CIAB

COAL INDUSTRY ADVISORY BOARD

International Coal Market & Policy Developments in 2003

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Contents

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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 briefly describes developments in international coal markets over the last year and highlights policy and other issues that CIAB Members regard as pertinent to the development of coal as a secure, clean and competitive energy source.

2 SUMMARY

2. Coal demand in the European Union and rest of the OECD countries during 2002 has remained relatively stable, while rapid development of the Chinese economy continued to support growth of over 2% in world coal demand. Some European countries that experienced a decline in demand, notably Germany and the UK, have seen a reversal of that position during the first half of 2003. In general, coal demand has been driven by changes in electricity demand.

3. China produced 5% more hard coal in 2002, and Q1 2003 production was nearly 15% higher than in the Q1 2002. Japanese production is now confined to one small government sponsored demonstration mine on the Island of Hokkaido and the last French coal mine will close in April next year. Hard coal production continues to decline in EU countries while, conversely, lignite production and use in Germany has continued its gradual growth.

4. With production declining in many coal-using countries, coal trade continues to grow. Seaborne trade grew by nearly 2% in 2002 and appears to have accelerated this growth significantly in the first half of 2003. Demand growth and freight supply restrictions have resulted in a near doubling over the last year in the price of steam coal delivered to NW Europe.

5. Market developments have again demonstrated the value of coal as a flexible and secure energy source, which continues to underpin rapid economic growth in China and to fulfil a role in accommodating rapid short-term changes in energy demand in developed economies.

6. However, many countries, notably in Europe, see coal as having little role in meeting future energy demand. If this view continues to prevail, it could have a significant negative effect on European energy diversity and security that will be difficult to mitigate.

7. Coal and electricity markets remain heavily inter-dependent and it is crucial that industry and government work together to understand and act on addressing the challenges to coal's sustainable development role. An appropriate policy background needs to be established that will encourage investment in advanced electricity generation technologies to reduce the environmental impact of coal use and support the longer term goal of zero and near-zero emission technologies to break the linkage between energy consumption and CO_2 emissions.

3 OVERVIEW OF WORLD COAL SUPPLY AND DEMAND

8. According to BP statistics (but see footnote[1] below), world consumption of **primary energy** grew by 2.6% (1.6%) in 2002, compared with less than 1% (2%) in 2001. Within this total, EU15 countries' consumption declined by 1%, the USA increased by 1.9% and the Asia Pacific region increased its energy consumption by a massive 7.9% (4.2%).

9. Many countries in the Asia Pacific region including Malaysia, Thailand and South Korea experienced substantial energy demand growth, although the most notable development was that China increased its coal consumption by close to 28% (but only by 8% on more realistic IEA data) in 2002! China now accounts for over 10% of reported world energy consumption compared to the USA with nearly 25% and the EU15 countries with nearly 16%.

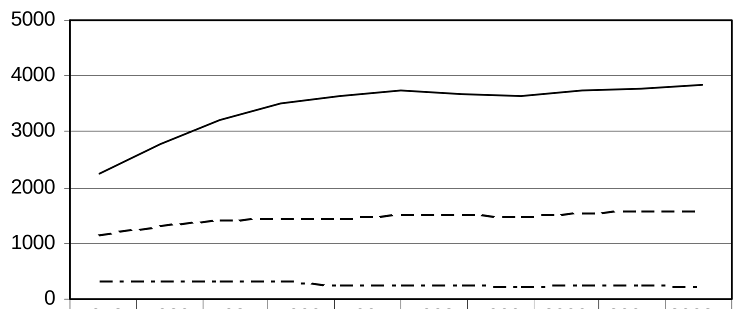
10. Thirty years ago, coal accounted for roughly one quarter of world primary energy and it maintains a very similar position today. It accounts for about 60% of energy requirements in China, whose economy is has been growing at about 8% annually since the mid 1990s.

3.1 Coal Demand

3.1.1 Total Hard Coal Demand

11. During 2002, IEA statistics show that world consumption of hard coal grew by 2.1% or 81 million tonnes, significantly higher than in 2001. Within that total, OECD consumption declined by 0.8% and EU(15) countries' consumption declined by 1.4%.

Chart 1 - Hard Coal Demand
(million tonnes)
Source: IEA Statistics



	1973	1980	1985	1990	1995	1998	1999	2000	2001	2002e
EU (15)	339	348	338	333	279	260	244	253	250	247
OECD	1143	1334	1437	1457	1447	1508	1502	1570	1600	1588
World	2250	2778	3201	3505	3658	3683	3639	3743	3772	3853

12. With a reported increase of 5% or 60 million tonnes in hard coal use in 2002, **China** was largely responsible for the **World** increase of 81 million tonnes. In recent years there has been much uncertainty concerning Chinese coal statistics, due

[1] BP Statistical Review of World Energy, June 2003. BP statistics are thought to have significantly underestimated Chinese coal production and demand in 2001, affecting Asia Pacific and world growth estimates for 2002. The figures in parentheses show growth based on more realistic IEA coal figures.

to suspected under-reporting of coal production (and consequently demand) in the late 1990s, 2000 and 2001. IEA statistics have been consistently adjusted for this under-reporting and are thought to be a more reliable indication of actual trends. A recent publication[2] by the Japanese Institute of Energy Economics supports this view. Reported 2002 coal production is believed to be much closer to actual production.

13. Notwithstanding the uncertainty over coal production estimates, there is no doubt that China continues to experience rapid growth and now has a major influence on world coal markets. The Chinese economy has grown at an average of 7-8% per year since the mid-1990s and now accounts for nearly 29% of reported world coal consumption. After many years of increasing coal exports and very low imports, exports declined by 7 million tonnes to 84 million tonnes in 2002 and imports increased by 8 million tonnes to 10 million tonnes[3]. The state news agency Xinhua has reported official Chinese sources as predicting 8.5% economic growth in 2004, with continued rapid growth in the motor and steel industries.

14. A major factor in the 0.8% decline in **OECD** countries' hard coal use was the **USA**. Here, hard coal use declined by 1.2% (10 million tonnes) in 2002 but total coal use has returned to slow growth in 2003, when demand is expected to be just short of the record set in 2000. 92% of US domestic coal use is accounted for by electricity production, while 25 million tons is used for coke making and 60 million tons is used by industry. 40 million tons of domestic production is exported.

15. While **Japan**ese hard coal demand remained stable in 2002, coal imports in the year to August 2003 totalled 113 Mt, up 9% from the same period last year.

16. Polish hard coal use declined by over 4% (3.6 million tonnes) in 2002, while Korean use increased by nearly 14% or 3.2 million tonnes.

17. The largest regional decline was in the **European Union,** where German coal use declined by 7.5% and United Kingdom coal use by 10%, in line with a dampening of economic activity across the continent. Increased electricity generation requirements have reversed this trend in the first half of 2003.

18. 25 % of **German** primary energy demand in 2002 was met by coal, with hard coal accounting for roughly half of total coal consumption and the remainder being supplied by domestic lignite production. Since 2001, German imports of hard coal have exceeded domestic production. In 2002, imports accounted for 57% of German hard coal requirements. Rotterdam, Antwerp and Amsterdam are the most important ports for German imports, with the German ports at Hamburg and Bremen also handling significant volumes. Coal from Poland and the Czech Republic is moved by rail.

19. Reversing the 2002 decline, hard coal consumption in Germany increased by nearly 6% in the first half of 2003, more than double the increase in total energy demand.

3.1.2 Steam Coal Demand

20. Recent trends in steam coal demand (see Table 1 below) reflect those of hard coal demand except that, within the OECD total, EU(15) steam coal demand increased slightly rather than

[2] "Prospects for the Supply and Demand of Coal and Related Coal Transportation Issues in China", Institute of Energy Economics, Japan, October 2003, http://eneken.ieej.or.jp/en/
[3] Source as footnote 2

declining.

Table 1 - Steam Coal Demand (million tonnes)

	2000	2001		2002e	
	m.tonnes	m.tonnes	%change	m.tonnes	%change
EU(15)	189	191	0.8%	191	0.3%
OECD Total	1355	1397	3.1%	1386	-0.8%
World	3238	3286	1.5%	3357	2.1%

Source: IEA Statistics

21. **World** consumption of steam coal increased by 2.1% (71 million tonnes) in 2002, with China's 5% or 56 million tonne increase accounting for the majority of the world increase.

22. 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 has been approved this year.

23. The summer of 2003 was hot and 16 provinces, nearly half the country, have suffered power failures. The State Grid Corp of China has estimated that national electricity demand will reach 1,784TWh this year, up 8.9%, while newly installed generation capacity is expected to grow by only 4.3%. With four-year lead times for large thermal power plants and seven to eight years for hydroelectric plants, electricity shortages could continue for several years more.

24. The country is also gradually opening its electricity system to competition. The State Power Corporation was established in 1997 to take up temporary business management of the sector and was subsequently dismantled on 29 December 2002 when 11 smaller companies were created nation-wide. At the same time the State Electric Power Regulatory Commission was set up, with responsibility for proposing power price adjustments and issuing and managing power service licenses. Power generating companies and distribution companies will gradually be allowed to conduct direct transactions with large electricity users from other provinces.

25. The first regional competitive power market was set up in Northeast China last June and five more will be established in North China, East China, Central China, Northwest China and South China.

26. Previously, the power distribution system and provincial barriers prohibited a free power market between provinces and the new system is expected to lead to greater utilisation of existing electricity generating capacity. By 2005, the government expects competitive wholesale electricity markets to be functioning nation-wide and providing an incentive for increased foreign investment. However, it could be 2010 before electricity fully embraces competitive market rules.

27. 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. Since 1993, 250 million tonnes of steam coal has been sold annually at prices set by government (typically about $4/tonne below market) and the remainder sold at market prices. In 2001 central government ceased dictating prices but continued to determine supply plans, resulting in price disagreements between electricity generators and coal producers, cessation of some

deliveries and mounting coal stockpiles. The State Development and Reform Commission finally stepped in and determined prices for 2003.

28. In **Malaysia,** coal demand increased by 150% or 3.3 million tonnes. Electricity demand has increased by nearly 6% so far in 2003 and electricity generation capacity has increased to 18.5 GW, with the bulk of the expansion taking place in the Peninsular.

