability of coking coal supply and quality is of far greater importance to steel-makers than is the case for steam coal for electricity generators, and commercial relations are generally closer and of longer standing. The coking coal market is today less closely related to the steam coal market than in the past and prices are influenced by different factors.

18. Coal remains principally a locally-produced commodity with only about 15% of production traded internationally. The international market is nonetheless growing rapidly, by about 5% per year since 1979. Australia remains by far the largest exporting country. However, in recent years both Chinese and Indonesian exports have grown rapidly and now compete for second place, while South African exports have stabilised and US exports have fallen. Because of the focus of growing demand in Asia, the transport cost advantage of Chinese producers is possibly the critical influence on the outlook for the pattern of future coal trade. Russia's proximity to Asian and European markets may become important if producers could overcome the disadvantage of domestic transport costs.

3.2 Coal Demand Developments

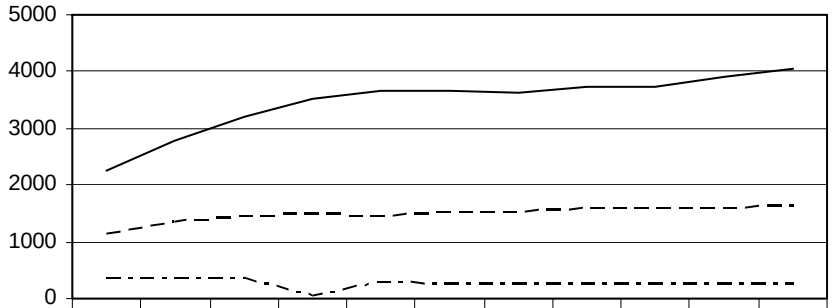
3.2.1 Total Hard Coal Demand

19. During 2003, IEA statistics show that **World** consumption of hard coal grew by 4% or 158 million tonnes, continuing at a level very similar to growth in 2002. Within that total, EU(15) countries' consumption grew at a similar rate while OECD consumption increased at a lower rate of 1.9%

Chart 1 - Hard Coal Demand

(million tonnes)

Source: IEA Statistics



	1973	1980	1985	1990	1995	1998	1999	2000	2001	2002	2003e
EU (15)	339	348	338	34	279	260	244	253	252	247	258
OECD	1143	1334	1438	1463	1456	1515	1506	1572	1581	1587	1617
World	2248	2781	3204	3512	3668	3676	3642	3725	3744	3900	4058

20. **China** was again largely responsible for the increase in World coal demand, accounting for 108 m. tonnes of the 158 m. tonnes growth.

21. 2003 saw Chinese GDP growth of over 9%. The economy has grown at an average of 7-8% per year since the mid-1990s and GDP has doubled over the last decade. Demand pressure on international coal, minerals and shipping is widely attributed, at least in part, to Chinese economic growth. Fixed asset investment is still growing at about 25%p.a., but many commentators are suggesting that this has caused unsustainable growth in the demand for basic commodities including coal. China currently accounts for over one third of the worldwide demand for iron ore.

22. However, Chinese pressure on coal relaxed slightly in 2003, with imports remaining broadly constant and exports increasing from 84 million tonnes in 2002 to 95 million tonnes in 2003. Despite the setting of lower formal export targets, volumes could approach 90 million tonnes in 2004.

23. For the **USA**, revisions to IEA data now indicate a 1% growth in hard coal use in 2002 (previously thought to have declined by 1.2% and 2003 showed a further small increase. 2003 exports were 39 million tonnes, bringing total demand for United States coals to just over 1,000 million tonnes. Further small increases are expected for 2004.

24. It should be noted that total coal demand plus exports exceeded total production in 2003

and will again in 2004. The gap has been filled through increased imports and stock drawdown. Imports have increased from 15.4 million tonnes in 2002 to 22.6 million tonnes in 2003 and could be as much as 24.5 million tonnes in 2004.

25. Inventories declined by 20 million tonnes in 2003, with a further 23 million tonne decline expected in 2004. This brings inventories at many utilities, at coke plants and at industrial plants to very low (sometimes critically low) levels. Most analysts state that it will be difficult to "catch up" and return to more normal inventories for several years.

26. **Japan**ese hard coal demand increased by about 6 million tonnes in 2003, to 162 million tonnes, due mainly to increased imports of thermal coal by Japanese power utilities. Australia is still accounts for more than 60%, and China for 17% of imports.

27. Reversing last year's trend, consumption of hard coal by **European Union (15)** countries increased by over 11 million tonnes, or nearly 5%, to reach 258 million tonnes – the highest level since 1998.

3.2.2 Steam Coal Demand

28. **World** consumption of steam coal increased by 3.8% (131 million tonnes) in 2003, with strong growth seen also in Europe. The last three years have all seen world growth of around 4%.

Table 1 - Steam Coal Demand (million tonnes)

	2001	2002		2003e	
	m.tonnes	m.tonnes	%change	m.tonnes	%change
EU(15)	193	191	-1.1%	201	5.5%
OECD Total	1378	1387	0.6%	1401	1.0%
World	3278	3409	4.0%	3540	3.8%

Source: IEA Statistics

29. In **China**, rapid economic growth is continuing to drive electricity demand, which has grown at an annual average of 8% over the last 20 years. Installed generation capacity has increased from 66GW in 1980 to 338GW in 2001. The 10th Five-Year Plan (2001-05) planned to meet electricity demand growth of 4.8% p.a. to 1,730TWh by 2005, and generation capacity growth of 3% p.a. to 370GW. However, rapid growth has resulted in accelerated capacity installation and the construction of 30 new power stations with a combined generation capacity of 23GW was approved in 2003. Over 70% of China's electricity generation is fuelled by coal, 25% is hydro and 2% nuclear. More than 60% of Chinese coal is used for power generation.

30. The country is gradually opening its electricity system to competition. Some regional competitive power markets have already been set up and the government expects competitive wholesale electricity markets to be functioning nation-wide and providing an incentive for increased foreign investment by 2005.

31. Steam coal demand in **South Africa** increased by over 5% to 166 million tonnes in 2003. Local market consumption is 70% of the total output (bituminous coal 98% and anthracite 2%). The rest is exported mainly through RBCT (95.6%), Durban (2.5%) and Maputo (1.9%). The Richards Bay Coal Terminal (RBCT) and the National Port Authority (NPA) have signed the memorandum of agreement (MOA) to allow the expansion of the RBCT from 72 million tons (Mt) capacity per annum to 82 Mt per annum. This agreement will make it possible for

Black Economic Empowerment (BEE) in the coal industry to participate in the coal exporting market. The 10 Mt capacity expansion, referred to as Phase V, will cost R750 million.

32. Durban has a 2-2.5Mt capacity for sized coal only and Maputo has 2.5Mt, which will be increased to 4Mt over the period of 4 to 5 years.

33. IEA estimates suggest that **Japan**ese steam coal use declined by 13% in 2003 to 80 million tonnes. However, Japanese power utilities purchased 75 million tons of steam coal in FY2003, a 5 million ton increase on FY2002, due largely to a nuclear shutdown which has continued since August 2002. More than 60% of this coal came from Australia, while Indonesia increased it shares and purchase from China decreased due to their increased domestic consumption.

34. Demand for steam coal to produce electricity in the **United States of America** increased by 2.7% in 2003 despite the fact that total generation declined slightly. Electric utilities' continued to reduce stockpiles to better control inventory costs. In 2004 electricity generation is increasing at a faster rate due to a stronger economy, coal-fired generation continues to increase at a faster rate than total generation and utilities are trying to rebuild low stocks. Demand for US coal on the world market has increased. According to the Energy Information Administration (EIA), demand will be 3.5% above production in 2003.

35. Electricity utilities used 911 million tonnes of coal in 2003 to generate 52.7% of all electricity produced during the year (EIA estimates). Although total electricity generation declined slightly in 2003, generation from coal was up by almost 2% and coal consumption at utilities was up by 2.7%. Utilities found it attractive to replace power generated from very expensive and scarce natural gas with affordable coal fired power. Nuclear generation was lower in 2003, placing additional demands on coal-fired base load capacity.

36. The outlook for coal use by utilities in the United States remains strong in 2004 as coal-fired generation continues to be the lowest marginal cost source of electricity. The demand for coal fired power increased by 2.7% in the first six months of 2004 as electricity demand increased in response to economic growth and to warmer spring weather patterns. The rate of growth abated somewhat in the summer however, as the weather turned cooler and steam coal demand is expected to end the year at 923 million tonnes, 1.3% higher than in 2003. Nuclear power is up in 2004, as is generation from gas despite gas prices remaining high.

37. Industrial use of coal for generation of steam and for other purposes totalled 56 million tonnes in 2003, 2% higher than in 2002. The increase in coal use by industry can be directly tied to economic growth, although coal use by industry is on an overall downward trend. EIA expects that industrial coal use will remain at the same levels in 2004.

38. **Australian** domestic demand increased by 4.5% to 62 million tonnes in 2003. Over 84% of Australian hard coal consumption occurs in New South Wales and Queensland, which are the two major producing states. More than 80% of domestically consumed coal was used for electricity generation. Despite expected healthy growth in Australian consumption of thermal coal, export and domestic markets are not expected to compete, due to Australia's abundant resources.

39. **European Union** steam coal demand increased by 5.5% to 201 million tonnes in 2003. Notable with the total are an increase of 7.5% in the UK to 56 million tonnes and a reduction of 7.5%, to 28 million tonnes in Spain.

40. In the **UK**, total power generation in 2003 was 377 TWh (an increase of 2.7%); of which 132 TWh (35%) was generated from coal. This was coal's highest share of total generation since

1996 and was driven by higher gas prices. As a result, total UK coal use increased by over 6%, contributing to a 2% rise in CO_2 emissions to 560 MTe CO_2 in 2003. Steam coal imports hit a record 24.5 million tonnes in 2003 and 2004 statistics available so far suggest another record year in 2004.

41. Wholesale electricity prices have risen over the last year, reflecting higher coal and gas prices. Forward prices have also increased for the same reasons and because Eu emissions trading costs have been factored in from 1st January 2005. At the same time, however, the margin made on electricity sales has not significantly improved.

42. Further consolidation of the UK generating industry has taken place. In July 2004 Scottish and Southern Energy bought Ferrybridge and Fiddler's Ferry, both of which are 2 GW coal-fired power stations, from AEP. Also in July, International Power acquired Edison Mission's non-US plant, including the pumped storage units at Dinorwig and Ffestiniog. Scottish Power and Centrica have both acquired IPP-owned CCGT plant.

43. In early 2004, both coal and gas prices rose sharply; coal as a result of high commodity prices and freight shortages, triggered by rapid expansion of the Chinese economy. Gas prices increased alongside oil prices. The onset of the EU Emissions Trading Scheme in 2005 is expected to result in a swing back to gas generation at the expense of coal, although the extent to which this occurs will depend on the price of CO_2 emission allowances and relative coal and gas prices at the time.

3.2.3 Coking Coal Demand

44. Table 2 shows IEA statistics for coking coal demand in the major world regions.

Table 2 - Coking Coal Demand (million tonnes)

	2001	2002		2003e	
	m.tonnes	m.tonnes	%change	m.tonnes	%change
EU(15)	59	56	-5.7%	57	2.1%
OECD Total	203	200	-1.5%	216	8.0%
World	466	491	-5.3%	518	5.5%

Source: IEA Statistics

45. While consistent coal use information is not available for 2004, Table 3 shows iron and steel production data for the nine months to September 2004 and will be indicative of the trends in coke demand this year.

Table 3 - Primary Iron & Steel Production (9 months to Sept.)

