CIAB

COAL INDUSTRY ADVISORY BOARD

International Coal Market & Policy Developments in 2005/06

JANUARY 2007

Contents

FORWARD FROM CIAB CHAIR STEVE LEER 0

1 HIGH LEVEL MESSAGES 1

1.1 CIAB Policy Messages to the IEA 1

1.2 The Role of Coal 2

1.3 Meeting the Challenge of Coal's Environmental Performance 4

1.4 Synopsis of Coal Market Developments 6

2 CIAB WORK PROGRAMME 7

3 OVERVIEW OF WORLD COAL SUPPLY AND DEMAND 12

3.1 Company Developments 12

3.2 Coal Demand Developments 13
3.2.1 Total Hard Coal Demand 13
3.2.2 Steam Coal Demand 14
3.2.3 Coking Coal Demand 16
3.2.4 Total Brown Coal Demand 18

3.3 Coal Supply Developments 19
3.3.1 Hard Coal 19
3.3.2 Brown Coal 23

3.4 Trade and Prices 24
3.4.1 Freight Market 24
3.4.2 Trade Volume 25
3.4.3 Market Prices 27

4 ISSUES RELATED TO COAL 30

4.1 Sustaining the Role of Coal 30
4.1.1 Policy and the Role of Coal 30
4.1.2 Industry Actions to Sustain the Role of Coal 38
4.1.3 Coal-to-Liquids 38
4.1.4 Emissions Trading 40
4.1.5 Power Station Emissions Control/Mining Regulations 43

4.2 Investment in Coal Supply, Transportation and Use 46

4.3 Developments in Clean Coal/Near Zero Emissions Technology 50

5 CONCLUDING REMARKS 55

Author's Note:

The report has been compiled on behalf of the CIAB by Brian Heath, CIAB Executive Co-ordinator, and thanks are due to the following CIAB Associates, on whose contributions it is substantially based:

Andy Lloyd	Rio Tinto	Australia
Darren Alessandrini	EPCOR Generation	Canada
Sylvie Cornot-Gandolphe	ATIC Services	France
Roland Lübke	GVSt (German Hard Coal Assn.)	Germany
Hans-Wilhelm Schiffer	RWE Power	Germany
Kyohei Nakamura	EPDC	Japan – consolidated input
Alison Brown	Solid Energy	New Zealand
Wendy Poulton	Eskom	Rep. of South Africa
Antonio Canseco	FUELEC	Spain
Angel. L. Vivar	UNESA	Spain
Mücella Ersoy	TKI	Turkey
Allan Jones	E.ON UK plc	UK
Connie Holmes	National Mining Association	USA – consolidated input
Ron Engleman	Leonardo Technologies	USA
Deck Slone	Arch Coal	USA

The sections of this report reviewing world coal supply and demand draw on a consistent coal data set provided by the IEA. At the time of writing, the latest such data available refer to 2005 and are based on preliminary estimates made by IEA Member governments. Where firmer or more recent data are available from CIAB Members or other sources, any significant differences between these and IEA data are highlighted. Thanks are also due to *The McCloskey Group* for permission to use their coal price data.

This report represents the personal views of the individual contributors and does not necessarily represent the views of their companies, organisations or the IEA.

FORWARD FROM CIAB CHAIR STEVE LEER

The *Coal Industry Advisory Board* (CIAB) is a group of high level executives from coal-related industrial enterprises, established by the International Energy Agency Governing Board in July 1979 to provide advice to the IEA from an industry perspective on matters relating to coal. There are currently 36 CIAB Members from 14 countries, typically Chief Executives or senior executives from coal mining, transportation and machinery companies, or from major power generation or other coal consuming companies.

The original task of the CIAB was to assist the IEA in the practical implementation of the "Principles for IEA Action on Coal" – measures aimed at ensuring a ready supply and trade of coal to underpin energy security. In recent years the CIAB has focused additionally on developments in the technology of coal use required to enable coal to contribute to energy security in this era of climate change concern; and on issues arising from increasingly liberalised energy markets, such as the restructuring and privatisation of coal and electricity industries in many countries.

The CIAB produces this report annually for the Governing Board, Standing Committees and Secretariat of the International Energy Agency and the opinions expressed in it are entirely those of CIAB Members and Associates.

It draws on contributions from Associates of CIAB Members to briefly describe developments in international coal markets over the last year and to highlight policy and other issues that CIAB Members regard as pertinent to the development of coal as a secure, clean and competitive energy source. We hope that it will also be of interest to a wider audience.