29. **Kazakhstan** also increased its steam coal use significantly, recording a 35% or 12 million tonne increase.

30. Steam coal demand in **South Africa** increased slightly to 154 million tonnes in 2002. Coal currently provides about 77% of South Africa's primary energy needs, and over 90% of electricity is coal-derived. 70% of coal produced is used inland, mainly for the generation of electricity, synthetic fuels and other industrial uses. The remainder is exported and coal is third largest export revenue earner after platinum and gold, earning more than R19 billion in 2002. Inland coal prices are considered one of the lowest in the World.

31. It is envisaged that all coal gasification activities at Sasol will be phased out by 2004, leaving only a small amount of coal being used there for steam and power generation.

32. **Indian** consumption of coal increased 7.4% in 2002, to 357.6Mt, making it the 3rd largest coal consumer in the world. In 2002, India sourced 93% of it coal needs domestically, which was a 1% decline on 2001 levels. The Indian coal industry has historically been heavily protected via large tariffs applied to imports. While this has improved in recent years, it still prevents large quantities of coal being imported.

33. Of the **OECD** countries, Japan, Poland and Turkey each showed declines of about 2 million tonnes in 2002 steam coal use.

34. In **Japan**, steam coal use declined by 2.2 million tonnes in 2002. However, in FY 2002 Japanese power utilities purchased 70 million tonnes of steam coal, a 5 million tonne increase on the previous financial year. This increase is due to a nuclear shutdown since August 2002, a hot summer and a cold winter. More than 60 percent of the coal came from Australia. While USA and South Africa decreased sales to Japan significantly, China and Indonesia both increased their shares.

35. Japanese power utilities plan to construct more than 9GW of coal-fired generation units in the next 10 years. However, demand for steam coal is expected to stay between 65 to 70 million tonnes.

36. Year-to-date steam coal imports into **South Korea** have reached 35.5 Mt, up 1.3% from the same period in 2002.

37. The **United States of America** reduced its steam coal use by nearly 12 million tonnes (1.3%) in 2002, although this is recovering in 2003. Coal use for the generation of electricity is expected to be 980 million tons (889 million tonnes) in 2003, slightly higher than in 2002. A colder winter in 2002/03 with increased demands for electricity for heating, along with slightly stronger industrial demand for electricity, contributed to a higher demand for electricity and a higher coal burn through the first six months of 2003.

38. Coal shipments to US utilities were slightly lower during the first half of the year due primarily to utility efforts to manage stockpiles, a cooler than normal spring which delayed the onset of the air conditioner season, and the fact that a number of generators have been idle for repairs or the installation of emissions control equipment. Shipments are expected to equate with demand over the course of the year resulting in very small changes in year to

year inventory levels.

39. The price of natural gas delivered to US utilities skyrocketed in early 2003 reaching over \$7.00/mmbtu before receding slightly, as a result of which the natural gas burn at utilities declined. Coal, and to some extent hydropower has picked up the difference. Although most nuclear plants are operating at extremely high capacity, nuclear generation is expected to be lower than in 2002 due to an extended shut down of two major nuclear generating plants.

40. **Australian** domestic demand in 2002 increased 2.3% to 66.3Mt. Over 84% of Australian hard coal consumption occurs in New South Wales and Queensland, which are the two major producing states. 83% of 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.

41. Within the **European Union** demand from both the Germany and the UK declined by 10% in 2002, accounting for a combined reduction of 10 million tonnes in steam coal use. Spain recorded an increase of nearly 15% (3.9 million tonnes), while Italy, France and Belgium also showed significant increases.

42. The very warm weather and sustained high pressure conditions in Europe in mid 2003 noticeably affected steam coal demand. In **Germany**, for example, reduced nuclear output due to low river water levels and the lack of wind generation contributed to the 6% increase in hard coal demand in the first half 2003. For the whole of 2003, power generation from hard coal rose by more than 7 % to 145 TWh and total hard coal consumption rose by 3.4% to 66.5 mtce.

43. In the **UK**, domestic and general industrial coal use showed a combined decline of 1 million tonnes in 2002. However, over 80% of the 58.5 million tonnes of UK coal demand in 2002 was for electricity generation, which used 3.2 million tonnes (6%) less coal than in 2001. The reduction in use of steam coal for electricity generation was a function of a 1.5% reduction in total fuel use for generation and a 5% increase in the use of gas.

44. The domestic and industrial steam coal use trend continued into 2003, showing a further combined decline of 1.2 million tonnes, while the trend in coal used for electricity generation has showed a remarkable reversal. 5.5 million tonnes more coal was used for electricity generation in 2003 than in 2002, a 12% increase. Effectively, coal has substituted for a greater than 2% reduction in gas used while also meeting a 4% increase in electricity production – a clear indication of the position of coal as swing producer of electricity in the UK. With UK coal producers unable to raise production, and electricity generators having a preference for lower sulphur international coals at power stations without FGD, imported coal demand has remained strong.

45. Low electricity prices in 2002 placed some electricity generators, especially those without supply businesses, into a difficult financial position. The majority of TXU's generation assets in the UK were acquired by Powergen in late 2002 and both Drakelow (1,000 MW) and High Marnham (945 MW) coal-fired power stations were subsequently closed. AES walked away from the financially troubled Drax coal-fired power station (3,870 MW) in August 2003, allowing International Power to take a 38% stake as bondholders and lenders attempted to limit their losses. British Energy, the nuclear power station operator, has now reached agreement with the majority of its creditors over a restructuring package and now awaits European Commission approval.

46. Wholesale electricity prices increased dramatically over the summer of 2003 as a result of extreme weather conditions and supply problems in continental Europe. Forward prices also increased, perhaps in part due to the cost of CO_2 emissions trading being factored in from

January 2005.

47. One development of note has been the widespread adoption of biomass co-firing at coal-fired plant. Much of this is in response to the Renewables Obligation (RO), and a variety of biomass fuels are being co-fired including wood pellets, olive pips and cereal co-product. Under current regulations, the majority of biomass co-fired after March 2006 has to be derived from purpose-grown energy crops to qualify under the RO, although the Government is consulting on a possible relaxation of this constraint.

48. However, there has been little power station construction activity in the UK other than on-shore and off-shore wind turbines, although a few developers are interested in new, coal-fired power stations. Progressive Energy has plans in South Wales and the North East for 400 MW IGCC power stations and Coalpower[4], which operates the Hatfield deep mine, has now obtained consent to build a 430 MW IGCC power station at its colliery.

49. These planned developments will only materialise if Government comes to share the view of some potential investors that gas prices will rise in response to the UK's future dependence on imported gas. Moreover, the longer-term future of coal-fired plant in the UK will be significantly affected by the transposition of the EU directives on Greenhouse Gas Emissions Trading and Large Combustion Plants (LCP) into UK law (see comments in section 4).

3.1.3 Coking Coal Demand

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

Table 2 - Coking Coal Demand (million tonnes)

	2000	2001		2002e	
	m.tonnes	m.tonnes	%change	m.tonnes	%change
EU(15)	64	59	-6.6%	55	-6.9%
OECD Total	214	203	-5.4%	202	-0.5%
World	501	482	-3.8%	496	3.0%

Source: IEA Statistics

51. While consistent coal use information is not available for 2003, Table 3 shows iron and steel production data for the nine months to September 2003 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)		
	2002	**2003**	**change**	**2002**	**2003**	**change**	**2002**	**2003**	**change**
EU(15)	67	68	0.7%				119	1119	0.2%
OECD	206	209	1.3%	4	4	15.8%	357	363	1.7%
World	447	481	7.7%	25	23	-8;6%	655	7701	7.1%

Source: international Iron & Steel Institute

52. Total **world** coking coal demand increased by over 7% in 2002 and this trend will have continued so far in 2003 with similar increases in world iron and steel production compared

[4] Coalpower went into administration in December 2003.

with the similar period in 2002. 2003 has seen a recovery in Brazilian production following its 2002 decline, but the main driver of world coking coal demand has again been **China**.

53. Chinese coking coal demand increased by 3% or 3.7 million tonnes in 2002, according to IEA statistics, and iron and steel production in the first half of 2003 has shown staggering growth of over 20% on the similar period in 2002. According to China's Customs Statistics, total iron ore imports for the year to September amount to nearly 111 million tonnes – a 33% increase on the same period last year.

54. China is now the swing player in the semi-soft coking coal supply/demand balance. It has become a significant importer of hard coking coal during 2003 due to concerns over the volume and quality of internal production. Spot purchases over the summer of 2003 added to the volatility in the coking coal market and, with iron and steel production set to continue its rapid growth, this position could well continue. Australian producers have been required to meet Chinese hard coking coal import demand, as well as supply those markets China has withdrawn from, as a result of spiralling domestic demand.

55. The decline in total **OECD** coking coal demand slowed markedly in 2002, driven by returns to significant growth in the USA, Japan, Australia and Turkey, and the recovery has continued into the first nine months of 2003. However, amongst the large iron and steel producers during 2003, strong growth in Japan, Turkey, Poland and the Czech Republic has counteracted declines in Canada and the USA.

56. **Japan**ese steel mills purchased a total of 64.4 million tonnes of metallurgical coal (coking coal and PCI coal) in FY2002, which is a 1.7 million tonne increase on the previous year, due mainly to increased production of pig iron. Australia's share of imports decreased by 2.3% and Canada's by 10.5%. China's share, remarkably, increased by as much as 54.6%, due mainly to Japan's increased imports of semi-soft coking coal.

57. Coking coal demand in **Europe** continued its decline in 2002, with substantial reductions in all EU (15) countries, but appears to have stabilised in the first half of 2003.

3.1.4 Total Brown Coal Demand

Table 4 - Brown Coal Demand (million tonnes)

	2000	2001		2002e	
	m.tonnes	m.tonnes	%change	m.tonnes	%change
EU(15)	249	259	3.9%	265	2.5%
OECD Total	637	640	0.4%	638	-0.3%
World	903	905	0.1%	888	-1.8%

Source: IEA Statistics

58. After relative stability in world brown coal demand since 1998, 2002 saw a significant decline driven primarily by Russia and the former Soviet states, which experienced about a 10% decline. Growth of 3.1% in Germany, 2.5% in Australia and 5.3% in Canada mitigated this to some extent.