	Blast Furnace Iron (m. tonnes)			Direct Reduced Iron (m. tonnes)			Crude Steel (m. tonnes)		
	2003	**2004**	**change**	**2003**	**2004**	**change**	**2003**	**2004**	**change**
EU(15)	68	70	4.2%				119	125	5.1%
OECD	209	215	2.8%	4	5	24.5%	366	384	4.9%
World	483	523	8.3%	26	31	18.2%	702	763	8.7%

Source: International Iron & Steel Institute

46. Total **world** coking coal demand increased by 5.5% in 2003, continuing the strong growth seen in 2002, and this trend has probably accelerated in 2004 with increases in world iron and steel production of nearly 9%, compared with the similar period in 2003.The main driver of world coking coal demand has again been **China**, which grew by 12 million tonnes to

reach nearly 150 million tonnes, 30% of world demand..

47. In FY2003, **Japan**ese steel mills and coke manufacturing companies purchased 68 million tons of metallurgical coal (coking coal and PCI coal), almost the same as in the previous year. This is due mainly to the high level of pig iron production which has been continuing for the last 2 years.

48. About 62% of total metallurgical coal imports were from Australia and China came second with 16%, followed by Canada with 11%. These market shares have been stable over the last two years.

49. Coking coal demand in **Europe** reversed the decline seen in 2002, growing by 2.8% during 2003 and potentially increasing that growth rate during the first 9 months of 2004.

50. Coking coal use in the **Unites States** increased in 2003 for the first time in three years. Coking coal consumption totalled 24.2 million short tons (22.2 million metric tons), 2.5% more than in 2002. Steel production was 103.3 million short tons (93.7 million metric), up 2.3% over 2002 levels. Just over 51%t was produced in electrical furnaces. Steel production was up due to an increase in demand for steel, but also due to the imposition of tariffs on foreign steel imports. In November 2003 these tariffs were lifted but steel production has remained high throughout 2004.

51. Through the first six months of 2004 US consumption of coking coal was 5.3% ahead of 2003, indicating that coking coal consumption should approximate 25.4 million short tons (23 million metric) in 2004. Construction was started on the first new coke plant to be built in the US in many years with a projected start date of late 2005.

3.2.4 Total Brown Coal Demand

Table 4 - Brown Coal Demand (million tonnes)

	2001	2002		2003e	
	m.tonnes	m.tonnes	%change	m.tonnes	%change
EU(15)	259	266	2.7%	262	-1.6%
OECD Total	626	626	0.1%	630	0.5%
World	894	890	-0.4%	907	1.9%

Source: IEA Statistics

52. 2003 saw 1.9% growth in world brown coal demand to 907 million tonnes, the highest level since 1998. The primary drivers of this growth were Russia (6% growth) and former USSR countries (8% growth), between them accounting for 12 million tonnes of the 17 million tonne growth in world demand.

53. In **Germany**, demand declined by 3 million tonnes during 2003. However, with a demand of 180 million tonnes, Germany remains the largest user of brown coal in the world. Between 1990 and 1999, demand more than halved to 163 million tonnes, but has been growing at an average rate of nearly 2.5% per year since then.

54. More than 90 % of lignite is used for power generation. Germany has a lignite-based power plant capacity of some 20GW, one third of which went on stream in the second half of the last decade or in the first years of the current decade.

55. In **Spain**, demand for brown coal (including sub-bituminous coal) declined by almost 10%. Although electricity production increased by 7% to 252Twh, this increase was more than compensated by a 50% increase in hydro generation resulting from high rainfall during the

year.

3.3 Coal Supply Developments

3.3.1 Hard Coal

56. Chart 2 illustrates the overall trends in world hard coal production. World production has grown strongly over the last 3 years, driven to a significant extent by China. OECD countries' production has remained broadly stable since 1990, while the steady decline in EU (15) countries' production continued through 2003.

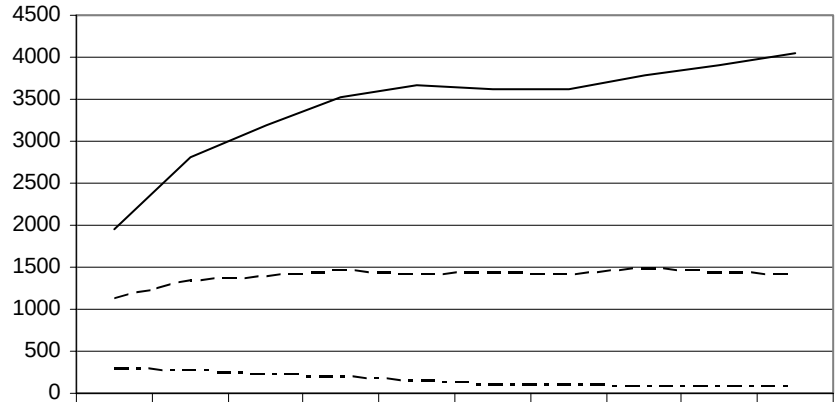
57. **China** produced 1,502 million tonnes of hard coal in 2003, 7.5% more than in 2002, making it by far the world's largest coal producer. Exports reached a record high of 93 million tonnes in 2003 (up from 84 Mtonnes in 2002) and making it the world's second largest coal exporting nation. Approximately 73 Mtonnes of the 2003 exports were steam coal, with the majority of the remainder exported for metallurgical purposes.

58. China is now enforcing an export license system in order to limit coal exports and ensure adequate supply for their booming domestic economy. This system is set to reduce China's coal exports in the coming years.

Chart 2 - Hard Coal Production

(million tonnes)

Source: IEA Statistics



	1973	1980	1985	1990	1995	1999	2000	2001	2002	2003e
EU (15)	285	266	224	198	135	98	84	76	71	68
OECD	1117	1336	1381	1455	1405	1426	1395	1469	1433	1399
World	1952	2810	3192	3519	3674	3628	3629	3794	3910	4038

59. **South African** hard coal production increased by over 5% in 2003, reaching 239 million tonnes. South Africa's 2004 total coal production is estimated at 243 Mt, about 12% of the world's hard coal production. Approximately 70 Mt will be exported and 175 Mt sold domestically to: Eskom (102 Mt), Sasol (55 Mt) and others (18 Mt). There are 34 billion tons of mineable reserves in situ. Infrastructure weaknesses, especially rail and port, and the distance of reserves from port constrain competitiveness. A coal price hike in the

international market encouraged an increase in exports. However, the local industry was just recovering from hard times caused by China's dramatic increase in coal exports from 2002 and was ill-prepared to benefit from the sudden price increase.

60. **Columbian** hard coal exports (the vast majority of production) increased to 46 million tonnes in 2003, an increase of one third on 2002. 50% of these exports were destined for European customers, while over 30% went to North America. In the eight months to August 2004, they have increased by a further 5 million tonnes on the same period in 2003.

61. 2003 saw **Indonesian** coal production again increasing strongly to 120 million tonnes, from 103 million tonnes in 2002 and 93 million tonnes in 2001. 2003 exports were approximately 90 million tonnes in 2003, up 20% (15Mtonnes) from the previous year, making Indonesia the world's fastest growing exporter of (predominantly steam) coal in tonnage terms.

62. As at the end of December 2003, 101 black coal mines were in operation in **Australia** of which 63 were open-cut and 38 were underground. Total Australian raw coal production was 353 million tonnes, but total washed (saleable) coal production was 279.0 million tonnes, up 2% on 2002 washed production.

63. Total hard coal exports out of Australia were 216.1 million tonnes in 2003, an increase of 5.9% over the 204.2 million tonnes shipped in 2002. Of the 2003 tonnage, 111 million tonnes was for metallurgical purposes and 105 million tonnes was steam coal. Japan was the largest market for Australian black coal exports, importing 95.4 million tonnes in 2003. Next largest was Korea (26.8 million tonnes), followed by Taiwan (16.9 million tonnes) and India (16.4 million tonnes).

64. The Southland coking coal mine in New South Wales shut unexpectedly in late 2003 due to heating which has caused the bankruptcy of its owners. Southland is not expected to reopen for some time.

65. Also in 2003, Rio Tinto's 5.5 million tonne p.a. Hail Creek coking coal mine began full-scale production in Queensland. This is supported by coal off take commitment by **Japan**ese steel mills. Hail Creek coking coal mine commenced its production in FY2003 and will reach full production in FY2004. Further expansion to 8.0 million tonnes p.a. is planned.

66. Increased coal demand has stretched rail and port capacity, despite successful attempts by mines and rail and port providers to achieve above-nameplate capacity in response to demand peaks.

67. In 2003, coal production in the **United States** totalled 1.072 billion short tons (972 million metric tons), 2.1% below coal production in 2002. Hard coal (bituminous and sub-bituminous production totalled 985.4 million short tons (894 million metric tons) tons and brown coal (lignite) production was 86.4 million short tons (78.4 million metric tons). Production declined in 2003 for several reasons including dry weather in the east which led to river transport difficulties and severe rains in the Powder River Basin that impacted production in the summer months. There were temporary technical production problems at some mines in all regions. Also, Electricity utilities continued to reduce stockpiles to better control inventory costs and the export market continued to be weak throughout much of the year.

68. In 2004 however, factors are at play to increase demand for coal and thus production. Electric generation is increasing at a faster rate due to a stronger economy. Generation from coal continues to increase at a faster rate that total generation and utilities are trying to rebuild low stocks. Demand for US coal on the world market has increased. As a result, production has increased and, according to the Energy Information Administration (EIA), is expected to be approximately 1.109 billion short tons (1.006 billion metric tons) or 3.5%

above production in 2003. Production is expected to increase in all regions of the country.

69. In **Germany**, salable output from hard coal mines is expected to remain broadly constant in 2003 and 2004, at about 26 million tonnes. Mining activities are at the three locations of Ruhr (seven pits), Saar (one pit) and Ibbenbüren (one pit).

70. **Spanish** hard coal production declined marginally to 9.4 million tonnes in 2003. Production is governed by the mining plan, which requires reductions averaging 4% p.a.

71. In **France**, the last mine, La Houve, closed in April 2004 and it is expected that the state-owned coal company CdF will be wound up some time in 2007.

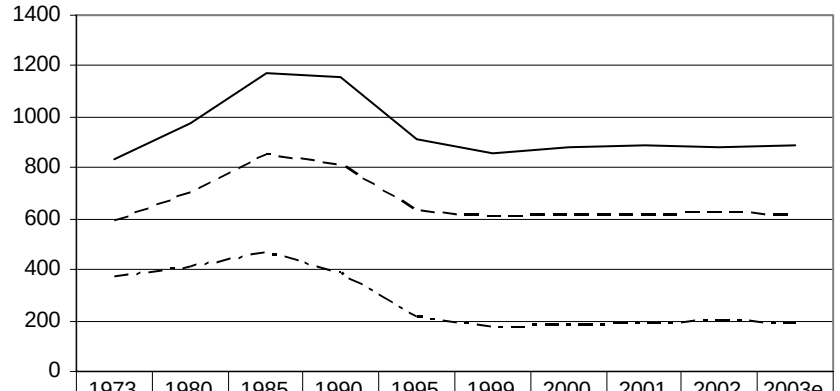
72. In the **United Kingdom**, the last deep mine in the Selby complex ceased production in October 2004 after 121 million tonnes of coal had been recovered over 21 years.The complex was opened in the 1980s with target production levels of 12 million tonnes p.a., which was achieved only once in 1993-94. Plans to increase production from 1.7mtpa to 2mtpa at the Kellingley Colliery in Yorkshire have been dropped due to poor geology, while at Daw Mill production reached a record 3 million tonnes in 2004. The North East coalfield's last mine at Ellington suffered major flooding in January 2005 and production has stopped. Production from surface mines continues a downward trend, falling 8% in 2003 to 12 million tonnes, with almost two thirds of this production located in Scotland. In England and Wales, government planning guidance issued in 1999 has a presumption against coal mining and this has resulted in very few new surface mine planning approvals. Consultation is taking place in Scotland on draft planning guidance that includes the same presumption against coal mining.