Steve Leer
CIAB Chairman

January 2007

1 HIGH LEVEL MESSAGES

1.1 CIAB Policy Messages to the IEA

1. Growth in coal use continues to be substantial and there is still the incentive for industry to invest in coal production capacity when future demand is demonstrated.
2. Despite some evidence of temporary bottlenecks as investment lags demand growth, the international coal market continues to be fundamentally competitive, expanding supply to meet rapidly increasing demand.
3. Each successive year's experience reinforces the realisation that coal needs to be part of the future energy mix, to fuel the rapidly developing electricity and energy needs of developing economies and to contribute to global energy security, including through considering the potential for its conversion to a liquid fuel.
4. Switching away from coal by developed economies is not an adequate response to global climate concerns: carbon capture and sequestration (CCS) will ultimately be required to stabilize GHG concentrations in the atmosphere, whatever fossil fuel is used. Faster and more dramatic improvement in coal's environmental performance is technically, and often economically, feasible now and should continue to be a high priority for industry and government.
5. Many issues for the coal industry – cost-effective achievement of environmental standards, technology research and development, technology transfer, collaboration along the value chain, for example – are also issues that governments can approach positively, in consultation with the industry, to achieve a long-term role for coal in a sustainable energy future.
6. Permitting of conventional coal fired stations is becoming more difficult. R&D efforts for the alternative low emission technology coal plants are ramping up, but collaborative efforts between governments and industry to reduce their costs need to be re-doubled. Concerns about climate change continue to increase and we need to accelerate low emission technology demonstration.
7. Continued investment in coal-based power generation by industrialized nations is essential if the world is serious about stabilizing GHG concentrations in the atmosphere. If the developed world does not lead the way in developing and deploying climate friendly coal-based technologies, such technologies are unlikely to ever become economically viable and GHG emissions in the developing world are likely to grow unchecked.
8. The efficient transfer of these new technologies to developing economies is therefore needed to support the continued responsible use of coal globally. In this regard, improvement of the Clean Development Mechanism (CDM) is necessary. In particular the scope of CDM must be widened to include abatement achieved through carbon capture and storage.
9. The CIAB also stresses the need to address CO_2 emissions from the current build of conventional PF coal fired power plant, including mechanisms for incentivising developing countries, and requests that the IEA examine the potential for post combustion capture to be retrofitted to these plants as well as existing gas-fired generating units.
10. Moreover, if the coal-to-gas/coal-to-liquids industry begins to gain momentum, there is great potential to take significant steps forward in our current knowledge and experience base as it relates to coal gasification, carbon capture and geo-sequestration in a manner that goes well beyond small-scale, government-subsidized demonstration projects.

1.2 The Role of Coal

11. Over the last 30 years or so, world primary energy demand has grown by approximately 2 percent per year and, despite the rapid growth in use of oil and gas, coal demand has grown only marginally more slowly, at 1.8 percent a year on average. The International Energy Agency expects lower primary energy growth in the future[1]. In its Reference Scenario, it expects total world primary energy use to grow by 1.6 percent a year to 2030 and coal use to grow by 1.8 percent a year, reversing the long term historical trend. Historically, coal has accounted for 24-25 percent of world energy use and this is now expected to increase to 26 percent by 2010, retaining that share for the remainder of the period. Even in the Alternative Policy Scenario, which reflects future government policy initiatives to combat the rising consumption of fossil fuels, coal still supplies nearly 23 percent of energy needs by 2030. In this scenario, the IEA expects coal use to grow strongly to 2020 but then to plateau, reflecting an assumed future in which Carbon Capture and Storage technology is not deployed..

12. These energy projections represent a significant shift in IEA expectations, reflecting the recent experience of very strong growth in coal demand. Total coal use has grown by 5 percent per year over the last five years and demand for hard coal has increased even more rapidly, by 6 percent per year - it is now over a third higher than it was in 2000.

13. Plans for the further expansion of coal use continue to be made. For example, the U.S. power generation industry has announced plans to build a new generation of coal-fired power plants to supply the nation's future electricity requirements. To date, power generators have announced plans to expand the installed base of coal-fuelled power plants by approximately 93GW, or approximately 30 percent. An estimated 30GW of this total is in advanced stages of development, with completion scheduled by the end of this decade. More than a dozen coal-fired plants, with expected capacity of approximately 8GW, have already broken ground.

14. Moreover, the U.S. Energy Information Administration currently projects that approximately 170 million tonnes of coal per year will be converted into transportation fuels by 2030. Legislation to accelerate construction of coal-to-liquids plants will be considered in the next Congress.

15. Of course, the main source of recent growth has been China, which serves to demonstrate the role that coal will play in developing economies with rapidly increasing demands for electricity and steel. The responsible use of coal can enhance a nation's quality of life, its global competitiveness, its long-term energy security and its prospects for stable and sustained rates of economic growth.

16. The development of indigenous coal resources provides national supply security benefits and, as they expand to meet increasing demand, international coal trade markets become more competitive in nature and increasingly contribute to world energy supply security. Coal is safe and easy to transport and can be readily stored. The world's coal reserves are extraordinarily large and – compared with petroleum and natural gas – widely dispersed.

17. And rarely have the advantages of maintaining a diversified energy mix been as evident as they are today. Political instability in the world's largest oil-producing regions and bottlenecks in supply routes raise serious questions about the long-term reliability of global oil supplies.

18. The United Nations has identified electrification as an important pre-condition for poverty

[1] "World Energy Outlook 2006"

alleviation; and coal is the most affordable source of electric power in many parts of the developing world. Consequently, identifying ways to maintain coal in the world's future energy mix, and to provide a bridge to the technology future, are critical.

19. Widely held attitudes to coal's use have evolved greatly in the past five years from those that largely dismissed a role for coal in sustainable development to a wider appreciation of coal's continuing role in providing a foundation for energy security and in meeting growing world energy demand, but only if accompanied by improved environmental performance.

20. There is strong coal industry awareness of the importance of applying sustainable development principles to maximise business opportunities and to comply with government policies and regulations. Leading companies are increasingly undertaking activities that impact favourably on global issues, which recognise and share responsibility for the social and environmental impacts of producing and using their products, and which better engage stakeholders.

1.3 Meeting the Challenge of Coal's Environmental Performance

21. However, despite changing attitudes in some cases, many nations still view the use of coal as inconsistent with broader environmental objectives. Indeed, the IEA has stated in its World Energy Investment Outlook (WEIO) that the key uncertainty facing future coal investment is environmental policy.

22. This uncertainty means that coal producers continue to be wary of investing in advance of a demonstrated demand for coal; a particular issue for European markets where prospects for coal in the longer-term are especially uncertain. Investment has increased as coal prices have risen, but to date it has been mainly operational and transportation investment rather than capacity investment in long term coal production.