59. With a 2002 demand of 183 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 4% per year since then.

60. 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.

61. Focal points of construction activities were the Lusatian and the Central German mining areas in the east of Germany. Late in 2002, the most advanced lignite-fired power plant in the world, with optimized plant technology (German abbreviation: 'BoA' standing for 'Braunkohlenkraftwerk mit optimierter Anlagentechnik'), was commissioned at Niederaussem near Cologne.

62. This 1,000 MW plant attains an electrical efficiency of > 43 % and a CO_2 reduction of nearly 3 million tonnes/ year when compared to the oldest plants in the Rhenish area, which have an efficiency of 31% and are gradually to be shut down.

63. The power plant renewal program in the Rhineland is planned to proceed steadily, although there will be no overall capacity expansion. Planning started in 2002 for a second BoA plant, which will achieve emissions reductions similar to the first BoA plant. This new supercritical plant, which could be on stream in 2009, will require investment of €1.2 bn/1,000 MW. Revenue from supplying base-load power to the wholesale market averages approximately Cent 2.5/kWh, compared with current total costs (including capital) for lignite-based power generation in the Rhineland of Cent 2.3/kWh, declining to Cents 2.2/kWh in 2004. However, new investment of this magnitude can only be realized if lignite-based power generation is not exposed to other cost burdens resulting, for example, from the new emissions trading system.

3.2 Coal Supply Developments

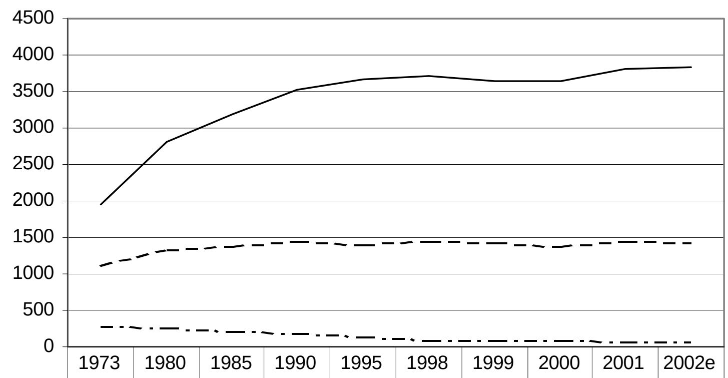
3.2.1 Hard Coal

64. Chart 2 illustrates the overall trends in world hard coal production. World production has grown strongly over the last 2 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 2002.

Chart 2 - Hard Coal Production

(million tonnes)

Source: IEA Statistics



	1973	1980	1985	1990	1995	1998	1999	2000	2001	2002e
EU (15)	285	266	224	198	135	105	98	84	76	70
OECD	1117	1336	1380	1453	1397	1447	1418	1386	1461	1423
World	1952	2811	3191	3516	3665	3704	3634	3633	3801	3837

65. **China** produced 1,326 million tonnes of hard coal in 2002, almost 5% more than in 2001. According to official statistics, 287 million tonnes were produced in Q1 2003, a 14.6% increase on Q1 2002.

66. Based on several reports from the Xinhua

news agency, safety in Chinese coal mines remains a major concern. Coal mine accidents claimed the lives of 4,620 people in the first nine months of 2003, nearly four deaths per million tonnes of coal produced.

67. There are around 3,200 State-run mines across the country and 22,000 mines run by townships and private operators. Since 2001, the Chinese government has shut down more than 15,400 small coal mines which were unlicensed or had poor production conditions, mostly for failure to meet minimum safety standards.

68. China has set the target of lowering the death toll in coal mine accidents from 7,000 a year at present to 5,000 by 2007, bringing 80% of large and medium-sized mines and half of the small mines up to official safety requirements by that date.

69. In **South Africa**, factors such as the demise of most of the large collieries in approximately twenty years time, growing numbers of economic empowerment producers, the emergence of strong competition in the export market, clean coal technologies and the Kyoto Protocol are set to change the face of South Africa's coal industry and its economy.

70. As South Africa plans to increase its coal exports to about 84 million tons per annum by 2004, the country needs sufficient reserves to meet this expansion, as well as to satisfy the projected local demand. Last year, coal-mining and beneficiation processes resulted in the generation of about 61 million tons of discards. It is estimated that more than a billion tons of this material has already accumulated around coal mines, and that new projects in South Africa, such as fluidised bed boilers, could be used to take advantage of these discards.

71. The replacement of coal by natural gas as a feedstock for some Sasol plants may lead to an increase in the life span of Sasol's coal reserves.

72. Economic empowerment (EE) entrepreneurs are actively looking for reserves to open collieries, but remaining reserves are not easily accessible to newcomers due to the lack of information. One of the prerequisites for opening a new mine is that the product has a local market with, if at all possible, a second product for export. Coal reserves of the better qualities produced for exports and some local users are not as abundant as they used to be. However, the Central Basin still contains significant mineable coal reserves. Future collieries in this area will probably not be of the size of the present 'mega' mines, but, with careful husbandry of remaining reserves, many successful operations could still be opened there.

73. However, it is uncertain whether the country really has sufficient reserves to meet exports expansion as well as satisfying the projected increase in inland demand. A re-assessment of coal reserves, to promote the diversification of energy sources and provide a clearer view of the future of coal mining in the country, is becoming a matter of urgency.

74. **Columbian** exports in 2002 declined 4% to 36.3Mt, as exports to Germany and the UK declined, as a result of a general decrease in demand for thermal coal in those countries. Colombian exports in 2003 have rebounded strongly, partly spurred on by a very hot and dry European summer that required additional coal-fired electricity generation.

75. **Indonesian** exports of thermal coal increased 10% to 68.6Mt in 2002, helping to make up for the decline in Chinese exports in 2002. In 2003, Indonesian exports have again increased in line with increases in demand from Japan, South Korea, Taiwan and Hong Kong. In 2003, Kaltim Prima Coal, Indonesia's largest export mine, was sold by Rio Tinto and BP to locally based company PT Bumi Resources.

76. In 2002 **Australia**n production of hard coal increased 3% to 273.6Mt. 204.2 Mt of this was exported, a 5% increase on 2001 levels. Coking coal exports fell 1.9% in 2002, to 104.3Mt

or 51% of Australia's hard coal exports. Exports of Australian coking coal have increased significantly in 2003, however, as world steel production and associated coking coal demand has increased, particularly in China which could import an additional 2-3Mt in 2003.

77. In 2002, Australian exports of thermal coal increased 13%, in response to higher demand for Australian coal from a number of countries including China, Taiwan and South Korea. In addition, Australian producers were able to make up market shortfalls resulting from China's reduction in exports.

78. The Australian coal industry was further consolidated in 2003, after Xstrata lodged a successful take-over bid for M.I.M, Australia's 4th largest exporter.

79. Several new export coal projects, both thermal and metallurgical, came on stream during the latter part of 2003 and early 2004 and there are a number of other projects in prospect. The effect of these developments on Australian coal supply will begin to become evident during 2004.

80. **Canadian** exports of coking coal fell 16% in 2002 to 22.9Mt, partly due to the loss of sales to long standing customers in Asia, and the closure of coke making capacity in the US, UK and Italy. In early 2003, the Canadian coking coal industry was reorganised, creating the Fording Trust, which is an income trust containing the coking coal assets of Fording Inc, Luscar Energy Partnership and Teck Cominco. The Fording Trust is the world's second largest coking coal company, and has an export capacity of around 25Mt.

81. Investment by **Japan**ese companies in the overseas coal industry continued in FY2002, when the largest new investments were the purchase of a 49% interest in the Theodore/ Dawson/Taroom coal deposits and a 30% interest in German Creek mine in Queensland, Australia by Mitsui & Co., Ltd. The Theodore/ Dawson/Taroom deposits mainly produce thermal coal and preliminary development of the Theodore deposit is planned to commence in FY2003. German Creek mine is producing 6 million tons of premium quality hard coking coal.

82. In 2003 coal production (mostly hard coal) in the **United States of America** is expected to total approximately 1.087 billion tons (986 million tonnes) essentially the same as actual production in 2002 and forecast production in 2004. This "flat" production pattern is due to the relatively slow growth in the US economy in 2002 and 2003, a slow growth in demand for electricity, utilities desire to reduce stockpiles, and low demand for metallurgical coal and for coal for export. Over time, however, the outlook for the coal industry is very favourable and production will continue to increase in all major coal producing regions.

83. In **Germany**, mining activities at the three locations of Ruhr (seven pits), Saar (two pits) and Ibbenbüren (one pit), are being performed by Deutsche Steinkohle AG (DSK) under the umbrella of RAG AG, Essen. In 2002, DSK produced a total of 26.1 million tonnes (26.8 mtce) of saleable hard coal output. For 2003, saleable output was 25.6 million tonnes (26.3 mtce).

84. German hard coal, which is by far the country's largest source of energy, is dependent on state aid to offset its geology-related cost handicaps. The regulation governing public aid, based on the EU agreement, entered into force on 24 July 2002. It underpins the coal policy agreement reached in 1997 covering the period to 2005 and, above all, it provides a perspective for a viable hard coal mining industry beyond this time. On 15 July 2003, the Federal Government, the State Government of North Rhine-Westphalia and the hard coal mining industry agreed to lower Germany's hard coal output to 16 million tonnes by 2012.

85. In **France**, coal production has continued to decline in accordance with the National Coal Pact agreed in 1994. In 2002, output was 1.6 million tonnes. The forecasts for 2003 and 2004 are 1.5 and 0.4 million tonnes.

86. Charbonnages de France (CdF) with its sub-producers Houillères de Bassin de Lorraine (HBL) and Houillères de Bassin du Centre et du Midi (HBCM) is the only operator of coal mines. Today, HBL runs one mine at La Houve, while operations at HBCM ended completely on the 31 January 2003 with the closure of the Gardanne lignite mine. In the Lorraine coalfield, Merlebach closed in October 2003 and the last mine in France, La Houve will close in April 2004. With the closure of France's last hard coal mines, it is expected that the state-owned coal company CdF will be wound up some time in 2007.

87. France has been dependent on coal imports for many years and increased imports are expected to substitute for the further decline in production (see Table 5 below).