3.3.2 Brown Coal

Chart 3 - Brown Coal Production

(million tonnes)

Source: IEA Statistics



	1973	1980	1985	1990	1995	1999	2000	2001	2002	2003e
EU (15)	373	409	461	382	209	175	180	188	194	190
OECD	590	699	849	807	626	609	617	617	621	612
World	835	979	1170	1153	909	858	884	885	882	886

73. **Germany** remains the world's largest producer of brown coal, although production declined by 1.5% in 2003 to 179 million tonnes. Conversely, during the first three quarters of 2004,

production was 1.6% above the same period in 2003. Sales to power stations (the market for more than 90% of lignite production) were also up by more than 1%, implying gross electricity production from lignite of 160TWh or slightly more. Price increases for gas and coal have further improved the competitiveness of lignite in Germany.

74. **Spain** produced 11.6 million tonnes of lignite and sub-bituminous coal in 2003, a reduction of nearly 6%. Including hard coal, employment in the mining industry declined by over 10% to 12,110 jobs. Imported sub-bituminous coal is blended with lignite in power stations to reduce SO_2 emissions.

75. Although **Turkey** produces about 2 million tonnes p.a. of hard coal, its main production is lignite. This is on a declining trend, with production of 65 million tonnes in 1999 declining to 46 million tonnes by 2003 as a result of committed natural gas agreements. Lignite production in 2004 is again likely to be lower. Reserves are estimated at 8,300 million tonnes.

76. Lignite is produced by the Turkish Electricity Generation Authority (EUAS), Turkish Coal Enterprises (TKI), both state owned companies, and by the private sector. Of the 8,300 million tonne reserves, EUAS owns 3,800 million tonnes, TKI owns 2,500 million tonnes and the private sector owns 2,000 million tonnes. TKI is the biggest producer (60% of the 46 million tonnes in 2003), supplying lignite for power stations, industry and heating. EUAS supplies only power stations and the private sector production (5.5 million tonnes) supplies heating and industrial markets. All power stations are owned by EUAS. Those fed by the company's own supplies have a total installed capacity of 2430 MW and those fed by TKI have a total installed capacity of 4273 MW.

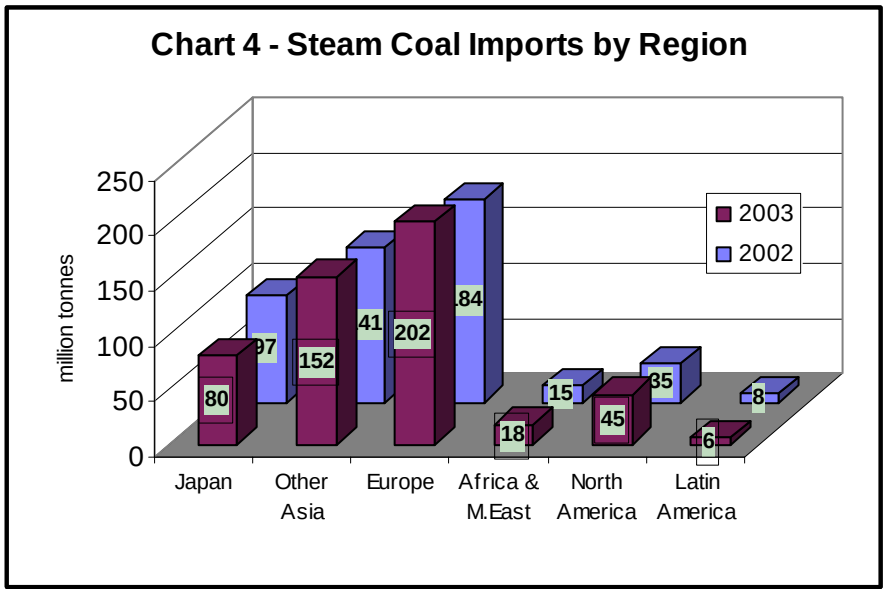
3.4 Trade and Prices

3.4.1 Trade Volume

77. According to IEA statistics, world hard coal trade increased by a massive 10% (65 million tonnes) in 2003 after a stagnant year in 2002. These increases were reflected across coking coal and steam coal and across total trade and seaborne trade.

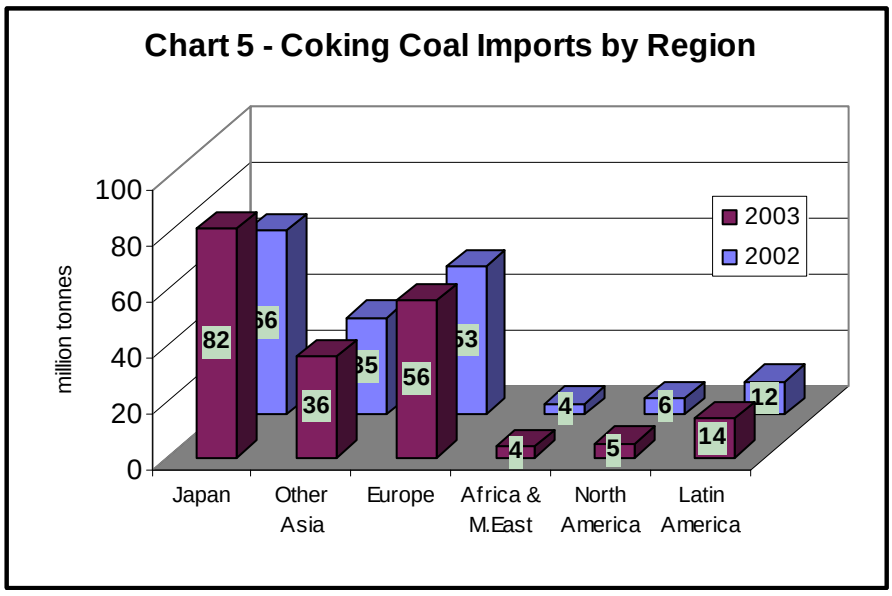
78. Charts 4 & 5 illustrate the changes in steam coal and coking coal trade by import region.

79. World **steam coal** trade grew to 512 million tonnes, of which 445 million tonnes was seaborne trade.



80. Total (OECD and other) European steam coal imports increased by nearly 10% to 202 million tonnes, with the majority of the increase supplied by Russia, South Africa and Colombia. According to IEA estimates, Japan reduced its steam coal imports by 18% to 80 million tonnes, with significant reductions in its imports from Canada, China and Indonesia. However, other estimates suggest growth in Japanese thermal coal imports of 5 million tonnes in 2003.

81. China remains the most influential and unpredictable factor affecting the Asian market due to the enormous size of its coal production and usage and the rapid growth rates currently enjoyed by both. Chinese thermal coal export volume increased by about 10% in 2003, but domestic demand continued to consume the bulk of China's production increases. Indonesia continued its recent strong growth, increasing exports by approximately 20% while Australia remained the largest supplier to the region with almost 40% market share.



82. World **coking coal** trade grew to 206 million tonnes, of which over 90% was seaborne trade. Due to a slight overhang of supply from Canada and (to a lesser extent) Australia, average 2003/04 contract prices for Queensland hard coking coal fell to around US$46/tonne, a drop

of about 4% versus prices negotiated in 2002.

83. However, as 2003 progressed it became clear that a global supply shortfall of quality hard coking coal was developing. Rampant increases in steel production in Asia and a severe shortage of Chinese coke exports meant that coking coal producers were inundated with requests for spot purchases. Production difficulties experienced by some Queensland hard coking coal operations exacerbated the situation. China was the driving force behind the increased global steel production, with Japanese and Indian production also showing robust increases (largely through exports to China to feed that country's insatiable domestic demand).

84. China's influence on coking coal sentiment in 2003 was even more pronounced than its influence on thermal coal. China, a massive producer of metallurgical coal, imported 2Mtonnes of hard coking coal this year, up from practically nothing the year before. In addition, a number of Chinese mills signed unprecedented long-term contracts with Australian and Canadian suppliers of hard coking coal, a sure sign of ongoing supply tightness in that market. Concurrently, China's limited exports of hard coking coal practically ceased and even those of semi-soft coking coal were cut dramatically. Thus, China almost single-handedly took the world hard coking coal market from oversupply to undersupply in 2003.

85. Although South African saleable coal production increased by 8.4% during 2003, this resulted in only a 3.3 percent increase in exports due to the lack of extra export grade capacity and infrastructure. With the decrease of the US$/Rand exchange rate by 45%, from January 2002, to June 2004, most of the potential profits for the local industry were lost. From 2002 to 2003, export prices decreased by 32% and the coal industry revenue losses amounted to approximately R6 billion.

86. The **Pacific coal market** was characterised by a serious supply crunch in the latter half of the year that resulted in a steep and steady rise in the spot price for thermal coal. The disruptions to supply began with a series of mine explosions in China's Shanxi province in August (and subsequent mine closures for safety reasons), resulting in a number of delivery cancellations and postponements. This was followed by a strike at the large Kaltim Prima mine in Indonesia, worsening congestion at the port of Newcastle, a Chinese domestic supply shortfall as winter set in and delays due to flooding in Indonesia. Korea was caught particularly short by China's supply problems and their increasing reliance on spot purchases meant that they were largely responsible for pushing prices for prompt tonnage higher in the latter half of 2003.

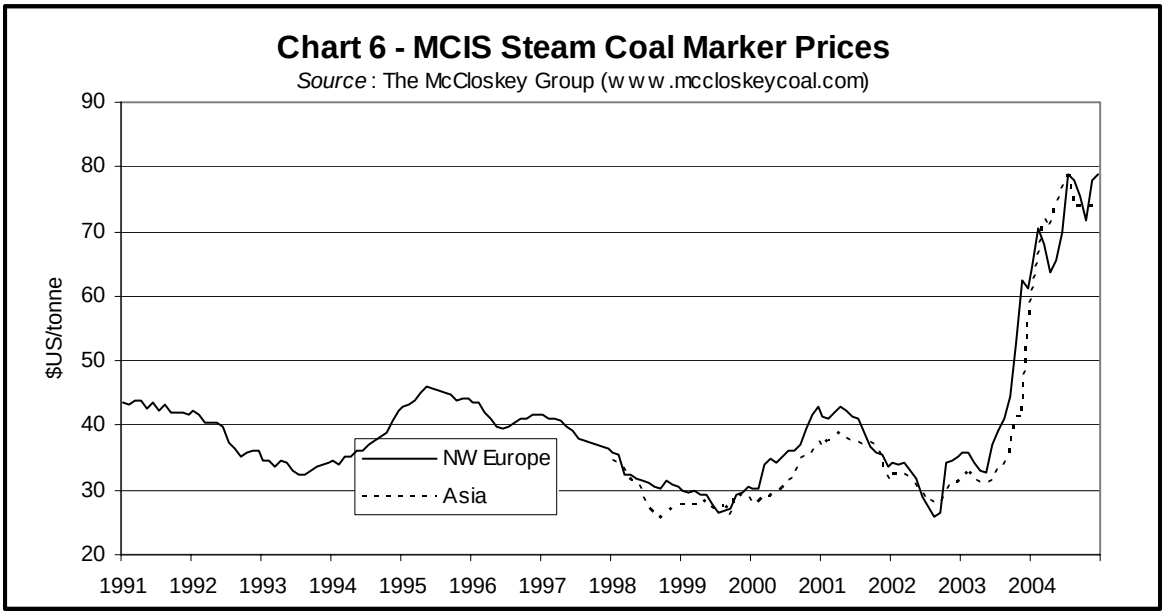
87. Coal exports from the **United States** increased in 2003 to 42.9 million short tons thanks to a sharp increase in steam coal shipments to Canada and a small increase in metallurgical exports to Asia (Turkey) and to non-EU Europe. By the end of 2003 metallurgical coal exports were starting to show some signs of increase, and in 2004 exports are expected to be some 20% above 2003 levels with an increase in both steam and met coal to overseas destinations. Global increases in steel production coupled with unavailability of met coal from other producing countries, a weaker dollar and higher shipping rates have all combined to make US coal attractive to overseas buyers. The US has shipped coal to Japan in 2004, the first such shipments in three years.