23. The uncertainty similarly affects investment in assets, such as power stations, that use coal. While energy efficiency programmes along the coal life cycle are being implemented, with positive benefits for electricity affordability and the environment, plans for major new coal-fired electricity generating capacity are still dependent on appropriate commercial and policy drivers. RWE's plans for new lignite-fired IGCC power stations incorporating CO_2 capture, transport and storage demonstrate what is possible if these are present – in this case the need to continue using an abundant and economic indigenous resource and to economically meet company CO_2 reduction targets. But even in cases such as the RWE investments and E.ON UK's recently announced plans for its Kingsnorth coal-fired power station, predictability of government policy is a pre-requisite.

24. The industries in the coal chain, together with consumers that depend on the numerous products provided through the use of coal, are interdependent but rarely vertically integrated. The complexity of commercial relationships is increased greatly by the international and highly competitive nature of coal trade, electricity generation and metals production, and by the variation in performance between developed and developing countries at all stages in the coal chain. Progress needs to be made on policy initiatives that provide a predictable background against which investment decisions can be made.

25. How coal is judged varies greatly between regions, depending on the relative cost of different fuels, itself reflecting the state of a nation's economic development, and the actual state of power generation technology in use. Where coal is not an important fuel, because of the competitive availability of other fuels, governments are inclined to adopt measures on environmental grounds that would reduce the role of coal in the energy mix. Conversely, governments relying on the low-cost and supply security benefits of coal are more inclined to adopt policies ensuring the sustainable use of coal.

26. While policy priorities vary between world regions, joint industry/government co-operation to demonstrate new low CO_2 emission technologies and to formulate policy frameworks that encourage investment in efficient coal-fired electricity generation technologies is essential if the goal of cleaner use of fossil energy is to be achieved within the necessary timescale.

27. Although developed countries are responsible for the vast bulk of historical CO_2 emissions, developing countries will be the main source of growth in greenhouse gas emissions from energy use over the coming decades. Most of these developing countries do not have Kyoto Protocol commitments. Thus it is in the best interests of the OECD countries to assist developing countries in using coal sustainably by facilitating the application of current best commercial technologies and by encouraging participation in international research and development of new coal technologies relevant to their needs.

28. The United States government continues to view advances in technology as the only real solution to ultimately stabilizing global concentrations of greenhouse gases in the

atmosphere, a viewpoint that isn't expected to change until at least 2009. Towards that end, the United States – in concert with the power generation and coal industries – is devoting significant resources to advance the state of technology for carbon capture and sequestration.

29. International collaborative initiatives to encourage the Research, Development and Demonstration of clean coal technologies continue to gain momentum. The Carbon Sequestration Leadership Forum (CSLF) now has 17 nominated collaborative projects. It would benefit from deeper involvement of industry stakeholders and efforts to include stakeholder participation on all CSLF committees continue. During 2005, the G8 recognised the importance of the low emission technology development efforts. The new Asia Pacific Partnership for Clean Development and Climate held its Inaugural meeting in Sydney in January 2006 and task force meetings were held in Berkeley, California during April. Participating countries include the US, Australia, Japan, South Korea, China and India, who between them account for over half the world's GDP and over half of global CO_2 emissions.

30. Within Europe, the EC Directorate for Research announced on 1st December 2005 a European Technology Platform for Zero Emission Fossil Fuel Power Plants. This unites all key stakeholders with the goal of determining the way forward for the UE energy industry by co-ordinating the technology development needed for zero emission fossil fuel power plants including CO_2 capture and storage.

31. Accelerating the development, demonstration and commercialization of clean coal technologies – and the deployment of such technologies around the world – is essential if the world is serious about stabilizing concentrations of carbon dioxide in the atmosphere.

1.4 Synopsis of Coal Market Developments

32. 2005 again saw significant growth in world primary energy demand (2.4 percent) and greater growth in world hard coal demand (7 percent), reinforcing the continuing role of coal in world energy markets. Although coal demand growth continues to be driven substantially by Chinese economic development and its need for electricity and steel, growth in coal demand was also apparent in many other countries, e.g., Australia, India, Korea, and Russia.

33. International and domestic coal markets remain tight as growing demand meets constraints in the existing production and transportation capacity. Investment in coal production and port capacity in exporting countries has typically been made in response to identified increases in demand, rather than in anticipation of such increases, so there have been time lags in bringing new capacity to market.

34. Nevertheless, international coal markets remain fundamentally competitive, thereby continuing to contribute to world energy security. Seaborne steam coal trade continued its relentless growth, expanding by 4 percent in 2005 to reach about 550 million tonnes. Over the last 8 years, seaborne steam coal trade has grown by over 70 percent in total (average 7.1 percent/year).

35. International steam coal prices peaked in the second half of 2004 with the ARA CIF delivered price reaching about US$79/t. Prices delivered to European distribution ports were on a declining trend during 2005, but had increased again to $68 tonne by August 2006. These changes illustrate that, while remaining fundamentally competitive, the markets remain finely balanced and prices are vulnerable to short term changes in the supply/demand balance.

36. Demand growth in Asian markets reflects commitments to coal in China (including Taiwan), Japan, Korea, Indonesia, India and other Asian markets, and these commitments are likely to continue. The future of coal use in Europe is less predictable, with market volatility resulting from competition with gas for power generation and longer term uncertainty regarding EU energy-environment policy, including concerns over energy security.

37. Australia remains by far the largest hard coal (thermal and coking coal) exporting country, followed by Indonesia and China. However, Indonesia now exports more thermal coal than Australia. Because the focus of growing demand is Asia, the transport cost advantage of Chinese producers is possibly the critical influence on the outlook for the pattern of future coal trade. Russia's proximity to Asian and European markets may become important if producers can overcome the disadvantage of domestic transport costs. The lower sulphur content of Russian coals is increasingly valued by European buyers.