Table 5 – French Coal Production & Imports

	(million tonnes)	2001	2002	2003 (forecast)
National Production		2.3	1.6	1.5
IMPORTS	USA	2.7	1.9	
	Canada	0.5	0.5	
	Australia	3.9	4.3	
	South Africa	3.4	4.9	
	Poland	0.9	1.0	
	Russian Fed.	0.2	0.3	
	China	0.6	0.7	
	Colombia	1.4	1.3	
	Others (includes EU)	2.1	2.9	
Total imports		15.7	17.8	18.0
Total available (recoveries excluded)		18.0	19.4	19.5

Source: Charbonnages de France

88. In the **United Kingdom**, improvements in productivity through the introduction of flexible working arrangements to allow almost continuous production have reduced costs at some UK collieries in 2003. Unions are expected to agree to such arrangements at remaining collieries, which will greatly improve the industry's prospects. These improvements, along with high international coal prices mean that UK production is currently very competitive and UK Coal plc remains confident that production from its long-life collieries will remain competitive with imports.

89. The industry received aid totalling £156 million over a two-year period ending in July 2002. Since then there has been no subsidy, although the Government is now considering applications for investment aid of up to £60 million under the same rules that apply to any other industrial investment aid (specifically, the creation or safeguarding of jobs). Some ambitious plans to access substantial new reserves of coal have been submitted which would qualify for a maximum of 30% State support.

90. Despite these promising developments, closures of deep mines in the UK continue. Clipstone Colliery closed in April 2003 and the carefully managed closure of the massive Selby complex is expected to be complete by March 2004. The relatively small Betws Colliery in South Wales closed in October 2003. Better news came from Daw Mill Colliery where production from a new 295 m face mining 5 m (16 ft) of coal finally hit its target after early geological problems.

91. Companies operating surface mines in England and Wales are finding it increasingly difficult to secure planning permissions for replacement sites, although the situation is more favourable in Scotland. Production from surface mines is expected to decline in the future.

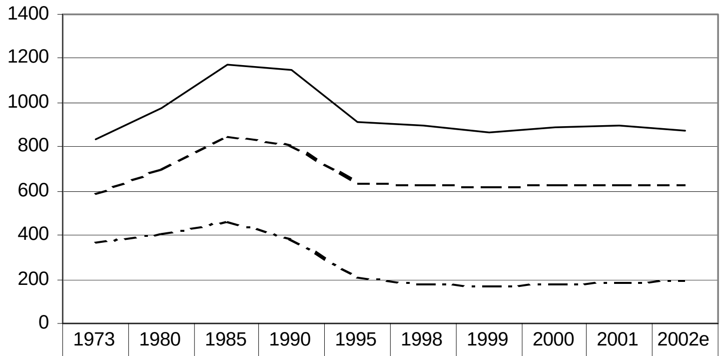
3.2.2 Brown Coal

92. **Germany** remains the world's largest producer of brown coal, increasing its production by 3.6% to nearly 182 million tonnes (56.4 mtce) in 2002. Lignite extraction is centered on four mining areas.

Chart 3 - Brown Coal Production

(million tonnes)

Source: IEA Statistics



	1973	1980	1985	1990	1995	1998	1999	2000	2001	2002e
EU (15)	373	409	461	382	209	181	175	180	188	194
OECD	590	699	851	810	633	631	618	626	630	626
World	835	979	1172	1150	912	895	862	889	897	877

93. In the Rhenish area, RWE Rheinbraun AG merged with RWE Power in October 2003. In 2002 the former RWE Rheinbraun AG produced a total of 99.4 million tonnes from three opencast mines located between the cities of Cologne, Aachen and Mönchenglad-bach.

94. In the Lusatian mining area (near Dresden), Vattenfall Europe Mining AG extracted 59.3 million tonnes of lignite from four opencast mines.

95. The most important company in the Central German mining area is MIBRAG, owned by Washington Group International and NRG Energy (both US companies). In 2002, the company recorded an output of 19.5 million tonnes from two opencast mines. In addition, Romonta GmbH is operating an opencast mine in the Central area with an annual output of 0.5 million tonnes.

96. In the Helmstedt area, the BKB company belonging to the E.ON group extracted a total of 2.9 million tonnes of lignite from the Helmstedt opencast mine, which was exhausted in August 2002, and from the Schöningen opencast mine.

3.3 Trade and Prices

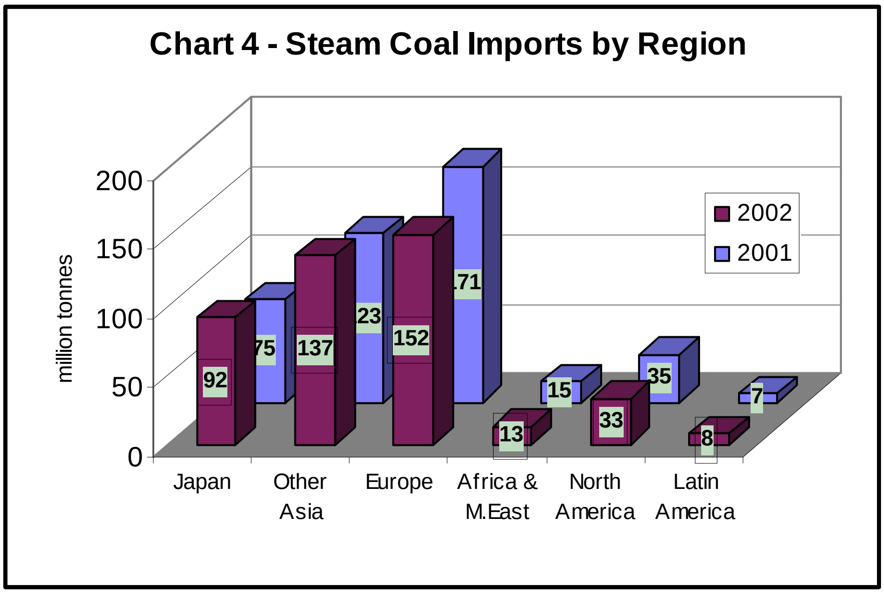
3.3.1 Trade Volume

97. According to IEA statistics, world hard coal trade increased only marginally (by 1 million

tonnes) to 623 million tonnes in 2002, although seaborne trade increased by 1.9% to 579 million tonnes

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

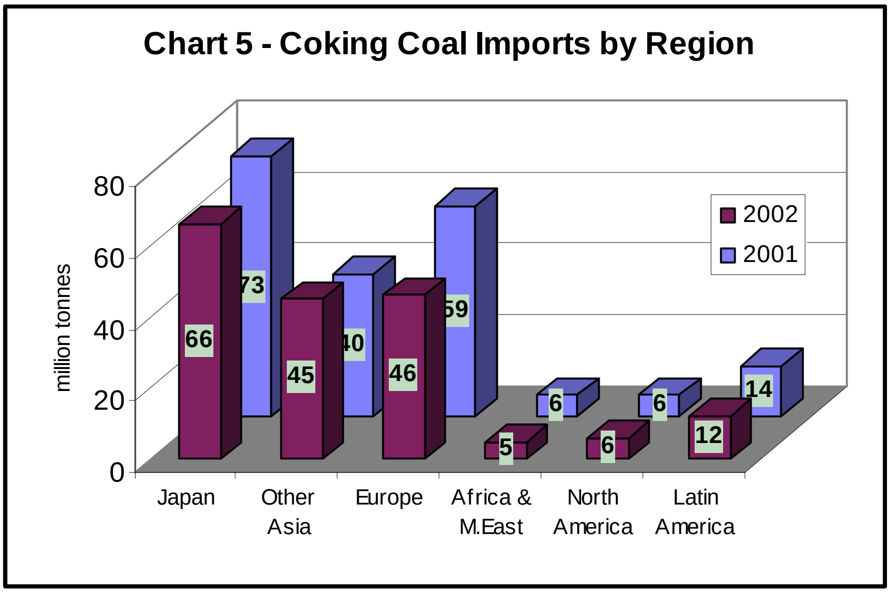
99. World **steam coal** trade continued to grow, with imports increasing by 2.4% in 2002 to reach 435 million tonnes (of which 403 million tonnes was seaborne trade).



100. European imports declined by over 10% to 154 million tonnes, although China, Indonesia and the Former Soviet Union managed to hold or increase their exports to Europe.

101. Japan increased its steam coal imports by 22% to 92 million tonnes, with a major increase of 9 million tonnes from Indonesia.

102. World **coking coal** trade, on the other hand, declined by over 4% in 2002, driven by Japan and Europe which more than compensated for a 9% increase in imports to North America.



103. Coal trade appears to have developed much more rapidly in the first half of 2003. Table 6 gives illustrative figures for countries which, in total, account for more than half of world hard

coal exports. In response to increases in demand, Colombian exports in the year to July 2003 have increased by 40% on the previous year, with the major increase being in exports to the USA. Official US trade statistics show that coal imports into the USA in that period rose by 48.5% to reach 12.6 million tonnes, with Colombia supplying 62% of the tonnage.