Table 5 – US Coal Exports (million short tons)

	2002	2003	Jan-Jul 03	Jan-Jul 04	04/03
					%change
CANADA					
metallurgical	4.7	3.6	1.7	1.9	+12%
steam	11.7	17.1	9.1	6.8	-25%
TOTAL	16.4	20.7	10.7	8.7	-20%
OVERSEAS					
metallurgical	16.5	18.5	11.5	15.8	+37%
steam	6.3	3.7	1.9	4.3	+129%
TOTAL	22.8	22.2	13.4	20.1	+50%
TOTAL EXPORTS	39.2	42.9	24.1	28.8	+19%

3.4.2 Market Prices

88. **World steam coal trade** has developed rapidly over the last 20 years. In general terms, the period 1996-2003 was one of rapid volume growth averaging nearly 25 million tonnes/year. Many new mines were developed specifically for the export market and the emphasis was on volume growth, which resulted in downward pressure on prices. As this growth in production capacity has slowed and the market has become more transparent with the introduction of electronic trading systems and price indices, price cycles have become more frequent, as illustrated by Chart 6 below.



89. The latter part of 2003, and all of 2004, have seen a strong growth trend in prices of steam coal delivered to North West European ports and the Asian market. (CIF, 6000 kcal/kg NAR). Asian market prices have followed European prices, with both peaking in the $75-80 range in mid year 2004, compared to the $60/tonne seen at the end of 2003 for prices delivered to Europe – itself then the highest price for the last 20 years.

90. These recent thermal coal price rises have resulted form a combination of market forces and

macro-economic effects. Rapid rises in global demand for energy outpacing infrastructure and mine development, large $US exchange rate appreciations in major producing countries and the high prices of substitutes have all contributed.

91. Increased trade volumes saw increasing infrastructure issues. Dalrymple Bay, a key Australian coking coal export terminal, saw vessel queues of up to 30 vessels while Newcastle had 50 vessel queues during 2003 and 2004. There was some expansion of production during 2004 (Colombian exports increased by 5 million tonnes) but not enough to halt or reverse the increasing price trend. Previous underinvestment in mining worldwide because of low returns limited the sectors ability to respond to rapidly increasing demand.

92. A large part of 2003 price increases had been due to freight cost increases. For example, by the end of 2003, rates had reached nearly $21/tonne for Puerto Bolivar/Rotterdam and $26/tonne for Richards Bay/Rotterdam. Capesize vessel rates were substantially higher than any of the market peaks experienced over the last 25 years. These rates have been broadly maintained during 2004, showing only cyclical reductions during the Northern hemisphere summer months.

93. However, delivered coal prices continued to rise during 2004. Chinese coal imports continued to grow in the nine months to September 2004, with large increases in anthracite and coking coal counteracting reduced steam coal imports. By September 2004, year-to-date imports had increased to 12.7 million tonnes, over 50% higher than in the same period during 2003.

94. In the **Pacific Steam Coal** market in 2003, the steady appreciation of the AU$ necessitated a more aggressive US$ pricing policy from Australian suppliers in order to maintain acceptable margins. As a result of these factors, the spot price for thermal coal (FOB Newcastle) rose from US$25/tonne in early August (low for the year was US$23/tonne in April) to reach almost US$40/tonne by year's end. The Tohoku Electric Power Co. term contract price (a reference price used by many long-term buyers of Australian coal) was set in March at US$26.75/tonne FOB Newcastle for the contract year beginning April 2003, a decline of 7% from the previous year.

95. The other major market issue during 2003 was the increase in seaborne freight rates, partly due to the massive build-up in demand for vessels for importing iron ore to China. The spot cape rate for shipping from Newcastle to Rotterdam rose from US$14/tonne at the start of the year to US$40/tonne by year's end, while the freight rate differential versus shipments into Europe from South Africa (RBCT) rose from US$4 to US$14/tonne. This resulted in a slowing of spot sales of Pacific (particularly Australian) coal into Europe and heightened the disconnect between the Pacific and Atlantic markets.

96. In FY 2004, spot prices continued to rise because of quota systems in Newcastle and further Chinese export restrictions, They found a plateau in July, when purchases were almost fully committed for the time being, and stood at US$/ton in September 2004.

97. Asian coal users have shifted from long-term contracts based upon existing reference prices to shorter-term contracts or spot contracts by bidding and individual negotiations, and moved towards Chinese and Indonesian coals. However, as a result of tight supply in FY 2003, Korea and Taiwan returned to long-term contracts and also diversified supply sources to South Africa and Russia. Electronic trades decreased in the aftermath of price hikes.

98. 2003 was characterised by unprecedented volatility in **Atlantic Steam Coal** market prices. The spot market started out the year at about $27.50/t, only to pull back in response to demand and supply variables. In April, spot prices fell to about $23/t due to increased availability, particularly from Columbia, and a lack of demand as customers tried to avoid

prevailing high freight rates. However, delayed purchases and stock reductions initiated by customers proved unsustainable and demand later increased. This together with solid USA demand was responsible for absorbing much of Colombia's increased production as well as South Africa's supply, the latter having suffered some constraints due to a rail capacity bottleneck.

99. Furthermore, the favourable impact of a weak US dollar on the competitive position of imported coal helped spur a run on the paper market. Spot physical coal prices subsequently followed suite and reached about $28/t by June 2003.

100. The market continued to gain momentum during the Europe's summer heat wave, leading to an accelerated drawdown of coal stocks. Advice of the possibility of Polish mine closures significantly reduced Polish exports in late 2003. Finally China, who until then appeared to be meeting and even exceeding export expectations, reduced export production in Shanxi due to mine safety issues. Strong domestic demand and bottlenecks in logistics led to a tightness in supply throughout the Chinese coal industry.

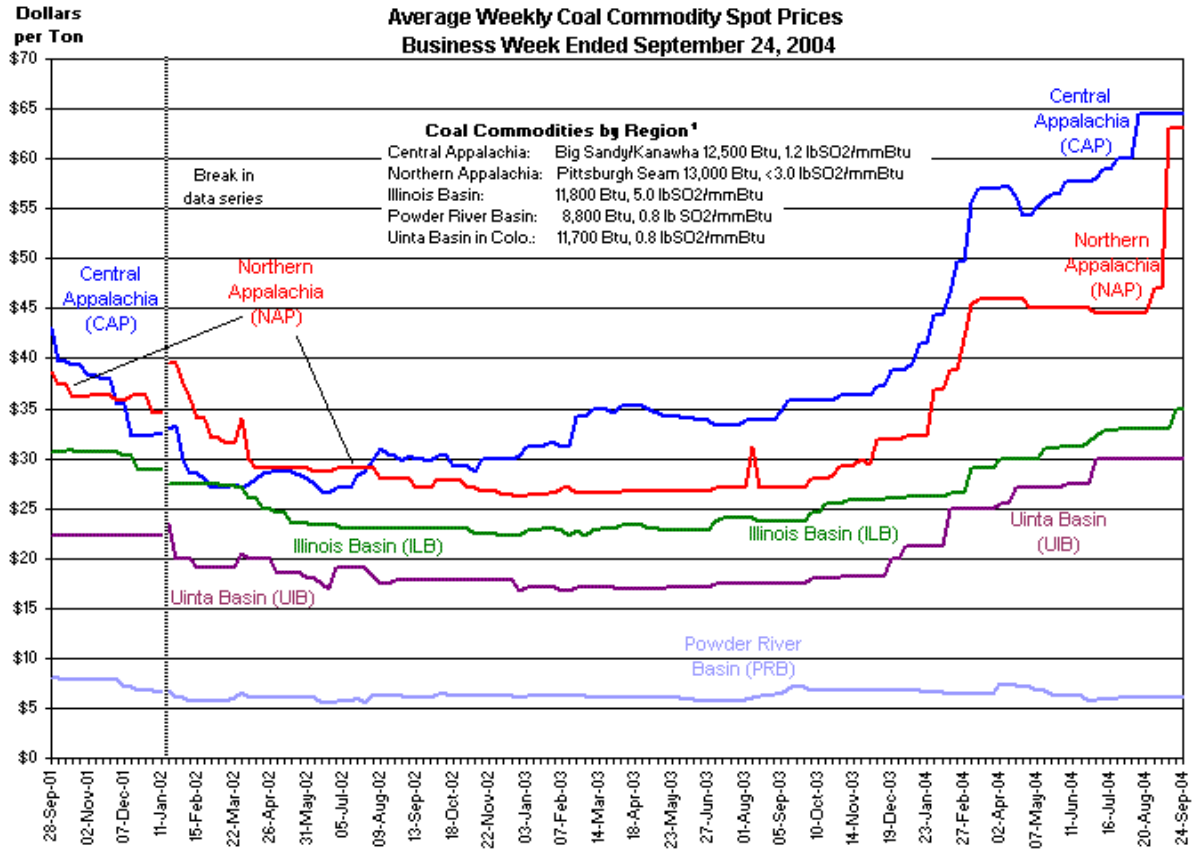
101. This prompted China to delay export tonnages to its key import markets such as South Korea, Taiwan and the Philippines, while it also considered increasing coal imports. The combination of all these factors contributed to a surge in spot prices through the $30/t level and up to +$38/t over the course of the second half of the year.

102. In 2003, Australian soft **coking coal** contract prices into the Asian steel mills (negotiated at the beginning of the year) fell in line with the "Japanese Reference Price" for thermal coal. At the beginning of the year many Japanese mills were replacing soft with hard coking coal to increase productivity from their furnaces. However, spot prices for this semi-soft material increased dramatically during the latter half of the year as they are closely tied to the thermal coal spot price. Soft coking coal demand received a further boost from the tight hard coking coal market with some non-Japanese steel-makers (who would normally not use this quality coal) sufficiently desperate to get any quality of coking coal they were willing to buy soft in place of hard coking coal in some instances. The fire at the Southland metallurgical coal mine in New South Wales in late December tightened availability of this product in early 2004.

103. In the **United States**, limited information is available on spot prices for selected coal types in Central Appalachia, Northern Appalachia, the Illinois Basin, Power River Basin and the Colorado Unita Basin. The information is prepared by "Platts Coal Outlook" and is published weekly by the US Energy Information Administration (EIA) on its web site: www.eia.doe.gov although still limited, there is some trading of coal futures on the New York Metals Exchange (NYMEX). Chart 7 shows the latest information.

104. As can be seen, Central Appalachian coal prices increased during 2003 and rose steeply in early 2004, followed to a more limited extent by Illinois Basin and Colorado Unita Basin coals. With the exception of Powder River Basin coals, spot prices for all coals are well above 2003 levels and are at or exceed the peak levels reached in 2001. Spot prices for coal from Northern and Central Appalachia have increased the most.