2 CIAB WORK PROGRAMME

38. During the G8 summit, held at Gleneagles on 6-8 July 2005, world leaders drew attention to why reliable and affordable energy supplies are essential for strong economic growth and poverty alleviation. In response to the accepted environmental challenge, the G8 communiqué focuses on energy efficiency and technological development through co-operation. In the case of coal, some specific actions are proposed:

    - Review, assess and disseminate information on the energy efficiency of coal-fired power plants with the aim of promoting the most cost-effective best practices in all countries, including developing countries.
    - Demonstrate the potential of advanced clean coal technologies through national and international research programmes and partnerships with industry.
    - Develop and commercialise carbon capture and storage technology, including a study of the "capture ready" plant concept and the role of economic incentives.

39. The CIAB set out a challenging work programme for 2006. We believe that the progress made will usefully aid the IEA as it undertakes its own work to address the above priorities from the G8 summit.

40. The IEA and the CIAB recognise the need to broaden and expand CIAB Membership to enhance the coverage of advice available to the IEA. Significant progress has been made during the year with respect to membership of individuals from EPRI in the USA, the Russian coal producer SUEK and Ukrainian energy company DTEK. Efforts to secure nomination of individuals from China and India continue.

41. Another key objective during 2005 and 2006 has been to increase CIAB interaction with other relevant organisations. Milton Catelin of the World Coal Institute has been leading the joint WCI/CIAB Working Group on Energy Security, the CIAB has involved a range of external organisations in workshops held in conjunction with the annual CIAB Plenary meetings and CIAB Associates held a joint session with the Working Party for Fossil Fuels in June 2006.

42. The joint CIAB/WPFF session proved to be a useful exchange of views on work priorities and the CIAB agreed to comment on various aspects of ongoing WPFF work including the Early Markets Study, communications strategy, and policy aspects of the IEA report to G8.

43. The 2nd November 2006 workshop, held in conjunction with the CIAB Plenary meeting and against the background of high oil prices and supply security concerns, addressed the subject of *"COAL-TO-LIQUIDS an alternative energy supply?"* Its aim was to review CTL technologies, economics and environmental issues and provide a compendium of advice to the IEA on coal liquefaction. The sessions, chaired by CIAB Members, included speakers and participants from countries including Japan, China, the USA, South Africa and Australia.

44. Coal-to-liquids (CTL) has a long history in South Africa and in the USA companies are moving ahead with projects that seek to reduce the country's dependence on imported oil, encouraged by a variety of Federal and state government incentives. However, it is in China that new projects are being developed in earnest. Here, carbon capture and storage (CCS) is not a priority, although there is a clear willingness to apply the technology if some way could be found to cover the economic cost. The CIAB will consider this challenge over the coming year within the broader context of how clean coal technologies can be more widely deployed.

45. In May 2006, the CIAB published *"Case Studies in Sustainable Development in the Coal Industry",* in which the coal industry detailed examples of progress being made towards sustainable development in many areas. The CIAB last surveyed its members on the subject of sustainable development in 2003 and this latest publication set out diverse examples of the significant achievements of CIAB Members' companies towards sustainable development.

46. This collection of case studies demonstrates a seriousness to improve the environmental performance of coal and will assist others, in developed and developing countries, to understand how the principles of sustainable development can be applied in practice. Copies of the report were sent by the CIAB Chairman to the Director of the United Nations Commission on Sustainable Development. A small number of the individual case studies were submitted by Business Action on Energy for inclusion on the UNCSD online database. The UNCSD will accept further case studies (through their website in a very specific summary format) for review and possible inclusion on their database. CIAB Members' companies may wish to submit their case studies on an individual basis.

47. Sustainable development is now regarded by coal producers and consumers as a key business driver and the report illustrates that many coal industry commercial objectives – cost-effective achievement of environmental standards, technology research and development, technology transfer and collaboration along the value chain – are also issues that governments can approach positively, in consultation with industry, so that coal is able to have a long term role in sustainable development.

48. This report, together with the current edition of "International Coal Market and Policy Developments" can all be downloaded free of charge from the CIAB website http://www.iea.org/ciab.

49. The following working groups have been active during 2006:

Zero Emissions Technologies *(Chair - Bill Koppe)*

50. The group's primary project planned for 2006 was the compilation of a Global Storage Atlas - to provide a key reference to the evaluation of geological storage sites around the world in relation to current CO_2 sources, to coal resources and to other fossil fuel resources - including CCS compatible oil and gas developments and infrastructure.

51. It was proposed as a CIAB and WPFF project in June 2005 subject to the availability of funding and expert resources required to undertake the project. In principle Australian Government funding for Geoscience Australia to undertake the project was then obtained, and the November 2005 CIAB plenary meeting endorsed the progression of the project on that basis. The expectation then was that the work on the Atlas, including the scoping for a global storage GIS, would be undertaken in the second half of 2006.

52. Funding for the project is intended to come from Australia's January 2006 A$100 million commitment to the Asia Pacific Partnership, and is subject to the Partnership's consultative process for formal project endorsement. That process, and a heightened shortage of petroleum geoscientists to undertake storage evaluations, means that the commencement of the project is now likely to be delayed until the beginning of 2007. The constraint on resourcing, and the evident sensitivity of some countries to external analyses of their national storage potential, has also prompted minor revisions to the scope of the project.