Table 6 – Recent Developments in Coal Exports

Export Country	Destination		2002	2003	change	
		Year to:			(m. tonnes)	(%)
Australia	Total	August	135.5	142.0	6.5	4.8%
Colombia	to Europe	July	11.2	14.3	3.2	28.3%
	to USA	July	3.7	6.9	3.2	85.7%
	to Latin America	July	2.7	3.3	0.7	25.7%
	Total	July	17.5	24.6	7.0	40.0%
Venezuela	to Europe	July	1.8	1.6	-0.2	-9.9%
	to USA	July	2.4	2.5	0.1	4.9%
	to Latin America	July	0.6	0.6	0.0	3.4%
	Total	July	4.7	4.7	0.0	-0.9%
China	Total	August	56.1	63.9	7.8	13.9%
Total 4 countries			213.9	235.1	21.3	10.0%

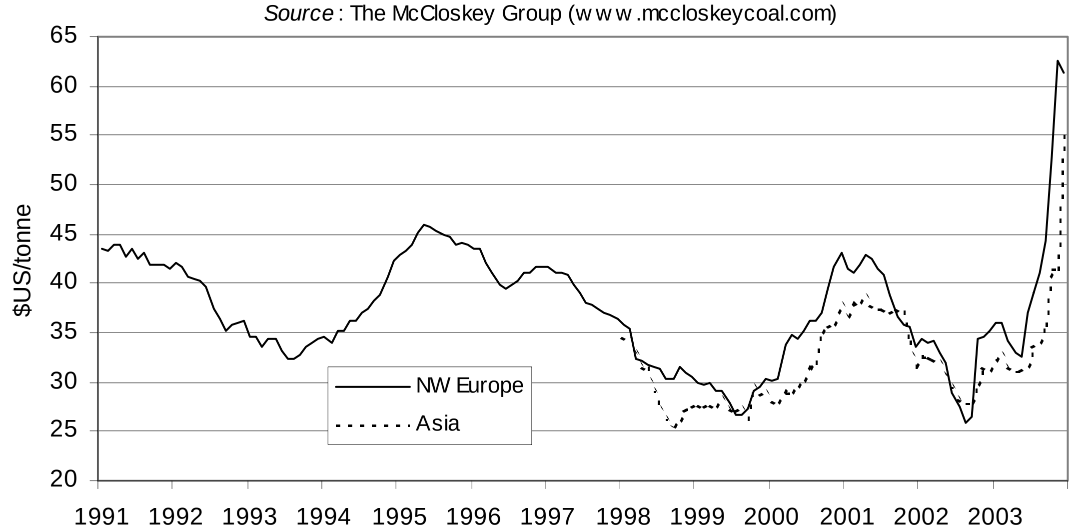
Source: The McCloskey Group (www.mccloskeycoal.com)

3.3.2 Market Prices

104. **World** steam coal trade has developed rapidly over the last 20 years. In general terms, the period 1995-2002 was one of rapid volume growth averaging 23 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.

Chart 6 - MCIS Steam Coal Marker Prices

Source : The McCloskey Group (www.mccloskeycoal.com)



105. With traded steam coal demand and supply closer to balance in overall terms, market conditions can lead to rapid price changes. During 2002 and 2003, the price of steam coal delivered to north west European ports (CIF, 6000 kcal/kg NAR) has fallen from $35/tonne to just over $25/tonne and then recovered to over $60/tonne by the end of 2003 – prices not seen for the last 20 years. The Asian marker price has been less volatile, exhibiting lower peaks and higher troughs than the European index.

106. A large part of this increase has been driven by freight cost increases. Capesize vessel rates are now substantially higher than any of the market peaks experienced over the last 25 years. For example, the end of 2003 saw rates of nearly $21/tonne for Puerto Bolivar to Rotterdam, up from about $8.50/tonne a year ago. The Richards Bay/Rotterdam rate rose by a similar amount during 2003, from $10.50/tonne to $26/tonne.

107. On the demand side, the staggeringly rapid Chinese demand for steel-making raw materials continues to de-stabilise the capesize freight market and has been one cause of the recent rapid increases in freight costs. Strong steam coal demand encouraging movements from the Pacific to Atlantic coal markets has been another upward influence on capesize rates, while strong US grain and soya bean exports have put pressure on Panamax rates.

108. More fundamentally, the supply of bulk carriers has been restricted. Shipyards are currently concentrating on orders for double-hulled tankers and new container ships, which deliver higher financial returns. However, the high bulk carrier shipping rates have slowed vessel scrapping and there is evidence of some new orders being placed.

109. Although market price increases have been driven primarily by freight rate increases, FOB prices have also increased substantially, with end-2003 South African and Colombian prices in the range $40-45/tonne FOB.

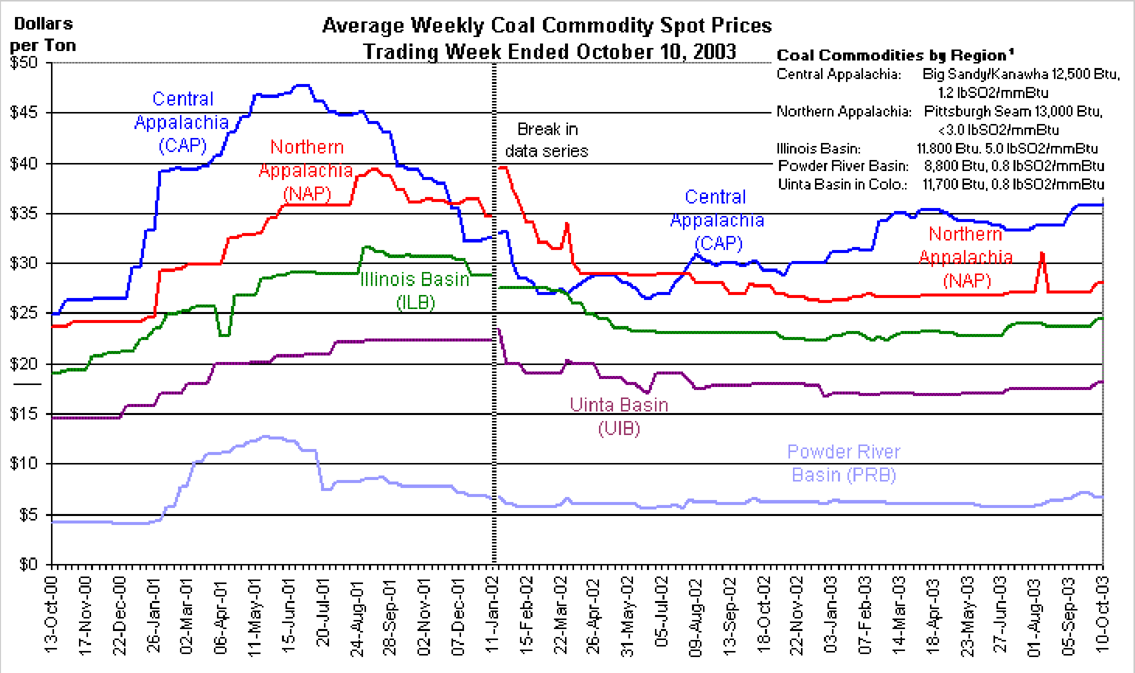
110. Following the collapse of the reference price system, **Japan** has seen shifts from long-term contracts based upon existing reference prices to shorter-term contracts or spot contracts. Various pricing mechanisms, including spot price indexation and electronic trades, are emerging.

111. Spot prices in Asia/Pacific regions started FY 2002 at around $28/t (BJI) and fell to $22/t in summer after reference prices were determined. They had climbed to $25/t by winter and again began to go down after reference prices for FY 2003 were determined.

112. Paper trades are not yet common in the Japanese market and development in the near future is also unlikely because of Japanese thermal coal consumers' differing quality requirements.

113. **US** spot market prices for selected coal types in Central Appalachia, Northern Appalachia, the Illinois Basin, Powder River Basin and the Colorado Unita Basin are shown in Chart 7 below. Although limited, there is some trading of coal futures on the New York Metals Exchange (NYMEX). According to this information, prices for all spot coals are well below the peak levels reached in 2001. Since the beginning of 2003, spot coal from Northern Appalachia and from the Illinois, Colorado and Powder River region have remained relatively stable but spot prices for Central Appalachian coals have trended upward.

Chart 7 – Spot Prices for US Coal 2002-2003



[1]Prior 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 Coal and Sustainable Development

114. The relationship between energy and sustainable development is well recognised – access to affordable energy is essential to support economic growth in developing countries while sustaining living standards in developed countries.

115. The IEA has forecast that total energy demand over the next thirty years will almost double. The task of meeting this demand is enormous and requires very significant new investment. 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. Therefore, a continuation of the rapid increase in the use of natural gas, including for electricity generation, cannot alone provide a sustainable response to this challenge.

116. A compelling economic and social case can be made for coal given that it is an affordable, reliable and secure source of energy and the coal industry can play a long-term role in supporting sustainable development. Coal is the most carbon intensive fossil fuel and its prime challenge is its environmental performance. The following paragraphs highlight developments over the last year that impinge on the necessary fulfilment of coal's sustainable development role.

United States of America

117. The long awaited comprehensive energy policy package stalled in the Senate in November 2003. The package was expected to expand coal research and development programs, firmly establish the Bush Administration's Clean Coal Power Initiative (a demonstration program for advanced clean coal technologies) and provide a limited number of tax incentives for installation of these technologies on existing plants and in new installations. The Senate may approve a slimmed-down energy bill, removing many energy industry incentives and costing $14 billion rather than the original $31 billion, in March 2004.

118. An increase in the demand for natural gas for electricity generation, coupled with a decline in natural gas production in 2002 combined to bring natural gas storage in the United States to very low levels. As a result, natural gas prices have soared and there is a great deal of concern about availability for industrial and residential use. Although official government forecasts show natural gas production increasing in 2003 and beyond to meet demand, many private analysts are not as confident.

119. Typical of these analysts is Andrew Weissman, Founder and Managing Director of Energy Ventures Group, who has stated that the supplies of natural gas available to the US market are likely to fall short of projected U.S. needs every year between now and 2010. As a result, prices for natural gas will be very volatile and much higher than official forecasts would suggest. Availability of natural gas to meet a growth in demand for electric generation is very much in question. This is turn will have a positive effect on the demand for coal for electricity generation.

120. Little new US coal fired generating capacity has come on line over the past several years. The increase in coal use for electric generation since 1999 has occurred at existing plants, which are operating at higher capacity utilisation rates. At this point, plans have been

announced to build 92 new coal plants with 64GW of capacity by 2020. A small amount of this new capacity will begin coming on line in late 2004 and in 2005. Much of the announced capacity (especially that scheduled to come on line in later years) is tentative. However, it is encouraging that electricity generators are considering new base load coal fired capacity using the most advanced pulverised coal and IGCC technologies.

121. Overall, the outlook for utility coal remains positive. US demand for electricity continues to grow, and coal-fired generation remains the cheapest marginal source of electricity. The volatility of natural gas prices improves the long-term competitive position of coal-fired generation. Clear Skies, the Bush Administration's aggressive plan to cut power plant pollution by 70 percent, is intended to enhance American energy security by enabling the continued use of diverse fuels, most notably coal, in generating electric power. The Clear Skies initiative states that it will ensure that environmental goals are achieved and sustained over the long term, even while energy use increases. The expectation is that the use of coal-fired electricity generation will continue to grow by an average annual rate of nearly 1.7% due to its relative abundance, low cost and ample delivery capacity.