Chart 7 – Spot Prices for US Coal 2002-2003



¹Prior to January 11, 2002, EIA averaged 12-month "forward" spot prices for several coal specifications; after that date, coal prices shown are for a relatively high-Btu coal selected in each region, for delivery in the "prompt" quarter. The "prompt quarter" is the next calendar quarter, with quarters shifting forward after the 15th of the month preceding each quarter's end.

Source: with permission, selected from listed prices in Platts Coal Outlook, "Weekly Price Survey."

Source: US Energy Information Administration

4 ISSUES RELATED TO COAL

4.1 Sustaining the Role of Coal

105. The IEA has forecast that total energy demand over the next thirty years will almost double. In order to maintain a stable and affordable energy supply whilst keeping economic, social and environmental objectives in balance, it is important that energy be obtained from a wide variety of sources.

106. A compelling economic and social case can be made for sustaining the role of coal in the future energy mix, given that it is an affordable, reliable and secure source of energy. All fossil fuels must address the challenge of climate change – most important for coal because it is the most carbon intensive fossil fuel. The following paragraphs highlight recent developments that impinge on the necessary fulfilment of coal's role in the future energy mix.

4.1.1 Policy and the Role of Coal

United States of America

107. There are several areas of policy that could affect the future of the coal industry in the United States in both a positive and negative manner.

108. Comprehensive Energy Policy legislation that included appropriations for an expanded coal research and development program, funds for the Clean Coal Power Initiative (a demonstration program for advanced clean coal technologies) as well as a limited number of tax incentives, did not pass the Congress before its adjournment in October.

109. Funding for coal R&D and for the Clean Coal Power Initiative is included in the annual appropriations bills for the Department of Energy. Awards have been given to one round of projects under the CCPI and a solicitation for the second round of projects is outstanding. Funding for carbon sequestration research is being increased.

110. President Bush has initiated a number of forward looking programs that will act to enhance the future of coal. In 2003, the President announced the beginning of the FUTURE GEN project, a zero emission coal based facility that will produce electricity and hydrogen from coal. A group of seven major coal companies and coal fired utilities are working with DOE to make this project a reality. Additionally the Administration has launched the Regional Partnerships on Carbon Sequestration, the International Carbon Sequestration Leadership Forum and the Methane to Market Partnership, an effort to promote international collaboration on capture of methane in coal mines and from other sources.

111. Following an earlier Senate rejection of Kyoto ratification, President Bush did not support the Kyoto Protocol in 2001, favouring instead a Climate Change Initiative based on accelerated scientific research programs, development and commercialization of new technologies (including sequestration technologies) and voluntary business actions to increase efficiency and reduce emissions. The United States' emissions reduction goal, an 18% reduction of emissions per unit of GDP, is an intensity goal that allows continued economic growth. The US coal, utility and rail industries are among those involved in voluntary climate programs.

112. Coal, and clean coal technologies, will be an important part of the United States energy future

Australia

113. Current Australian Government policy is not to ratify the Kyoto Protocol, to which Australia is a signatory, on the basis that to do so at the present time is not in Australia's interests. These national interests include the importance of low-cost and reliable fossil fuel based energy to Australia's international competitiveness and living standards, and the contribution to national income from the production and export of fossil fuel-based energy commodities.

114. Nevertheless, the Government has committed to developing domestic emissions abatement programs to meet Australia's assigned amount under the Protocol – most recent emissions projections indicate that Australia is "within striking distance" of achieving its Kyoto target of 108% of 1990 emissions in 2008-12 – and to further reduce Australia's emissions beyond the first commitment period.

115. Australian national and state governments have introduced a range of measures to reduce greenhouse gas emissions from energy supply and use. These include both voluntary and mandatory measures relating to emissions, energy efficiency, demand management and fuel choice, and support for research and development of lower emissions energy technologies.

116. In June 2004 the Australian Government launched an Energy White Paper entitled "*Securing Australia's Energy Future"*. It comprehensively reviewed energy sector arrangements and included support for low emissions technologies, mandatory energy efficiency improvement assessments by large-scale energy consumers, and extended renewable power subsidies.

117. As part of the Energy Statement, the Federal Government recognised the importance of encouraging the demonstration of low emissions fossil fuel based energy technologies by announcing the creation of a fund to facilitate such projects. The Low Emissions Technology Demonstration Fund will provide funding of up to one-third of the cost of industry-led projects for large-scale demonstration of low emissions technologies with significant long-term abatement potential. Total committed outlays are expected to be AU$500 million to June 2008, with at least an additional AU$1000 million from industry proponents, focussing on technologies that are capable of lowering Australia's GHG emissions by at least two percent and have potential to be commercially available between 2020 and 2030. (see also 4.1.2)

Japan

118. There was no energy tax on any domestic or imported coal in Japan until September 2003. As a result of the Government review in FY2002 of its Revenue and Expenditure structures, it decided to introduce a new energy tax on coal from October 2003, as part of its energy tax reform. The amount of the "Coal Tax" is to be increased by three stages:

    - initially 230JPY/ton from October 2003 to March 2005;
    - 460JPY/ton from April 2005 for two years; and finally
    - 700JPY/ton from April 2007.

119. The amount of the "Coal Tax" per ton is fixed with no adjustment for calorific value. Coking coals for steel making and steaming coals for cement making are exempted from the "Coal Tax" at least until March 2005.

120. During the first half of 2004 the Ministry of Economy, Trade and Industry (METI) revised its Long-term Energy Supply and Demand Outlook which was previously prepared in FY2001. This year's Outlook covers a longer period to 2030, compared to the previous version's ten year time horizon. In the new Outlook, coal is again expected to continue to play an important role throughout the period to 2030, accounting for around 18% of the primary energy supply for the whole period; and 19% in 2010 reducing to 16% towards 2030 in power generation.

121. In parallel with the revision of the Long-term Energy Supply and Demand Outlook, the Coal Division, Agency for Natural Resources and Energy, METI, set up in January 2004 the Clean Coal Cycle (C3) Study Group to advise on the recommendation for the future Government's coal policy.

122. The C3 Study Group's interim report, prepared in June 2004, has emphasized the importance of coal in the energy mix and identified the following areas for action:

    i) overcoming its environmental disadvantages and strengthening its advantages;

    ii) thermal efficiency improvement through development of Clean Coal Technology (CCT);

    iii) transfer of superior CCT to the Asian countries; and

    iv) further strengthening relationships with coal-producing countries to secure stable coal supply.

123. Based on the above, the report has recommended promotion of an action program called the "Clean Coal Cycle (C3) Initiatives".

South Africa

124. The main issues for coal in South Africa are:

- the new Mineral and Petroleum Resources Development Act, which is changing the face of the coal industry and providing an opportunity for Black Economic Empowerment (BEE) firms;
- access to potentially economically viable reserves;
- export infrastructure (port and rail) for the BEE producers; and
- the implementation of clean coal technologies.

125. With government and industry co-operation, the problems caused by the re-shaping of the industry will be overcome and coal will remain the country's cheapest and main energy source for a long time. The industry's local market sales are closely linked to the export market, which provides the extra revenue that allows local coal prices to remain low and stable.

126. At present, the outlook for the coal industry during the next two to three years is very optimistic. With the implementation of some, or all outstanding coal projects, including the RBCT Phase V expansion by 2005-6, coal production and exports should increase by 10-15%. The re-assessment of the remaining coal potential in the Central Basin will give many BEE companies the reserves they need to enter the industry. Some of these companies have already opted for partnerships or joint ventures with some of the existing coal companies - a quicker way to enter the coal industry, but one that will not bring the desired increase in production and exports.

127. The implementation of Clean Coal Science (CCS) in South Africa, as a result of the acceptance of the country as a member of the International Energy Agency CCS Agreement in April 2003, has opened the door to all the CCS Agreement's resources and projects. South Africa's research scientists can co-operate with their colleagues overseas in the area of coal combustion. No longer does coal need to be a threat to the environment.

128. Given the right technology, coal is expected to remain South Africa's major energy source. Displacement by hydro, gas and alternative energy sources is not currently a major threat, but it may become one if coal reserves become less accessible, more difficult to mine and/or when quality decreases further.

129. Rehabilitation requirements to restore land to original use may be too onerous and alternative rehabilitation options should be explored, e.g. agricultural production according to the concept of sustainable development.

130. Future investments in the coal industry will go hand-in-hand with the implementation of the Mineral and Petroleum Resources Development Act. New mines must now comply with the Act and Charter. Goals such as SHE standards and environmental obligations and growing HDSA mining inputs and procurement rank with facilitation of broader access to exports and maintenance of global market share.

131. There are low expectations of beneficiation, job creation and rail infrastructure efficiency, though the central importance of addressing the latter for industry competitiveness and black empowerment is recognised.

Spain

132. The ECSC treaty expired during 2002, and 2003 saw efforts by the Spanish administration and the coal mining industry to adapt the previous legislation in line with the Treaty of Rome. Many issues are still pending, some of them as important as authorization of the coal subsidies that in fact have already been given for 2003 and 2004. If these are not approved, the money must be returned. Brussels has opened an investigation in Spain in connection with the subsidies granted during 2003, specifically because the Spanish government did not provide sufficient individual detail of the aid granted.

133. In addition to a possible non-fulfillment of the European rules, the Commission appears concerned that the general statement that the subsidies will decrease by 4% between 2002 and 2007 is not enough guarantee that this will happen. Also Brussels appears to have concerns that some mines with closure plans have not in fact closed and that they continue receiving aid, and that some companies might be receiving subsidies for closure as well as for normal activity.

134. There are also other two issues that require immediate attention by the coal industry in conjunction with the Spanish Administration.

135. The first is the "access to reserves plan". According to EU legislation, before 30 June 2004 the Spanish Administration shall decide which mines will close before 2007 and which ones will continue under a "subsidies plan" that complies with the European rules. The problem is that this timing is co-incident with electricity power plant decisions to be made under the provisions of the Large Combustion Plant Directive regarding plant refurbishment and future levels of generation. The mining industry needs knowledge of electricity industry plans in order to make its own decisions because electricity generators are its only customers.

136. The other issue that the mining industry has to face is the extension of the "mining plan", currently defined and approved until 2005. Re-negotiation between the Spanish

administration and the industry this year could extend the plan, probably until 2010.

United Kingdom

137. The four goals of UK energy policy, as stated in the February 2003 Energy White Paper, are: a 60% reduction in CO_2 emissions by 2050; reliable energy supplies; competitive energy markets and the elimination of "fuel poverty".

138. The majority of the White Paper is concerned with the first of these four goals. It states that the Government will intervene in the market only in extreme circumstances – believing that the best guarantee of security is that firms believe that the Government will allow markets to work. Generation capacity margin and fuel mix are merely to be "kept under review".

139. Towards the end of 2003, the Government concluded an initial review of the Renewables Obligation for electricity supply. As a result of this, the Obligation was revised with effect from 1st April 2004. The major changes are:

- the obligation, previously set at 10% from 2010 onwards, now rises progressively from 10% to 15% in the period 2010-2015, and remains at 15% thereafter; and
- the timescale over which biomass co-firing is eligible has been extended from 2011 to 2016; with a relaxation of the requirement that the majority of biomass be in the form of energy crops.