53. National sensitivities will be addressed by placing the geographic categorisation of storage potential firmly in the context of gaps in knowledge and the priority requirements for further evaluation. The scarcity of experienced storage researchers has required a

pragmatic approach to Atlas content, centring on the compilation and synthesis of available work in preference to resource-intensive original new work. Particular attention will now be given to factors influencing early CCS deployment opportunities – aligning the Atlas with the IEA-CSLF G8 program for early CCS deployment. That will entail a focus on existing and potential sources of high concentration by-product CO_2, and on sinks comprising mature oil-fields potentially offering scope for enhanced oil recovery.

Creating Commercial Drivers for CCT Investment *(Chair - Deck Slone)*

54. The focus of this group includes:

- identifying potential commercial drivers for investment in Clean Coal Technology;
- articulating policy mechanisms that can support further progress;
- delineating where and to what extent these mechanisms are already effectively employed;
- sharing these effective practices with other countries; and
- accelerating the arrival of a cleaner future.

55. The group is preparing a report "Creating Commercial Drivers for Clean Coal Technologies" that draws on the experience of CIAB Members and Associates to review examples of clean coal development and understand what commercial drivers have been responsible for the progress that has been made in individual cases. The aim is to review their effectiveness and make recommendations for future improvement, bearing in mind that different commercial drivers may be effective in different countries or world regions.

56. During 2006, input has been provided on behalf of several Members and this is now being synthesised into a draft report by the working group. Work will continue during 2007 it is anticipated that the report will be finalised later in 2007.

Best Practice *(Chair - Andy Lloyd)*

57. The working group is currently progressing two projects. Firstly, discussion with the IEA Clean Coal Centre has identified a need for a greater understanding of how coal-fired power station efficiency is measured around the world to increase the value of reported efficiencies and their benchmarking. The aim of the working group is to define a consistent methodology for the assessment of plant efficiency and specific CO_2 emissions of coal fuelled processes, together with means of normalising reported efficiencies and emissions values from other common bases.

58. Work during 2006 has focussed on outlining the framework of a report, and requesting information via the working group, that will ultimately provide the IEA with:

- a review of existing efficiency and emissions reporting methodologies;
- documentation of sources of regional data for efficiency and emissions;
- definition of a reference efficiency reporting methodology; and
- a reconciliation process for efficiency and emissions data.

This work will continue during 2007.

59. Secondly, following preparatory visits to two Indian power stations (Panipat and Badarpur), the working group is seeking to arrange a benchmarking visit to 3-5 older electricity generating plants in India to complement the new plant case studies being

prepared by the IEACCC. The Confederation of Indian Industry's Sohrabji Godrej Green Business Centre has been involved in similar benchmarking work and is enthusiastic about engaging with the CIAB around best practice transfer and helping arrange a site visit schedule in India.

Enhancing Energy Security *(Chair - Milton Catelin, WCI)*

60. The focus area of this joint CIAB/WCI working group has been the definition and measurement of coal's contribution to energy security; and seeking to promote a better understanding of its future role.

61. Following concern that some of the conclusions drawn from the initial draft of an IEA Information Paper *"Energy Security and Climate Change Policy Interactions: an Assessment Framework"* were counter-intuitive, a small group of CIAB Associates reviewed and provided comments that centred on:

    - Diversity of fuel mix: the study's proxy indicator for geopolitical risk should include a factor for a consuming country's diversity of fuel mix.
    - Risks affecting individual nations' capabilities to serve as reliable fuel suppliers, which are not always independent. The initial study methodology does not reflect the geopolitical risk implications of fuel procurement when several fuels are obtained from identical or proximate fuel suppliers.
    - Adequacy of in-country fuel storage, which is not included in the initial study but which affects the impact of potential supply disruptions
    - The need to include an "accelerated Clean Coal Technology Investment" scenario in the work.

62. The issues were discussed with the IEA in June 2006, but the CIAB remains concerned about the conclusions that can be drawn from the work and has requested the opportunity to comment further before publication.

63. Other potential areas of work for the CIAB on the topic of energy security were discussed in February 2006. It was agreed that highlighting the potential for coal liquefaction was useful and this has been the focus of the November 2006 workshop.

64. The IEA has embarked on a study to explore the role that governments could play in ensuring timely and adequate investment in power generation to maintain the security of electricity supplies in liberalised energy markets; because it is particularly important that policy makers establish a framework where competition allows for efficient investment decisions on a level playing field and where any necessary regulation and policies reduce, rather than enhance, investment uncertainty.

65. It has requested input from CIAB Members to inform its thinking on the key decision parameters, such as costs, security of supply and environmental impacts; the management of uncertainties and risks in competitive markets; the implications for regulation, including site permitting; and the role of government. The CIAB has recently expressed its views in the publication "*Investment in Coal Supply and Use – an industry perspective on the IEA World Energy Investment Outlook"*. CIAB Members further responded to the request for input to the study through written submissions and discussion at their Plenary meeting on 3rd November 2006. These have been summarised in a paper submitted to the IEA Secretariat.

66. Much energy security work has been done by the CIAB and other organisations over recent years and it is not clear what further initiatives would be useful and within the working group's capabilities – it stands ready to respond to suggestions.

Other Work

67. The CIAB is most effective when engaged in activities that are of genuine interest to Members, drawing on their practical, technical and commercial experience to complement the work of more specialised technical, financial and policy organisations. The CIAB will continue to work with the IEA to progress the clean coal agenda in support of a clean, clever, and secure energy future by progressing the working group agendas set out above and responding to other future requests for support and advice.

3 OVERVIEW OF WORLD COAL SUPPLY AND DEMAND

68. According to BP statistics, world consumption of **primary energy** grew by 2.4 percent in 2005 (4.3 percent in 2004). Within this total, the Asia Pacific region increased its energy consumption by 5.5 percent (8.9 percent in 2004). Within the EU, German primary energy consumption declined by 2.0 percent, with over half of this decline attributable to coal.