Australia

122. Australia does not currently have a formal national energy policy. However, the Council of Australian Governments (COAG), encompassing the federal and all state and territory governments, has agreed on the following national energy policy objectives:

- Efficiency – encouraging efficient provision of reliable, competitively priced energy services;
- Energy security – encouraging development of Australia's energy resources, technology and expertise;
- Environmental sustainability – mitigating environmental impacts of energy production, transformation, supply and use.

123. Further, as a guide to policies which impinge on the energy sector, COAG has identified Australia's national interests and circumstances as follows:

- the energy sector underpins Australia's economic, environmental and social goals;
- competitively priced, reliable energy is key to the country's international competitiveness and living standard;
- the production and export of energy commodities contributes significantly to national wealth;
- Australia will remain substantially reliant on fossil fuels for the forseeable future.

124. Coal ranks very highly against these criteria. It is Australia's most valuable export commodity, accounting for about 12% of total export revenue, and coal-fired generation makes up 85% of the country's electricty consumption. Domestic steel production is also coal based, and coal is an essential input for a number of other industrial activities.

125. The role of coal production and consumption in sustainable development in Australia is well recognised, therefore, and has a major influence on key energy-related policies such the National Greenhouse Strategy (which embodies the need for greenhouse response to be integrated with other government commitments and to recognise the above national

interests and circumstances) and Australia's position on ratification of the Kyoto Protocol, emissions trading and clean coal technology (see later sections).

Japan

126. Coal has been playing a very important role in sustainable development and has retained a very important position in primary energy supply/demand. Its share of Japan's primary energy supply has increased at an average rate of 2.4% per annum since 1991, to an estimated 20.4% in JFY 2002 and is the second largest energy source after oil, which has an estimated 50.9% share.

127. Coal has increased its share of power generation from 10.3% in JFY 1991 to an estimated 21.8% in JFY2002: an average growth rate of 9.1% per annum compared to 1.9% per annum for overall power generation for the same period. On a unit calorie basis, coal is the most stable and the lowest priced fossil fuel in Japan.

128. Coal has played a significant role in meeting power supply shortages, which suddenly emerged in September 2002 due to the shutdown of the exiting nuclear power plants.

129. In 2002 the Japanese government announced its intention introduce an energy tax on imported coal, which is commencing in October 2003 at 230 yen per tonne, increasing to 460 yen per tonne in April 2005 and to 700 yen per tonne in April 2007. Existing taxes on gas will also increase over the same period. The government said the tax was not an environmental tax but will be used to fund research into cleaner energy options as well as incentives for nuclear power plants. The tax does not apply to coal used in the manufacturing of steel, coke and cement until April 2005 and Okinawa EPC is exempt until 2007.

South Africa

130. The South African Department of Minerals and Energy has been working on various policy documents of interest including the following:

- Renewables - "The vision of the Department of Minerals and Energy (DME) is to [provide] access to adequate and affordable energy to developing communities through a balanced mix of alternative energy resources at a reasonable cost. The purpose is to satisfy the basic needs of the developing sector, at the same time to promote the effective utilisation of South Africa's vast alternative energy sources." The DME is currently finalising a renewable energy strategy and implementation plan.
- Energy Efficiency - The CaBEERE Project has been initiated between the Governments of South Africa and Denmark and is aimed at building capacity in energy efficiency and renewable energy. "The overall objective of the project is: "*an increased use of Renewable Energy and Energy Efficiency throughout South Africa to maximise the energy sectors' contribution towards sustainable development ".*
- Small scale mining - the DME has increased funding by almost three times, (R5.1 million to R15 million) to assist in the small-scale mining sector.

Germany

131. Coal is predominantly used for power generation, with 51 % of Germany's gross power generation in 2002 (581TWh) based on coal. Nuclear energy accounted for 165TWh, but current plans are that the use of nuclear energy will cease in Germany within the next 20 years. So far, the contribution of natural gas to power supply has been restricted to close on 10% and it has been preferentially used in CHP plants. Its application in highly efficient new power plants with an electrical efficiency of at least 57% (net) is being promoted by five years' exemption from mineral oil tax.

132. In the last few years, renewable energies have gained considerable significance. In 2002, their share in power generation amounted to 45TWh or 8 %. Hydropower served to generate 24TWh, while 17TWh came from wind energy and 4TWh from biomass/refuse. The Renewable Energy Sources Act is of crucial importance to this development. It provides for the network operator to pay a specified minimum price to suppliers of power from plants governed by the Renewable Energy Sources Act. Examples of prices paid to the suppliers of power from plants governed by the Renewable Energy Sources Act in 2002 are:

large hydro (>5 MW)	6.65ct/kWh
wind energy	9.0ct/kWh
solar	48.1ct /kWh

The example price of 9.0ct/kWh, for example, is more than three times the price that a supplier of base-load power can obtain on the wholesale market.

133. With the formulation of the National Allocation Plan for the period from 2005 to 2007, which is to be submitted for European Commission approval by 31 March 2004, the future priorities for CO_2 reduction strategy (i.e. technical efficiency increase versus substitution, primarily of gas for coal) will be determined.

134. From the German coal industry's viewpoint a fuel substitution strategy would not support the idea of sustainability, which is equally based on the three pillars of economic, environmental and social compatibility.

135. The contributions to climate reduction that are feasible through increased efficiency in coal-fired electricity generation alone are reflected in the following figures:

- almost two thirds of the worldwide coal-based power plant portfolio is older than 20 years; and
- with an average efficiency of 29 %, the plants emit some 3.9 bn t CO_2/year.

If all these power plants were replaced by state-of-the-art plants, a reduction potential calculated at 1.4 bn t CO_2/year could be tapped (more than the total CO_2 emissions of Germany and Great Britain together) at clearly lower costs than those arising from a changeover to renewable energy sources.

136. Therefore the German Federal Government started an initiative in 2002, in close co-operation with industry and scientists, to draft a development concept for low-emission power stations operating on fossil fuels. The goal of the COORETEC (**CO_2 Re**duction **Tec**hnologies) project is the development of a coal-fired power station, free of CO_2 emissions, by roughly 2025. In a first phase, the aim of this project is to improve power-station efficiency as described above. This phase alone offers a large potential for avoiding CO_2 at favourable costs. The second step of the project will aim at CO_2 sequestration and subsequent storage.

France

137. The main objectives of securing energy supply, achieving international competitiveness and protecting the environment have been part of a consistent French energy policy in recent decades. The focus on energy security has made France one of the world's top producers and consumers of nuclear power.

138. However, the French government has recently organised a national energy policy debate, focussed on energy sources for the next thirty years. Although not yet completely settled, the results of this debate will probably be a new phase of nuclear development and an increase in renewables.

139. Coal seems to have been completely excluded from the options for France, at least in the short term. Furthermore, like in the other Member States, the application of the European directive on greenhouse gas emissions will threaten the future of the coal plants. The price of coal-based electricity will increase and competition with nuclear production will be more and more difficult.

United Kingdom

140. Since publication of the Energy White Paper in February 2003, the issue of security of electricity supply has risen in the public consciousness. Although the widely-publicised power cuts that occurred in the USA, Italy, Scandinavia, and especially those that affected South London and Birmingham, were all caused by transmission and distribution system problems, they have been interpreted in the media as heralding the possibility of power blackouts this winter, a view reinforced by low capacity margins reflected by high wholesale prices over the summer.

141. The part that coal-fired plant in the UK plays in longer-term electricity generating capacity will be significantly affected by the way in which EU directives on Greenhouse Gas Emissions Trading and Large Combustion Plants (LCP) are applied. Both directives will add to the operating costs of coal-fired plant and will therefore tend to reduce the competitiveness of coal-fired generation. The UK Government is currently consulting on both the form of implementation of the LCP Directive (Emission Limit Values or a National Emissions Reduction Plan) and on the National Allocation Plan (NAP) for the Emissions Trading Directive. One of the key uncertainties surrounding the NAP is whether the Government will base the overall allocation on the UK's 12.5% greenhouse gas reduction target under the Kyoto Protocol or on its own, more onerous target of a 20% reduction in CO_2 emissions.

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

143. The investment required to meet such environmental legislation cannot be justified at current market prices and decisions made in the coming months will have a major impact on the fate of coal-fired power generation in the UK. At a time when companies producing about one third of the UK's electricity are struggling commercially, the additional uncertainty over how CO_2, SO_2 and NO_x emissions will be controlled leaves industry reluctant to invest. Nevertheless, FGD is currently fitted to 8 GW of the UK's 28 GW of coal-fired capacity, with another 2 GW under construction and planning permission granted or under consideration for a further 6.2 GW. By 2008, at least 12 GW of FGD plant should be in service.

4.2 Developments in Energy & Environmental Policy

4.2.1 Post Kyoto developments

United States of America

144. Many of the issues that have emerged over the past several years with the potential to dampen long term expectations for the US coal industry are in the process of being resolved, and new programs are being put into place that make the outlook much brighter.

145. A major impediment to greater use of coal was removed in March 2001 when President Bush announced that the United States would not be a party to the Kyoto Protocol. In place of the mandatory restriction, the United States has embarked on a Climate Change Initiative that is based on:

- accelerated scientific research programs;
- development and commercialization of new technologies (including sequestration technologies);
- bilateral agreements to advance technology transfer; and
- voluntary business actions to increase efficiencies and reduce emissions.

146. The goal to reduce emissions per kWh by 18% is an intensity goal that allows continued economic growth.

147. The United States coal industry developed the Mining Industry Climate Action Plan, a five-point plan that will result in overall lower emissions from production and processing of coal and minerals. The US utility industry and the railroad industry have similar efforts underway.

148. These actions bode well for the future of the coal industry in the United States as the principal fuel source for electrical generation and may very well result in an increase in the share of generation provided by the countriy's most abundant fuel source.

Australia

149. The current Australian Government re-affirmed its policy 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. Nevertheless the Government committed to continue to develop domestic emissions abatement programs to meet Australia's assigned amount under the Protocol and to further reduce Australia's emissions beyond the first commitment period.