140. During 2004 the government consulted on its carbon abatement technology strategy, with the intention of launching a new R&D programme in 2005 that will include CO_2 capture and storage. It also announced a consultation on the UK's Climate Change Programme. Although a scheduled review, it has attracted added impetus because, on current projections, the UK will not achieve its national 20% CO_2 reduction goal by 2010. A 14% reduction is forecast – the same as forecast for the basket of greenhouse gases and comfortably meeting the UK's 12.5% reduction target under the Kyoto Protocol.

The Netherlands

141. In the Netherlands, government and the owners of coal fired power stations have concluded a voluntary agreement to achieve an annual CO_2 reduction of 6m tons of CO_2 during the Kyoto period (2008-2012). About half of this reduction will be achieved by keeping the generation efficiency of all installations (both coal and gas) at world class level as determined by benchmarking Dutch efficiencies with the rest of the world. These global benchmarks cover all power stations larger than 50 MW which deliver electricity to the market. In these benchmarks the trend for world class performance is set by the generating efficiency of new investments. This implies an ambitious challenge for existing Dutch power stations in order to achieve and follow the world class benchmark.

142. The second important element of the voluntary agreement to reduce CO_2 emissions involves the switch from coal to biomass. This switch should deliver more than 3m tons of CO_2, which equals on average 12% of the generated electricity by 2012. At the start of the European CO_2 trading scheme in 2005, the government expects that coal fired power stations will have implemented more than one third of their final Kyoto obligation.

143. The Minister of Economic Affairs, who is responsible for energy policy, has declared that a new coal fired power plant is desirable from the viewpoint of increasing security of supply and price developments; and the Ministry of Environment has made a reservation in its SO_2 budget for such a new plant.

4.1.2 Industry Actions to Sustain the Role of Coal

Australia

144. The coal industry continues to work hard and commit substantial funds towards the development of clean coal technologies. These include production based activities such as coal seam gas utilisation, where viable, and support for RD&D of lower emissions coal use technologies. Technology development programs in which the coal industry is involved include:

- COAL21 (see below);
- the Coal Research Council for Greenhouse Gas Technologies (CO2CRC), which involves collaboration among the coal, oil/gas and power industries, governments and research providers on a $100m, 7-year RD&D program on capture and geological storage of CO_2;.
- the Coal Research Council for Coal in Sustainable Development (CCSD), which is half-way through a $60m, 7-year R&D program on current, transitional and future coal-based power generation technologies, including coal gasification and coal/renewables companion technologies; and
- the Centre for Low Emission Technology (CLET), which is a newly formed centre for R&D of coal gasification and gas processing to facilitate zero emission power generation from coal.

145. Coal21 is a partnership between coal companies, utilities, researchers and national and state governments to facilitate demonstration and commercialisation of zero emissions coal based power which aims to:

- scope, develop, demonstrate and implement near zero emissions coal-based electricity generation that will achieve major reductions in greenhouse gas emissions over time and maintain Australia's low cost electricity advantage;
- facilitate the demonstration, commercialisation and early uptake of technologies identified in its plan; and
- promote relevant Australian RD&D and provide a mechanism for effective interaction and integration with other international zero-emission coal initiatives.

146. Following twelve months of consultation among the coal and electricity industries, governments, the Australian research community and interest groups, COAL21 released a National Plan of Action for Reducing Greenhouse Gas Emissions Arising from the Use of Coal in Electricity Generation (www.australiancoal.com.au) in March 2004.

147. The action plan examines the range of current and emerging technologies for reducing emissions from coal-fired generation and identifies those that are particularly promising for Australia in terms of their ability to facilitate near zero-emissions, increase energy efficiency and facilitate hydrogen production. It also reviews the developmental status of each of the technologies and makes recommendations on actions, including government policies, which are required to accelerate their commercialisation and adoption in Australia. Finally, the plan looks at the extent of greenhouse gas emission abatement that, conceivably, could be

achieved from a concerted program of support and application of these key technologies.

148. COAL21 looked at the potential for abatement of greenhouse gas emissions from Australian coal-based electricity by 2030, in the context of strong forecast growth in electricity demand and coal-fired generation. It found that, provided certain key assumptions were met, a reduction in the average emissions intensity of coal-based generation from the current level of 1020kg CO_2/MWh to 650kg CO_2/MWh in 2030 was possible.

149. The Low Emissions Technology Demonstration Fund (see 4.1.1) will fund up to one-third of the cost of demonstration projects that underpin Australia's resource base (i.e. coal and natural gas). It represents a major opportunity for the Australian coal industry to realise key technology development goals by;

- building on pilot projects already in prospect, such as proposals for the retrofitting of an existing power station to oxy-fuel firing (potentially the first of its kind in the world in commercial operation within 5 years);

- demonstrating the viability of CO_2 geosequestration in deep saline aquifers, with which Australia is particularly well endowed; and

- demonstrating the feasibility of a black coal-based near-zero emissions facility, such as an IGCC plant with integrated CO_2 capture and geological storage. The need for such a demonstration under Australian conditions, and in partnership with government, was one of the main conclusions from the assessment of coal technology development requirements carried out under the auspices of the industry's COAL21 program.

Japan

150. Coal has been fulfilling an important role in the primary energy mix and the power generation in Japan. In FY 2003 coal accounted for 21.1% of the primary energy supply and 23.6% of power generation, while those were 20.4% and 22.2%, respectively, in FY2002.

151. Since FY1992 the coal-related industries have been holding "Clean Coal Day" events annually during August and September under the sponsorship of METI and the relevant embassies with the support of various energy-related industries. This is one of the activities on the sustainable role of coal undertaken by the industries for the general public and those involved in various coal sectors. During this year's 13th "Clean Coal Day" period, two international conferences on coal were held in September and coal-related facilities such as coal-fired power stations, steel mills and coal museums throughout Japan were open to the general public.

4.1.3 Emissions Trading

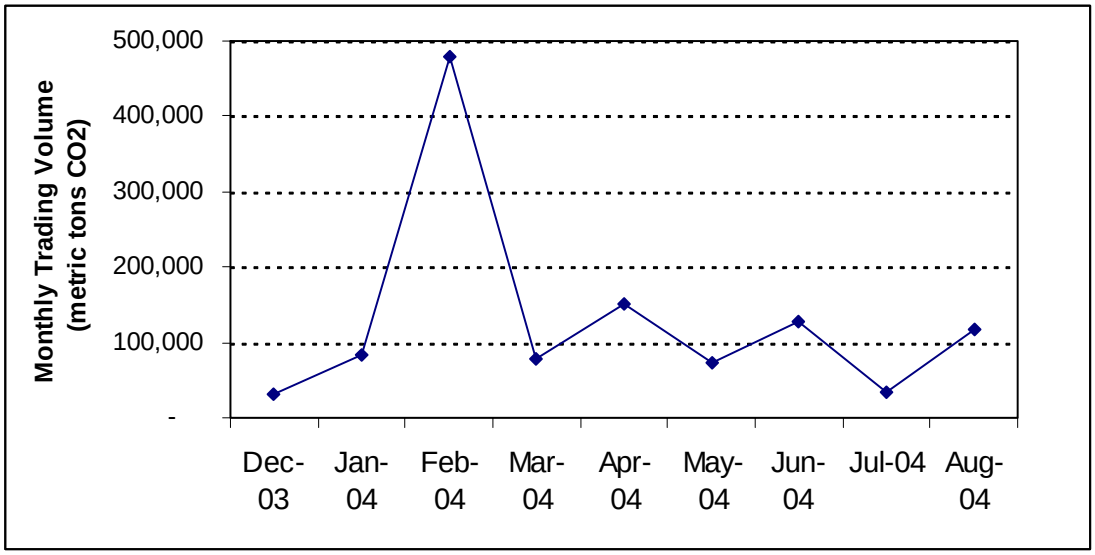
United States of America

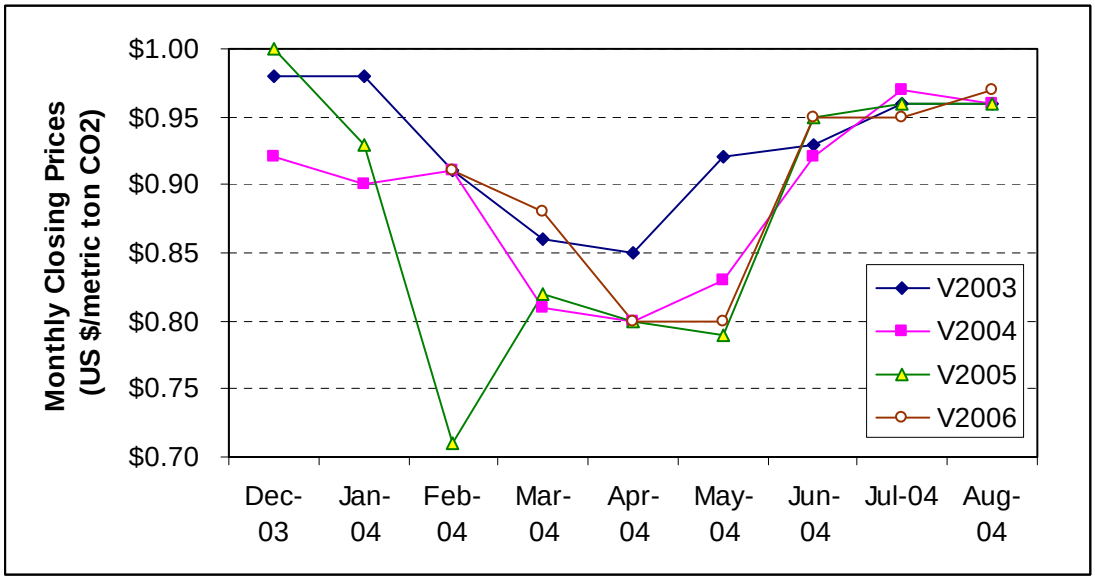
152. The United States has not, and is not likely to, embark on an official carbon emissions trading program developed by the government although a number of companies are engaged in informal carbon trading programs. Additionally, some states and regions have proposed and/or are in the early stages of developing greenhouse gas emissions programs.

153. As a private industry example, the Chicago Climate Exchange has been established as a

self-regulatory, voluntary organization that manages a market for trading greenhouse gas emissions. Although located in the US, Chicago Climate Exchange participation is multi-national. The exchange began continuous electronic trading of greenhouse gas emission allowances in December 2003 and trading volumes have been increasing through 2004. A number of US-based corporations, including major coal-burning power generators, buy and sell CO_2 emissions credits on the exchange for purposes that include achievement of voluntary reductions pledged under the Climate Change Initiative that has been established in the US as an alternative to participation in the Kyoto Protocol. Experience gained by US firms in trading SO_x and NO_x emission allowances under the nation's clean air protection programs aids participation in the exchange's CO_2 emission trading programs.

154. The following charts illustrate recent trading volumes, for all permit vintages, and prices for each vintage year on the Chicago Climate Exchange.





155. The NO_x and SO_x emissions trading programs that have been in effect in the USA since the mid-1990s, as an integral component of the national strategy to achieve mandated emission reductions, continue to operate effectively.

Japan

156. During FY 2004, the Japanese government is reviewing progress on its current measures to reduce GHG to achieve its Kyoto Protocol target, and will decide on additional measures to be taken after FY2005 if necessary. Emissions trading is one of the options likely to be considered.

157. In early August, the Ministry of Economy, Trade and Industry (METI) and the Ministry of Environment (MoE) separately each released an interim report on the review. In their report, METI is pointing out a number of problems on Emissions Trading, while admitting there are influential arguments for it. On the other hand, MoE is suggesting several specific measures including a domestic emissions trading scheme and carbon tax in their interim report focusing on its effectiveness. MoE is suggesting an Emission Trading scheme along the lines of the UK Emission Trading Scheme (ETS), based on voluntary participation of private companies aiming to build up experience.