69. Asia Pacific energy growth was again dominated by Chinese growth in total primary energy demand of about 9 percent (10.6 percent for coal). China's primary energy consumption now accounts for nearly 15 percent of the world total.

70. While world primary energy consumption growth has moderated in 2005, coal use again grew more strongly (4.7 percent) than total energy use (2.4 percent). Thirty years ago, coal accounted for roughly one quarter of world primary energy demand and it now accounts for nearly 28 percent. Approximately 70 percent of energy requirements in China, whose economy has been growing at about 8 percent annually since the mid 1990s, are met by coal.

3.1 Company Developments

United States of America

71. Coal industry sales, acquisitions and reorganizations were somewhat less active in 2005 than in the last few years, but there were still a number of mine ownership changes:

    - Arch Coal Inc. sold its Hobet Mining, Apogee Coal Co. and Catenary Coal Co. subsidiaries to Magnum Coal Company effective 31st December 2005.
    - International Coal Plc completed the purchase of Cambrian Mining's final shares in King Coal Corporation and Maple Coal Co. Ltd. in December 2005.
    - International Coal Group Inc. (ICG) acquired Anker Coal Group Inc. in October 2005 and began publicly trading in November.
    - After acquiring Triad Mining Inc. in May, 2005, James River Coal Co. became a publicly traded company in November 2005.

France

72. Charbonnages de France must legally cease to exist on 31 December 2007. A legal and financial liquidation structure will be set up for a length of time estimated at 3 years. The residual activities after mining (security, surveillance, management of buildings) will be taken over by the Bureau de Recherches Géologiques et Minières (BRGM), a public body.

Steel Industry

73. Historically, the steel industry has been highly fragmented. The largest producer, Mittal Steel, was responsible for only 5 percent of global steel production. However, the merger between Arcelor and Mittal Steel will create the world's largest steel company with an annual steel production capacity of 120 million tonnes, or 10 percent of global steel production. It is possible that this merger will act as a catalyst for wider consolidation of the steel industry, with Chinese, Japanese, European and US steel makers moving quickly to reach critical mass by forming alliances. This, in turn, could encourage a balancing consolidation of the coal industry.

3.2 Coal Demand Developments

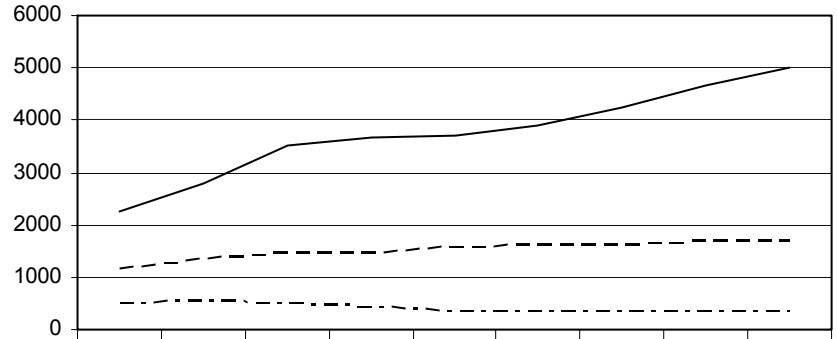
3.2.1 Total Hard Coal Demand

74. During 2005, IEA statistics show that **World** consumption of hard coal grew by just over 7 percent. While this is less than the 2004 growth of close to 10 percent, it still amounts to an additional 331 million tonnes of coal used. OECD consumption increased by less than 1 percent, while consumption within EU(19) countries declined by almost 4 percent. ***World hard coal consumption has now increased by a total of about one third in the five years since 2000.***

Chart 1 - Hard Coal Demand

(million tonnes)

Source: IEA Statistics



	1973	1980	1990	1995	2000	2002	2003	2004	2005e
EU (19)	497	543	480	408	353	344	360	362	348
OECD	1143	1334	1463	1458	1575	1590	1620	1667	1675
World	2247	2777	3508	3653	3721	3893	4242	4659	4990

75. Almost inevitably, **China** was again largely responsible for the increase in world hard coal demand during 2005, accounting for almost 90 percent of the 331 million tonnes growth.

76. Official estimates of economic growth in 2005 have again recently been revised upwards and now stand at 10.2 percent. However, the Chinese government is now taking measures to try and restrict the very rapid growth in infrastructure investment in China, where spending on new urban factories, real estate and government infrastructure rose by over 30 percent in the first half of 2006. Since March, the cabinet and the National Development and Reform Commission have imposed a series of controls on investments in industries including steel and cement; and have ordered local governments to tighten environmental and industrial policy controls on new projects.

77. For the **USA**, the IEA estimates growth of 1.9 percent in hard coal demand and 1.7 percent in brown coal demand during 2005. Brown coal accounts for only about 8 percent of total coal demand. According to the US Energy Information Administration, ***total*** coal demand for use in the United States was 1,128 million short tons in 2005 (metric: 1,023 million tonnes). Exports were 45.3 million tonnes, bringing total demand for United States coals to 1,069 million tonnes. In 2006, the EIA estimates use of 1,032 million tonnes domestically and 44 million tonnes of exports, of which 26.8 million tonnes will go to overseas destinations and 17.2 million tonnes to Canada. Included in the total

figures are production of 72.7 million tonnes of brown coal (lignite) in 2005, all of which is used for power generation, and estimated production of 75.3 million tonnes in 2006.

78. In **Canada, *total*** coal consumption in 2005 remained broadly at 2004 levels, with over 90 percent used for electricity generation in its 23 coal-fired electricity plants. 21 million tonnes of coal were imported from the USA, Colombia and Venezuela (an 11 percent increase on 2004), of which 17million tonnes was thermal coal for use in Ontario, Nova Scotia and New Brunswick's power stations. Coking coal imports were 4 million tonnes.