150. Australia's most recent official emission projections –contained in Australia's *Third National Communication* under the UNFCCC – indicate that total CO_2 emissions will be 111% of 1990 levels over the period 2008-12. On this basis the Government has described Australia as "within striking distance" of achieving its 108% Kyoto target.

151. The Federal and state governments have initiated a number of measures to reduce greenhouse gas emissions from energy supply and use and to encourage the development

of cleaner fossil fuel generation technologies and renewable energy. These include regulated measures, such as:

- the national Mandatory Renewable Energy Targets scheme that, through requirements on electricity retailers and other wholesale power purchasers to source an additional 2% of their load from renewable and specified waste product energy sources, will result in an additional 9,500 GWh of generation from renewable and waste fuels by 2010 (this scheme is currently under review by a Government appointed panel that is due to report by the end of September 2003);
- the New South Wales (state) Greenhouse Gas Abatement Scheme which sets mandatory emissions benchmarks for electricity retailers and large-scale users, and aims to reduce emissions per head of state population from 8.65 tCO2e in 2003 to 7.27 tonnes by 2007; and
- the Queensland (state) 13% Gas Scheme, which requires electricity retailers and wholesalers to source at least 13% of their supply from gas fired generation from mid-2005.

152. There are also a number of voluntary measures, including:

- the national Greenhouse Challenge, under which enterprises and organsiations enter into agreements with the Federal Government to undertake and report on emissions abatement – almost all coal producers and electricity supply businesses in Australia are signatories to the Challenge;

- Generator Efficiency Standards, through which the Federal Government aims to move fossil fuel generation towards best practice (identified under the scheme as 42% thermal efficiency on a HHV basis for coal based generation);

- various GreenPower schemes and a Renewable Energy Action Agenda focussing mainly on electricity supply; and

- the national Greenhouse Gas Abatement Program, which provides grants to eligible greenhouse gas abatement projects in return for government ownership of any abatement credits arising during the period 2008-12 - projects for the capture and utilisation of waste coal mine gas feature prominantly in the range of proposals approved during the first two years of the program.

153. The governments also provide industry support and research and development assistance, including Cooperative Research Centres (which are joint ventures between government, industry and research providers) on:

- Coal in Sustainable Development, which incorprates research into current, transitional and future coal-based generation technologies;
- Clean Power from Lignite, aimed at reducing the environmental impact of brown coal use; and
- Greenhouse Gas Technologies, investigating the technical and commercial feasibility of CO2 capture from industrial systems and its storage in deep geological formations.

Japan

154. In July, the global environmental subcommittee, environmental committee, industrial

structure council under METI (Ministry of Economy, Trade and Industry of Japan) made public its interim report entitled "Perspectives and actions to construct a future sustainable framework on climate change".

155. In consideration of the results and lessons learned from the series of international negotiations leading to the Kyoto Protocol, the report suggests four basic concepts for a sustainable framework:

- focus on technological solutions;
- simultaneous achievement of effectiveness, efficiencies and equity;
- contribution both to economy and environment; and
- multi-stakeholder participation and various forms of commitments.

156. For constructing a future sustainable framework, it also proposes simultaneous introduction of two options as follows:

- multi-facetted approach, which requires actions by government, industries, NGOs, and individuals respectively
- major emitters initiative, which means major emitting countries' initiative with authority and responsibility, to discuss measures for reduction of GHG

157. Of significant interest is the proposal (not yet confirmed) by the Japanese government to introduce an "environmental tax/carbon tax" on fossil fuels in 2005. The purpose would be to encourage alternative energy use and therefore reduce greenhouse gas emissions. The tax could be imposed at 3,400 yen a tonne of carbon, which could translate into 2,000 yen (US$18.35) a tonne of coal. This tax will apply to all fuels that produce carbon emissions, but coal will be the most adversely affected due to its higher carbon intensity.

Germany

158. On behalf of the Federal Association of the German Lignite Industry (DEBRIV), Cologne, PROGNOS AG, Basle, published a study in February 2003 on the development of energy consumption in Germany until 2040. The study was based on the premise that the three sustainability targets:

- economic efficiency of energy supply;
- security of supply ; and
- conservation of the environment, climate and resources;

would be pursued with equal priority.

159. The major results are:

- Energy consumption in Germany will decrease by 19% to 395 mtce by 2040. Power consumption and generation will still increase at annual average rates of 0.4 and 0.3% until 2020, followed by a slight slowdown to 2040, but will still be at a higher level than in 2000.
- Lignite will be the most important energy feedstock in power generation until 2040.

With stable coal input quantities, lignite-based power generation will grow by 34% to around 200TWh.

- Power generation from hard coal will rise by one quarter.
- Power generation from natural gas will double.
- Nuclear energy's share in power generation will decrease from 30 % in 2000 to 2% in 2020 and, as laid down in the Nuclear Phase-Out Act, it will decline to zero in the following years.
- Power generation based on wind energy will increase from 9TWh in 2000 (17TWh in 2002) to more than 60TWh as from 2030 with a growing off-shore share.
- Against this background, the emissions of the six Kyoto gases will diminish by 21% from 1990 to 2010. Due to the nuclear phase-out, a slight increase is expected to 2020, following which the constant efficiency gains will result in further reductions on the1990 figure amounting to 25% by 2030 30% by 2040.
- For the CO_2 emissions, changes on the 1990 figure are forecast to be -19% by 2010, -18% by 2020, -22% by 2030 and -28% by 2040.

160. The forecast thus shows that it is quite feasible for Germany's energy scenario to develop in such a way that the economic efficiency of energy supply will be maintained and the energy mix remain diversified, with further progress in the reduction of CO_2 and other greenhouse gas emissions being made.

161. In order to further explore future energy growth and CO_2 emissions, in July 2003 the Federal Ministry of Economics and Labor commissioned the Institute of Energy Economics (EWI) at the University of Cologne and PROGNOS AG, Basle, to prepare an energy-related reference forecast for Germany in the European context. The study entitled 'The development of the energy markets until 2030' is to be submitted by October/November 2004, with an interim report In February 2004. These companies also carried out the last comparable investigation on behalf of the Federal Government in the autumn of 1999.

United Kingdom

162. The UK Government published its Energy White Paper in February 2003. It contains four stated policy goals:

- to put ourselves on a path to cut the UK's carbon dioxide emissions…by some 60% by about 2050, as recommended by the Royal Commission on Environmental Pollution, with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond…; and
- to ensure that every home is adequately and affordably heated.

163. The majority of the White Paper is concerned with the first of these four goals. Speculation beforehand that the White Paper might propose specific measures to address security of supply proved to be unfounded: the White Paper states that the Government will not intervene in the market except in extreme circumstances. By stating its clear intention to allow energy markets to work, the Government believes firms will have the confidence to

invest for reliability. Beyond this, generation capacity margin and fuel mix are merely to be monitored and kept under review.

164. On coal, the White Paper states that, *“If [it] is to play more than a marginal role in the mix beyond 2015, generators will need to find economic ways of dealing with the consequential carbon dioxide emissions.”* To this end, the White Paper demands *“an urgent detailed implementation plan”* to establish what needs to be done for a demonstration of enhanced oil recovery in the North Sea, this appearing to be the most economic way of usefully disposing of large volumes of CO_2 whilst recovering additional oil.

165. UK CO_2 emissions in 2002 were provisionally 551.5 $MtCO_2$; a 3.7% fall from 2001 which reverses the trend of increasing emissions in the previous two years.

4.2.2 Emissions Trading

166. The topic of CO_2 emissions trading is being actively discussed in the European context because the schemes now being introduced have the potential to promote a more rapid shift from coal to other fuels. While this may improve efficiency in meeting short term goals, it has the potential toharm longer term European energy security. The following paragraphs give some insight into emissions trading developments in other countries.

Australia

167. During the year, an independent review of the Australian energy market, commissioned by the Council of Australian Governments, recommended that a national emissions trading regime be introduced in place of a range of existing federal and state government greenhouse measures.

168. The review concluded that the targeting of these measures at fuels and technologies rather than emissions, plus a lack of coordination among the federal and state governments, had lead to inconsistency, high costs and heightened risk for investors in the electricity and gas sectors. It recommended that the measures be replaced by a national, cross sectoral greenhouse gas emissions trading scheme, but exempting intensive energy users in the traded goods sector of the economy.

169. Notwithstanding this recommendation, the Federal Government does not propose to introduce such a national emissions trading regime. However, in addition to the domestic measures mentioned above, the Government has entered into bilateral Climate Change Action Partnerships (with the USA and Japan during 2002-03) which reflect its longer term focus on the further development of greenhouse science, emissions measurement and new abatement technologies.

170. The Government’s rejection of emissions trading at this time, and its alternative technology-based approach, is strongly supported by the Australian coal industry. A major drawback of emissions trading is its short to medium term focus on measures such as fuel switching and marginal technological improvements, and its inability to accommodate longer term investment in the major technological advancements such as breakthrough zero emissions technologies that will ultimately be needed if atmospheric greenhouse gas concentrations are to be stabilised at acceptable levels.

Japan

171. Two departments of Japanese government have respectively started prototype projects on emission trading schemes:

- the METI has started trial projects of trading and transferring emission reduction credits aiming for providing infrastructures, capacity building and know-how on Kyoto mechanism.; and
- the MOE (Ministry of Environment) has started a prototype project for a voluntary domestic emissions trading scheme, aiming for knowledge and information on how to:
  - monitor, verify and report GHG emissions;
  - deal with credit transactions; and
  - set appropriate initial targets.

4.2.3 Power Station Emissions Control

United States of America

172. The Administration has introduced a “Clear Skies” initiative that would achieve additional reductions of sulphur dioxide, nitrogen dioxide and mercury emissions from power plants by 2018.

173. When passed, this initiative will replace a myriad of conflicting regulations proposed by the US Environmental Protection Agency to control these same pollutants. It is intended that it will allow the electricity generators a more certain future so that new generating capacity can be built.

174. The United States coal industry supports the “Clear Skies” program with some modifications, because it believes that regulatory certainty will encourage the construction of new coal fired plants and the retrofit of existing coal capacity with technologies that increase efficiency and reduce emissions.