158. The review will be completed, and the decision on additional measures made, by the end of March 2005. Domestic emissions trading might have some effect on coal, although the level of the impact is uncertain until the scheme is developed in detail, and the carbon tax impact seems much more serious and direct than the potential effect of domestic emissions trading.

South Africa

159. The Designated National Authority (DNA), required to approve proposed Clean Development Mechanism (CDM) projects in South Africa, has been established in the South African Department of Minerals and Energy. Sustainable Development criteria have been drafted and comment invited. Once the DNA is fully operational and the criteria finalised, CDM projects can be submitted for approval. As coal plays a dominant role in South Africa's energy mix, it is possible that potential CDM projects related to coal will be submitted.

United Kingdom

160. In preparation for the commencement of the EU Emissions Trading Scheme in January 2005, the UK's National Allocation Plan was submitted to the Commission in April and approved (with some minor conditions) in July. The NAP assumes a total reduction in CO_2 over business as usual of 5.5 MT over the period 2005-7, with the whole of this being taken from the power sector's allocation. Recalculation of the UK's baseline emission forecasts caused the UK to apply for a 20 MT upwards revision to its NAP in October 2004. This has not been accepted by the European Commission, again placing the onus on the power sector to achieve the UK's targeted emissions reductions.

4.1.4 Power Station Emissions Control/Mining Regulations

United States of America

161. Early in the last term, the Administration introduced a "Clear Skies" initiative that would achieve reductions of sulphur dioxide, nitrogen dioxide and mercury emissions from power plants by 2018. SO_2 and NO_x emissions would be reduced by 70% from already regulated levels. Mercury emissions would be controlled for the first time. If passed, the initiative would replace a myriad of conflicting regulations either in existence or proposed to control these same pollutants, thus giving a measure of certainty so that future generating capacity can be

built. The US coal industry supports this legislative initiative.

162. Unfortunately, this legislation did not pass in the current Congress and will have to be brought up again next year. In the meantime, the Environmental Protection Agency issued two proposed rules, one covering mercury and one addressing sulphur dioxide and nitrogen dioxide. Taken together these rules would emulate the reductions intended by Clear Skies Legislation, but unfortunately regulation does not give the industry the same level of certainty that legislation would provide. Final regulations will be issued after public comments are considered and they could act to affect various coal types in different ways.

163. Legal and regulatory actions associated with mountaintop removal mining and valley fills continue to dampen Appalachian surface mining activity, especially in the central Appalachians, but they show signs of abating. The public comment period for a draft version of a federal Environmental Impact Statement (EIS), initiated in 1999 to address mountaintop removal/valley fill (MTR/VF) mining and released in 2003, closed in January of 2004. The draft EIS recommends actions to alleviate environmental concerns, but it does not recommend severe restrictions on MTR/VF mining. Some of the EIS recommendations have already been implemented, including a requirement that coal mining operations mitigate disturbances of permanent and intermittent streams; such disturbances are commonly associated with valley fills in the Appalachians, including those constructed by both mountaintop and conventional surface mines. The EIS also recommends that alternative excess spoil placement options be utilized to minimize valley fill placement, and that the conditions under which regulatory agencies are able to authorize mining disturbances within 100 feet of a stream be liberalized; changes in federal regulations that would implement those recommendations have been proposed.

Japan

164. The Japanese Air Pollution Control Law has not been amended recently. Power-generators are required to observe environmental agreements concluded between companies and local governments. The level of allowable emission standards for newly commissioned power stations tends to be stricter than ever before, as illustrated by the following table showing two examples of environmental agreements between coal-fired power plants and the city of Yokohama.

Plant	**Isogo Unit 1**	**Isogo Unit 2**
Generating capacity	600MW	600MW
Conclusion of environmental agreement	Oct. 1999	Mar. 2004
Start of commercial operation	Apr. 2002	Jul. 2009 (scheduled)
SOx	20 ppm	10 ppm
NOx	20 ppm	13 ppm
Particulates	10 mg/m^3 N	5 mg/m^3 N

165. In July 2003, the advisory council to the Ministry of Environment recommended a guideline for ambient mercury level. The proposed value, 0.04 ug/m^3, would be a base for discussions to set an ambient criterion and an emission standard in the future.

166. In November 2003, water environmental standards for aquatic creatures were set, limiting zinc content to 30ppb for fresh water and 20ppb for seawater. Emission standards for point sources are yet to be determined, but are under discussion.

South Africa

167. The South African Department of Environmental Affairs and Tourism has drafted a new National Environmental Management: Air Quality Bill, which will replace the outdated Atmospheric Pollution Prevention Act (no. 45 of 1965) (APPA). The Bill proposes the development of a national framework and has been heralded as a watershed for Air Quality Management in South Africa. It will address protection of the environment against air pollution, as well as the cumulative impact of pollutants on the environment. One area where coal has a significant impact on ambient air quality in South Africa is where it is utilised in domestic applications. Efforts to reduce these impacts have been undertaken through the Department of Minerals and Energy who have developed a strategy for addressing this issue.

United Kingdom

168. The longer term future of coal-fired plant in the UK is being influenced by the transposition of the Large Combustion Plant (LCP) Directive into UK Law. The UK Government now favours implementation through Emission Limit Values for coal-fired power stations, with a National Emissions Reduction Plan for smaller combustion plant, although approval for this hybrid scheme has yet to be granted by the European Commission.

169. FGD is currently fitted to 8 GW of the UK's 28GW of coal-fired capacity. A further 2 GW is currently under construction or pre-commissioning and at least 2.5GW under consideration. By 2008, at least 10 GW of FGD plant should be in service.

170. In addition to the LCP Directive, all generating plant must be authorised under EU Integrated Pollution Prevention and Control (IPPC) legislation in order to operate from 2007 onwards, requiring the use of Best Available Techniques to reduce plant emissions.

171. During 2004, the Environment Agency of England and Wales proposed how it would implement LCP and IPPC Directives. In essence, it will demand "FGD equivalent performance" from all plants from 2008. During the transition period, the Agency proposes SO_2 allocations based on plant capacity and, whilst these are not as severe as previously envisaged, they will push operators to use lower sulphur imported coal.

The Netherlands

172. In order to meet new NOx emissions requirements, three coal fired units will be equipped with DeNOx installations.

173. Government has set the new SO_2 emissions cap for 2010 at 13.5k.tonnes. This level more or less corresponds with current annual emissions, but is 5k.tonnes less than the level which had to be achieved by 2000. In addition, however, government has also set aside a reserve of 1.5k.tonnes of SO_2 for a new coal fired power station.

4.2 Investment in Coal Supply, Transportation and Use

Australia

174. Xstrata Coal will be investing up to AU$300M to begin production at the 8MTpa Rolleston coal mine in Queensland Australia. This investment covers work on construction of a rail spur to transport the coal to the port of Gladstone.

175. In September 2004 the BHB Billiton Mitsubishi Coal Alliance (BMA) announced plans to increase its coal production capacity from 52 to 59 MTpa by the second half of 2006, and further growth beyond this level is in prospect as part of BHP Billiton's announced plans to lift its worldwide coking coal production to 100 MTpa by 2010. This includes projects to lift annual throughput capacity at the company's Hay Point Coal Terminal by six million tonnes to 40 MTpa, and the commencement in mid-2005 of punch longwall underground coal mining at the new Broadmeadow Mine, which is designed to produce 3.6 MTpa at full production.

176. The Australian Federal government is to invest approximately AU$130M in upgrading the Hunter Valley rail network to improve the rate and efficiency of coal transport to the port on Newcastle in New South Wales. Ultimately it is hoped that this investment will bring the rail performance in line with the port's rated capacity of 89MTpa. The current rail network can only deliver approximately 80MTpa. The Queensland government is spending AU$ 570m this year upgrading infrastructure including the Blackwater rail system and the Gladstone coal terminals.

177. Over the medium to longer term, expansion to meet growing demand is planned, with latent brownfield capacity plus new infrastructure developments in prospect

Japan

178. Investment by Japanese companies in the overseas coal industry continued in FY2003. EPDC purchased a 15% interest in an Australian thermal coal deposit, Clermont, from Mitsubishi and Queensland Coal. Itochu and Sumitomo Corporation respectively purchased a 10% interest in Oaky Creek coking coal mine and the NCA (Newlands-Collinsville- Abbot Point) project from Xstrata. Mitsui & Co. purchased a 4.75% interest in Moranbah North coking coal mine from Tomen and Sumikin Bussan.

179. No investment by Japanese companies was made in transportation, while exit from the Los Angeles coal terminal project was completed in FY2003.

180. In FY 2003, Japanese power utilities started 1920 MW of new coal fired generation and from FY 2004 onwards they will construct a further 5850 MW. They hope to secure and expand the role of coal in the generation mix, which amounted to 41GW (16%) in 2013). However, due to matured power demands, the total volume of planned coal fired units has decreased.

South Africa

181. As a result of the changes brought about by the new Mineral and Petroleum Resources Development Act the large coal mining companies are still testing the new investor's environment and, although some large coal projects have been announced, the full implementation of such projects is still awaiting the final go-ahead from those companies.

182. On the other hand, a number of Black Economic Empowerment (BEE) companies have acquired reserve blocks and have opened a number of small collieries. As a result of the

allocation of some export tonnage by RBCT to BEE companies, there will be more mines opening in the later half of 2004 and probably during 2005.

183. The only large infrastructure investment was the approval of the construction of the new coal terminal, SDCT, and the related rail capacity increment. The new port will probably be fully operational by 2006.

184. Eskom is likely to build its next new power station in 2010/12 and is assessing a number of coal technologies.

United Kingdom

185. The issue of electricity supply security came to the fore in the latter half of 2003, with media reports of possible winter blackouts as a result of low capacity margin. In the event, the capacity margin was raised as companies reopened mothballed plant. In the future the UK will require a significant volume of replacement capacity as coal and nuclear plant closes, yet in 2004 the only planning applications were for relatively small projects, mainly wind turbines. In early 2005, applications for two new CCGTs were submitted: 2000 MW at Milford Haven by RWE npower and 2400MW on the Isle of Grain by E.On.

186. At present there is little power station construction activity other than for renewables and FGD retrofits. There are, however, a few developers interested in new coal-fired power stations. Progressive Energy has plans at Drym in South Wales and at Teesside for two 460 MW IGCC power stations and Coalpower, which operated the Hatfield deep mine, has permission to build a 430MW coal gasification power station at its colliery site near Doncaster.

187. There are two LNG import facilities currently being built in the UK. The Isle of Grain LNG storage facility in Kent is being extended and converted by BP to accept imports of Algerian gas and an LNG import terminal at Milford Haven in South Wales is being built by ExxonMobil to handle LNG from Qatar as part of the world's largest LNG project. A second terminal at Milford Haven is planned by BG and Petronas of Malaysia. These terminals provide the capacity to meet one fifth of the UK's gas demand with LNG.

Turkey

188. Due to the power station privatization policy, planned to commence in 2006, there has been no state investment in coal power stations for the last three years. However, the private sector has installed a power station fed by imported coal and another is under construction, planned to be fed by indigenous coal.