79. In **Japan**, total metallurgical coal, thermal coal and anthracite imports in FY2005 were 178 million tonnes, a 6 million tonne decrease from the previous year. The largest share of imports (58 percent) was from Australia, while Indonesia accounted for 17 percent and China 12 percent.

80. In **Germany**, economic growth in 2005 worsened relative to 2004, being only 0.8 percent compared with the 1.6 percent achieved in 2004 and this trend is likely to continue in 2006. Hard coal consumption declined by almost 5 percent in 2005, driven by reductions in use by the electricity and steel industries. About 60 percent of requirements were met by imported coal. Imports from South Africa, Poland, Russia, Colombia, Australia, Canada and the USA met approximately 60 percent of German hard coal demand.

81. In **France**, stocks of hard coal have been used more intensively since the end of 2002, falling from 8 million tonnes (138 days consumption) to 4.9 million tonnes (84 days consumption) at the end of 2005.

82. Hard coal consumption rose by 2.7 percent to 21.3 million tonnes in 2005, with coal-fired power plants' consumption increasing by 15 percent to 10 million tonnes, boosted by increased electricity demand in the winter season. Consumption by the steel industry was 8.3 million tonnes, a reduction of 6.3 percent in line with global steel industry trends.

83. Hard coal consumption was broadly stable overall at 7.9 million tonnes during the first 4 months of 2006, with an increase of 11 percent in steel industry consumption balanced by a reduction in electricity generation use.

3.2.2 Steam Coal Demand

84. **World** consumption of steam coal increased by 7.2 percent (292 million tonnes) in 2005 according to IEA provisional estimates, slightly lower than last year but continuing the recent high growth that has averaged 8.5 percent per annum or 950 million tonnes in total over the last three years. This growth has been driven by continued steam coal use in developed economies as well as very rapid growth in developing economies including China and India. Growth in non-OECD countries in 2005 was close to 11 percent.

Table 2 - Steam Coal Demand (million tonnes)

	2003 m.tonnes	2004 m.tonnes	change	2005e m.tonnes	change
EU(19)	281	281	-0.1%	272	-3.3%
OECD	1425	1467	3.0%	1482	1.0%
World	3732	4065	8.9%	4357	7.2%

Source: IEA Statistics

85. Steam coal demand in **South Africa** decreased by 5 percent to 173 million tonnes in 2005. Local market consumption is 71 percent of the total output (bituminous coal 99.5

percent and anthracite 0.5 percent). The rest is exported mainly through Richards Bay Coal Terminal (97 percent), Durban (1.5 percent) and Maputo (1.5 percent).

86. For **Japan,** the IEA estimates a 5.7 percent decline in steam coal demand to 114 million tonnes in 2005. However, Japan experienced a gradual economic recovery in FY2005 and an increase in the power demand during a chilly winter. As a result, Japanese Power Utilities (JPUs) consumed about 95 million tons of steam coal, almost the same volume as in FY2004 with its extremely hot summer. Australia remained as the largest steam coal supplier for JPUs with a 63 percent share. China continued to reduce its share from 19 percent to 15 percent because of its robust domestic demand, while Australian and Russian shares respectively rose by about 2 percentage points.

87. In the **United States**, EIA preliminary estimates show that the electric power sector used 1,038 million short tons of coal (942 million metric tonnes) in 2005 for electric generation and for useful thermal output. Just over 51.3 percent of all electricity produced during the year was coal fired. Total electricity generation increased by 2.0 percent in 2005 and generation from coal increased by 1.8 percent. Due in part to the difficulty in building already low coal inventories, and in part to a 1 percent decline in nuclear generation, utilities increased their use of expensive natural gas by 7.7 percent more in 2005.

88. Coal use by electric generators in the United States will continue to increase in 2006 as the EIA expects 1,047 million short tons (949 million metric tonnes) will be burned to generate just over 51percent of electricity produced. Coal-fired generation continues to be by far the lowest marginal cost source of fossil-fired electricity.

89. The demand for electricity during the first half of 2006 increased by 0.8 percent. Declines in the early part of the year caused by a warmer than normal winter were offset in April and May by a warmer than normal spring and relatively strong economic growth. Coal fired power through the first six months of the year however declined by 1.6 percent as nuclear power returned to a higher level and hydro generation increased sharply. Since May, the weather throughout the United States has continued to be warmer than normal. Data from the Edison Electric Institute shows that electricity generation from early June to early September was essentially flat with weeks of high generation being offset by weeks of lower electricity use on a year on year basis.

90. The utilities have replenished inventories, on average, to more normal levels although some shortages remain on an individual utility basis. Inventories at coal fuelled plants were 16.7 percent higher at the end of June 2006 than a year earlier and 33.5 percent higher than at the end of 2005. Stock build over the first six months of 2006 was 34 million short tons (31 million metric tonnes).

91. Industrial use of coal for generation of steam and for other purposes totalled 65.9 million short tons in 2005 (59.8 million metric tonnes), slightly lower than in 2004. The EIA expects that industrial use of coal will remain flat in 2006.

92. In **India**, the 11th 5-year Plan for India projects a requirement for an additional 100GW of electricity generating capacity, all of which is expected to be fossil-fuel fired. The view has been that coal indigenous to India or to a particular state, whatever its quality, should be used in preference to imported coal. However, in May, officials from the power ministry and the Power Finance Corporation (PFC) initiated discussions with global coal companies for securing long term coal concessions from dedicated mines for proposed 4,000MW power projects, each with an annual coal requirement of up to 20 million tonnes. There could be seven such 4,000MW projects set up in Madhya Pradesh, Gujarat, Maharashtra, Karnataka, Orissa, Andhra Pradesh and Chhattisgarh.