175. The time at which this legislation will be considered is uncertain. Barring passage of Clear Skies legislation the US EPA will issue a proposed mercury regulation in December 2003, which would be effective in December 2004.

Japan

176. The Japanese Air Pollution Control Law has not been amended recently. Power-generating companies are strictly required to observe environment agreements entered into between companies and local governments. For example, allowable emission limits for newly commissioned J-Power (Electric Power Development Co., Ltd.) coal-fired power stations are:

- Isogo power station, (1x 600MW 1unit), commissioned in FY2002 in Yokohama City:

- SOx: 20ppm
- NOx 20ppm
- Particulates: 10mg/m^{3}N

- Tachibana-wan power station (2,100MW net capacity, 2units), commissioned in FY2000 in Tokushima Prefecture:

  - SOx: 50ppm
  - NOx 45ppm
  - Particulates: 10mg/m^{3}N

South Africa

177. The South African National Environmental Management Act sets out environmental management principles. As part of the environmental law reform process, a number of pieces of legislation having some relevance to the coal industry, and some of which pertain to power plant emissions, have recently been promulgated in South Africa. These include:

- National Environmental Management Act – Air Quality Bill, which provides "the framework for the reform of air quality governance through the establishment of national norms and standards, and a regulatory framework for an air quality management planning and reporting regime and numerous regulatory instruments for the control of air pollution and a comprehensive approach to compliance and enforcement."
- National Environmental Management Act – Protected Areas Bill "seeks to bring the system of national parks and protected areas in line with the new constitutional and legal order, as well as the policies and programmes of government. It also aims to deal with the system of protected areas more broadly, and ensure that the system of conservation and protected areas management is linked with the current policies and programmes of government, and brings tangible benefits to all South Africans, in particular local communities."
- National Environmental Management Act – Biodiversity Bill which covers the following key areas:
  - the management and conservation of the biological diversity of South Africa;
  - the sustainable use of biological resources; and
  - the fair and equitable sharing of benefits arising from the use and application of genetic resources and material.

178. South Africa is focusing on the basic science of coal combustion, with specific objectives to:

- encourage, support and promote research and development that will lead to an improved understanding and characterisation of conventional combustion processes;
- develop techniques that control and reduce solids, liquid and gaseous emissions associated with combustion processes;
- improve operating efficiency; and
- identify methods for the effective utilisation of combustion by-products.

179. South Africa is now a signatory to the IEA Clean Coal Sciences Agreement.

4.3 Developments in Clean Coal/Near Zero Emissions Technology

180. Rising demand for sustainable energy justifies the wide use of advanced coal technologies, and a long-term sustainable energy future can only be achieved with the development and deployment of viable zero emission coal technologies. This section gives examples of recent industry progress towards that goal.

United States of America

181. The Bush Administration has initiated a number of forward-looking programs that will act to enhance the future of coal. In February 2003 the President announced the beginning of the Future Gen project, a zero emissions coal based facility that will produce electricity and hydrogen from coal. The project will be combined with advances in carbon sequestration to make this a truly zero emissions effort. Many of the nation's major coal companies are partners in FutureGen.

182. Additionally, the Administration has launched Regional Partnerships on Carbon Sequestration, the International Carbon Sequestration Leadership Forum and added substantially to research to advance the capture and sequestration of carbon dioxide from coal.

Australia

183. Support for clean coal technology (CCT) development is an important component of Federal and several state government policies, although Australia lacks a coherent national strategy for the development and uptake of CCTs.

184. COAL21 is a recently announced joint industry-government initiative intended to develop such a strategy, with a particular emphasis on near zero emissions technology. Its aims include to:

- Create a national plan 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 the plan.
- Promote relevant Australia RD&D so that it can both build upon and make a unique contribution to international RD&D in the area.
- Provide a mechanism for effective interaction and integration with other international zero-emission coal initiatives.

185. COAL21 released an issues paper for consultation with stakeholders on development of the proposed national plan for reducing emmissions from coal fired electricity (available at http://www.coal21.com.au). Following consultations with stakeholders during September and October 2003, a clean coal technology roadmap and actions plans will be be developed for implementation from early 2004. A key element of this roadmap may be the establishment in Australia of a commercial size demonstation of advanced coal-based

generation (IGCC or possibly Oxy-fired plant) with CO_2 capture and storage.

Japan

186. Clean Coal Technology (CCT) development has been strongly pursued in Japan, including:
    - an Advanced PFBC;
    - a combined generation system using Hyper Coal with less than 200 ppm ash; and
    - SCOPE21, an advanced coke manufacturing technology.

187. Japanese power companies jointly established an R&D company in June 2001 for technology development of IGCC, which includes building a 250MW IGCC plant for JFY2004 through JFY2006 and a generation test for JFY2007 through JFY2009.

188. Another technology development on Integrated coal gasification fuel cells (IGFC), the "EAGLE Project", includes building and testing a pilot plant of 150t/d coal feed. It has been proceeding under the Japanese Government support since JFY1998 through to JFY2006.

189. 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 storage technologies:
    - the senior vice minister of METI participated in the Coal Sequestration Leadership Forum in July and signed the Charter;
    - 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 carbon dioxide into an aquifer during FY2003; and
    - JCOAL (Japan Coal Energy Centre) is running a coal mine methane gas recovery and utilisation project.

Germany

190. Several projects aimed at increasing the efficiency of power generation are proceeding in Germany. Compared to the efficiency of > 43 % that has currently been attained by existing new power plants on the basis of hard coal and lignite, further rises in efficiency are quite foreseeable.

191. Power plant construction companies in North Rhine-Westphalia together with operators of hard coal-fired power plants are developing a reference power plant using frontrunner technologies with an efficiency of 45 to 47 %, which is to be built in North Rhine-Westphalia and will be offered on the world market. This is an important step towards the hard coal-fired power plant of the future with efficiencies exceeding 50 %.

192. The lignite sector, too, is pursuing this target. A significant development focus is on the further development of an efficient technology for power generation from run-of-mine lignite. RWE Power is concentrating on fluidized-bed drying with internal waste heat utilization (German abbreviation: 'WTA' standing for 'Wirbelschichttrocknung mit interner Abwärmenutzung'). With the development of the new WTA fine grain drying process, a breakthrough in capacity, technical and economic efficiency was attained allowing the process to be employed for pre-drying in the power plant. This was confirmed by a recent

study on a dry lignite-fired power plant, which shows further efficiency advantages of some 4 % points as against the BoA technology at almost the same investment costs. This WTA fine grain drying process is to reach commercial application maturity in the next few years. From 2004 on, a prototype plant is to be erected and tested together with the dry coal firing system. This so-called BoA-Plus variant ('Braunkohlenkraftwerk mit optimierter Anlagentechnik plus vorgeschalteter Kohletrocknung') with complete commercial pre-drying may be suitable for use in the third new power plant unit in the Rhineland.

193. Other approaches to the further development of this BoA-based technology are new materials to step up the process parameters (700° C power plant) as well as the optimization of components and processes. In this way, an additional efficiency potential of some 4 % points could be opened up. In about 2020, this lignite-based power plant technology could render net efficiencies of > 50 % feasible.

194. In the longer term, CO_2 capture and sequestration provides an option for the complete avoidance of CO_2 emissions from coal-derived power generation, although this needs further investigation and it will inevitably give rise to efficiency losses. The estimated CO_2 avoidance costs of a post-2020 coal-fired power plant including CO_2 capture and sequestration are €40-70/t CO_2, giving this concept the potential to compete with renewable energy.

5 CONCLUDING REMARKS

195. 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.

196. Firstly, the role of coal as a secure energy source, able to meet unexpected changes in energy demand, has again been demonstrated. It continues to underpin rapid economic growth in China. Furthermore, substantial increases in coal use this year in European countries including Germany and the UK have reinforced the ability of coal to accommodate rapid short-term changes in energy demand in developed economies.

197. Secondly, whether or not they have ratified the Kyoto protocol, many countries are taking the environmental consequences of energy use seriously and are developing policies, particularly in respect of CO_2 emissions.

198. Thirdly, those countries with access to substantial reserves of economically recoverable coal are actively pursuing means to sustain coal's role in the energy economy. Other countries, notably in Europe, see coal as having little role in meeting future energy demand. In some years' time, this could have a significant negative effect on European energy diversity and security that will be difficult to mitigate.

199. Projections of future energy demand suggest a requirement for very significant investments in energy infrastructure over the next 30 years. These investments will need to be made across the whole range of energy supply sources because investment in renewable energy alone will be very unlikely to meet the increase in energy demand.

200. In the context of sustainable development, the key challenge for the coal industry is to maintain and develop its role by supporting developments in electricity generation and other technology that will progressively address the environmental challenges to coal use. Furthermore, while coal's role in economic and social development has been well demonstrated over many years, it is crucial that the industry's continuing ability to perform this role is not taken for granted.

201. Energy policies need to actively encourage investment in the following two areas:

   i) Continued development of highly efficient advanced coal technologies, which will reduce CO_2 emissions per unit of delivered electricity while abating emissions of conventional pollutants, is required. Although this will not achieve the scale of reduction required to help stabilise atmospheric CO_2 concentrations, higher plant efficiencies will be necessary to minimise the energy penalty associated with CO_2 capture and storage.

   ii) Zero and near-zero emission technologies are a longer-term imperative, because CO_2 capture and storage breaks the linkage between energy consumption and carbon emissions. This will enable "deep cuts" in CO_2 emissions to be made while allowing the growth in energy demand necessary to support world economic development. Given the nature of the power industry and the investment involved, the time frames required for the transition to zero emissions will necessarily be long.

202. In some countries, the issue for governments is one of achieving the right regulatory and policy setting to attract foreign investment. In other more developed countries, whilst market deregulation of energy and electricity markets has brought many benefits, it has also had a number of undesirable consequences. Firstly, energy security is not appropriately valued in

today's marketplace. Secondly, deregulation has increased risk aversion in major utilities, making investment in new technology, and its financing, more difficult.

203. Stable and reliable power supply systems will require diversified energy sources with appropriate value attached to environmental performance and security of supply. Coal and electricity markets remain heavily inter-dependent and it is crucial that industry and government work together to understand and act on addressing the challenges to coal's sustainable development role.

CIAB, February 2004