4.3 Developments in Clean Coal/Near Zero Emissions Technology

United States of America

189. One of the nation's largest electric power generators, American Electric Power Co., has announced plans to build a 1000 MW integrated gasification combined cycle (IGCC) generating plant within the next 5 to 6 years. Although two government-subsidized 250 MW IGCC demonstration plants are currently operating in the US, this would be the nation's first commercial-scale IGCC plant. The IGCC technology's capability to reduce SO_2, NO_x, and mercury emissions, relative to conventional pulverized coal; the expected capability of IGCC to accommodate CO_2 capture technologies; an expectation that future years will bring tighter air-emission control requirements; and a desire to gain operating experience with low-emission coal generation technologies were mentioned in company statements as factors that contributed to its decision to invest in a commercial-scale IGCC application.

190. Several coal companies and utilities have agreed to participate in FUTUREGEN, a Department of Energy – industry partnership to build a zero emission coal fired plant consisting of an integrated gasification combined cycle plant that produces both hydrogen and electricity and geologic carbon sequestration. The private sector consortium and the DOE are currently in the final stages of negotiation on project details. This project will contribute to the research and technology development that must occur to reach the Administration's long term objective of a hydrogen-based economy.

Australia

191. There were a number of developments during 2004 that improve the prospects for the development and demonstration of coal-based low emissions power generation technology.

192. The Australian Coal Association's COAL21 Action Plan (see 4.1.2) succeeded in focussing political attention on coal and the need for demonstration of key technologies.

193. The Australian Government's announcement of a Low Emissions Technology Demonstration Fund will provide one means of accessing substantial government assistance for the non-commercial elements of industry-led technology demonstration projects. The task for Australian coal producers and utilities is to identify priorities and potential projects around which to organise RD&D providers and present coherent, non-competing proposals to government.

194. Australia's Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC) is internationally recognised, and is successfully moving into the demonstration stage of its activity plan involving an Australian trial of CO_2 geosequestration.

195. Australian utilities are evaluating the feasibility of demonstrating key technologies, including IGCC with integrated CO_2 capture and storage and the oxy-fuel retrofit of an existing coal-fired power station

Japan

196. Clean Coal Technology (CCT) development has been strongly pursued in Japan. Japanese power companies jointly established an R&D company in 2001 to implement a demonstration project on IGCC, which includes building a 250MW plant from FY2004 and conducting a power generation test from FY2007 to FY2009. Another project on Integrated

coal gasification fuel cells (IGFC), the “EAGLE Project”, has been under way at a pilot-scale plant of 150ton/d coal feed since FY1998 and will continue to FY2006.

197. Other CCT projects are:

- Upgraded Brown Coal (UBC) Pilot Plant launched in Indonesia with support from JCOAL (Japan Coal Energy Centre);
- gas turbine combined cycle system using Hyper Coal with less than 200 ppm ash; and
- SCOPE21, an advanced coke manufacturing technology.

198. In addition to these ongoing projects for high-efficiency coal use technologies, the Japanese government has also enlarged its R&D efforts on carbon capture and sequestration:

- RITE (Research Institute of Innovative Technology for the Earth) has a 5 year (FY2000 - 2004) CO_2 geological sequestration project which ran a field experiment to inject CO_2 into an aquifer.
- JCOAL is running a coal mine methane gas recovery and utilization project.

South Africa

199. South Africa joined the Carbon Sequestration Leadership Forum and the Department of Minerals and Energy commissioned a study to assess sources and suitable sites for carbon sequestration in South Africa. Further work needs to be carried out in this area.

200. Underground coal gasification (UCG) is a process whereby coal is converted in situ into a combustible gas that can be used for power or chemical production. The Exergy UCG Technology (eUCG™) is the UCG technology developed, refined and practiced by Ergo Exergy Technologies Inc., Canada (Ergo Exergy). In December 2003 Eskom, together with Ergo Exergy, completed a pre-feasibility study for applying eUCG at Majuba Colliery (Mpumalanga). The outcome of the study is positive from the point of view of producing gas to co-fire with coal in Majuba power station. The site characterisation has been initiated and engineering and planning for the pilot plant has begun. Provided the outcomes of the pilot phase are both technically and economically attractive, the technology will be demonstrated at 112 MWe. Subsequent to this phase being successful, the technology could be scaled up to a commercial end state. A successful demonstration of commercial eUCG operation at Majuba would open a broad range of potential applications of eUCG gas as fuel and chemical feedstock in South Africa.

Europe

201. In Europe, there are three main approaches to cutting CO_2 emissions from fossil energy sources.

202. **Use of state-of-the-art technology -** Successive renewal of the coal-fired power plant fleet makes an important contribution to CO_2 mitigation. In Germany, the eighth supercritical lignite-fired power plant unit since 1990 came on line in 2002. The latest 1,000 MW-unit was a lignite-fired power plant with optimized plant technology (BoA) with an efficiency of more than 43%. This will reduce CO_2 emissions by some 3,000t/MW/year compared to the old lignite-based units.

203. **Further development of cutting-edge power plant technologies –** In terms of technology

and cost, boosting efficiency is the most favourable pathway to achieving further cuts in CO_2 emissions over the medium-term. An increase in efficiency to values of more than 50% for pulverized coal-fired power plants can be achieved mainly by raising the steam parameters to 375 bar / 700 °C / 720 °C. Within the framework of the COMTES 700 project funded by the EU, and a consortium consisting of leading energy generators and manufacturers, a facility to test critical power plant components to 700 °C will be started at E.ON AG's Scholven power plant in mid-2005.

204. In lignite-fired power plants, pre-drying run-of-mine lignite offers the possibility of increasing efficiency by some 4 percentage points. In this context, RWE has systematically improved fluidized-bed drying over the past ten years. Construction of a prototype plant at Niederaussem power station and co-combustion of dry lignite in a BoA unit are planned.

205. **Zero-CO_2 fossil power plants –** This concept is being investigated as an option to slash CO_2 emissions in the long-term. In a number of R&D projects, operators, manufacturers and universities are collaborating to develop the technical concepts for zero-CO_2 power plants and exploring their technical, economic and environmental consequences for power generation. Several co-operative research projects such as ENCAP, CASTOR and CO2SINK receive funding under the recently started 6th European Framework Programme.

206. The ENCAP project investigates the zero-CO_2 integrated gasification combined cycle (IGCC) coal-fired power plant and further development of the oxy-fuel process. The CASTOR project deals with the development of zero-CO_2 power plant technology based on conventional steam power plant – an option involving integration of an additional CO_2 scrubbing stage downstream of the FGD system. The comparatively high energy demand of this process results from the regeneration of the required chemically acting scrubbing agent (amines) with steam extracted from the steam turbine. In the context of the CO2SINK project, CO_2 storage in so-called aquifers (porous, water-bearing rock layers) at a depth of approx. 600m will be experimentally tested at a location in Brandenburg.

207. Also, in Germany, zero-CO_2 power plant is the subject of co-operative projects under the Federal Economics Ministry's COORETECT programme.

208. In the UK, work on CO_2 abatement is led by the Department of Trade and Industry (DTI). During 2004, the DTI consulted on a new carbon abatement technology programme to replace the former cleaner coal technology programme that had run since 1998. In the interim, two engineering design studies have been commissioned: retrofit options at existing pulverised coal plant to reduce CO_2 emissions, including CO_2 capture, and IGCC plant designs optimised for CO_2 capture. As an active member of the CSLF, the UK has contributed to the technical debate on CO_2 capture and to the development of new policy measures for CO_2 storage. Notably, it has instigated reviews of the London and OSPAR Conventions in relation to the storage of CO_2 beneath the seabed.

5 CONCLUDING REMARKS

209. The information given in the body of this paper has been compiled with the help of CIAB Associates and using other published sources. It describes developments over the last year in international coal markets and in environmental/energy policy in various countries from the perspective of individuals active in the coal, electricity and transport industries. Some interesting points emerge.

210. World primary energy demand grew at nearly 3% during 2003, while coal demand grew at 4%, reinforcing coal's continuing essential position in world energy supply. About 80% of coal is used for electricity generation, while iron and steel production accounts for two-thirds of the remaining coal use. China again accounted for the majority of the increase in world coal demand, illustrating the importance of coal to this and other developing economies.

211. Coal is a fundamentally secure and reliable international energy source, with over 40% of world hard coal exports sourced through OECD countries. However, the continued rapid increases in coal demand, driven substantially by China, are putting pressure on coal production and delivery infrastructures. During the latter half of 2003 and into 2004, internationally traded markets for coal have demonstrated increased volatility and substantially increased prices.

212. Furthermore, the economic and regulatory environment does not encourage investment. Coal is the most carbon-intensive of fossil fuels and therefore the most affected by uncertainties surrounding the implementation of climate protection measures through the Kyoto protocol and other national initiatives in countries including Australia and the USA.

213. Projections of international energy demand including the IEA's "*World Energy Outlook 2004"* take due account of the potential for the development and use of low/zero carbon renewable energy sources and for the increased penetration of fuels such as natural gas with lower carbon intensity than coal. Despite this, projected energy demand growth means that coal will at least maintain its current level of use.

214. So future energy market security depends on the ability to use coal in a more climate-friendly manner. Developing countries will be the main source of growth in greenhouse gas emissions from energy use over the coming decades and most of these countries do not have Kyoto Protocol commitments. This places the onus on OECD countries to assist developing countries to use coal sustainably by facilitating the application of current best commercial technologies and by encouraging participation in international research and development of new coal technologies relevant to their needs.

215. Moreover, energy policy in many industrialised countries is paying insufficient heed to future energy supply and security. Carbon emission trading schemes and other attempts to punitively tax coal run the risk of creating future energy crises. By attempting to reduce reliance on coal (the most economical source of power) these countries are running a grave risk of inflationary power prices and lack of adequate power supply.

216. Progress with the EU Emissions Trading Scheme is being closely monitored by the coal industry. Coal is the fuel most heavily penalised under the scheme, as a result of which its use in Europe is likely to be less than otherwise envisaged. However, restrictions on the growth of other fuel sources for electricity generation may mean that there is little change in the electricity generation fuel mix; merely an increase in costs for the entire system and resulting detriment to European economies.

217. But there <u>are</u> options to strengthen global energy security, provide large-scale, low-cost

options for energy-poverty alleviation, and to enhance the environmental performance of coal use. Available advanced combustion technologies such as supercritical and ultra-supercritical steam cycle, integrated coal-gasification combined-cycle, and pressurised fluidised bed combustion achieve very high conversion efficiencies and reduced emissions. In the longer-term, carbon capture and storage combined with other available technologies could be used to construct coal-fired plants that emit close to zero emissions. Allied with coal-gasification technology, the route could establish coal as a major source of manufactured hydrogen.

218. Evidence from CIAB Members shows that electricity and coal companies in several countries are pursuing these options, but to ensure success to a realistic timescale requires joint industry/government action.

219. The necessary steps are to:

- minimise the complexities, costs and duration of procedures for obtaining approvals for new coal mines and coal-fired power stations;

- support free and fair trade in coal and diversity in the supply of fuels competitively available for power generation and industrial use;

- support continued reduction in the emissions intensity of coal-fired power generation by requiring new capacity in developed countries to conform to best available commercial standards, and encouraging the transfer of these technologies to developing countries;

- accelerate the development and adoption of cleaner coal technologies (CCT) by supporting research, development and demonstration programs aimed at increasing efficiency and lowering the costs of such technologies in competitive energy markets; and

- prepare for the advent of commercial zero-emission coal technologies by elaborating the major technologies for CO_2-free power stations and their economics.

220. Through measures such as these, governments can help realize the security and social benefits of coal while continuously improving environmental performance. They are necessary elements of a realistic policy approach that recognizes the continuing role of coal and the need for regulatory certainty to support investment in coal production and coal use, and which appreciates the lead times involved in new coal technologies and the need to work with industry in accelerating their development and adoption.

CIAB, April 2005