93. Coal washing has not been the norm, and even washed coal is considered acceptable at 34 percent ash. None of the power stations currently planned used the best available

technologies and the concept of "clean coal" use in India still means reduction of SO_x, NO_x and particulate emissions rather than CO_2.

94. In **Germany** in 2005 as much as 47 percent of Germany's power generation was based on coal, with 10 percentage points of this accounted for by German hard coal, 12 percentage points by imported hard coal and the remainder by lignite. Gross power generation rose slightly to 619TWh, while hard coal's contribution to generation declined from 22.9 percent to 21.6 percent, balanced primarily by an increase in natural gas.

95. Power stations in **Spain** consumed 11.9 million tonnes of domestic hard coal and 19.6 million tonnes of imported coal in 2005 (as well as 7.6 million tonnes of domestically produced brown coal). Gross coal–fired power plant output rose slightly (0.8 percent) to 82.5 TWh, mainly due to the extremely low hydro production in 2005 compared to 2004.

96. Almost all existing coal-fired plant will continue to operate, meeting the requirements of the EU Large Combustion Plant Directive, although no new coal-fired electricity plant is planned.

97. Total **United Kingdom** power generation in 2005 was 398 TWh (gross[2]), a slight increase on 2004. 136 TWh of this was generated from coal, again slightly higher than in 2004. Growth of over 14 percent was seen with contributions from both electricity imports and wind plus other renewables (each sector delivering 11.2TWh).

98. Wholesale electricity prices have risen, driven by increasing gas (and carbon) prices. Since the start of the EU Emissions Trading Scheme (ETS), the cost of coal (plus carbon credits) has been lower than that of gas (plus carbon credits) during the UK winter, with the two fuels being more or less evenly matched during the summer.

99. Steam coal imports, used mainly for electricity generation, continued their growth in 2005, increasing to 37 million tonnes (a 25 percent increase on 2004). This growth continued in 2006, with demand in the nine months to September 2006 being 18 percent higher than in the same period of 2005. Over half of these imports were sourced from Russian suppliers, reflecting the value of low sulphur content to electricity generators.

3.2.3 Coking Coal Demand

100. Table 3 shows IEA statistics for coking coal demand in the major world regions.

Table 3 - Coking Coal Demand (million tonnes)

	2003 m.tonnes	2004 m.tonnes	change	2005e m.tonnes	change
EU(19)	79	81	2.9%	76	-6.0%
OECD	195	200	2.7%	193	-3.5%
World	510	594	16.4%	633	6.6%

Source: IEA Statistics

101. **World** demand for coking coal increased by approximately 6.6 percent in 2005. 82 percent of the world growth was accounted for by China, while both EU(19) and OECD countries showed significant reductions. China now accounts for over 40 percent of world coking coal demand. As the following table shows, strong world growth in iron and steel production continued through 2006, with production also increasing in EU and

[2] i.e. including power subsequently used within the power industry itself (aux power, T&D losses…)

OECD countries. These trends will presumably be reflected in the demand for coking coal.

Table 4 - Primary Iron & Steel Production (11 months to November)

	Blast Furnace Iron (m. tonnes)			Direct Reduced Iron (m. tonnes)			Crude Steel (m. tonnes)		
	2005	2006	change	2005	2006	change	2005	2006	change
EU (19) total	98	101	2.9%	0	0	0.0%	171	180	5.6%
OECD	255	261	2.3%	0	0	0.0%	369	379	2.7%
World	714	791	10.9%	41	45	9.2%	1014	1112	9.6%

Source: International Iron & Steel Institute

102. In **Japan**, a total of 77 million tons of metallurgical coal (coking coal and PCI coal) was imported by Japanese steel mills and coke manufacturing companies in FY 2005. Crude steel production was 112 million tons, almost the same level as in FY 2004. Showing concern over the very tight FY 2004 supply situation resulting from accidents at mines and natural disasters, the steel mills over-committed to coking coal contracts in FY 2005. As a result their performance of contracts, especially semi soft coking coal and LV PCI coal, was low at the end of FY 2005. Approximately 60 percent of total imports were from Australia, imports from China and the U.S. decreased and those from Indonesia increased.

103. Coking coal use in the **United States** declined in 2005 to 23.4 million short tons (21.3 million metric tonnes). Steel production in the US was 102.8 million short tons (93.3 million metric tonnes), 5.8 percent lower than 2004 levels which had themselves shown an equivalent increase on 2003. Just over 56 percent was produced in electrical furnaces and the entire decline in steel production was in blast furnace production. The industry operated at an average 85 percent capacity throughout 2005. Apparent consumption of steel increased by 4 percent in 2005, although steel imports declined as inventories of finished steel products increased. However, imports to June 2006 are on track to set new records as total steel imports are up by 33 percent and finished steel imports are up by 32 percent. Even with the increase in imports, steel production climbed steadily through early August and is 5.5 percent ahead of 2005. If these trends continue, steel production will be at least 109 million short tons (98 million metric tonnes) in 2006. Apparent consumption should increase as well this year.

104. Many of the tariffs imposed on foreign steel imports were lifted in November 2003. The steel industry is closely monitoring the level of steel imports and has expressed concern about their increase, especially the increase in steel imports from China. It would not be out of the question for the steel industry to request that the US Department of Commerce again initiate an investigation on steel imports.

105. Through the first four months of 2006, estimated consumption of coking coal was 1.3 percent above 2005 levels. The EIA has forecast that coking coal use will increase by a million short tons in 2006, a forecast that will be met if early estimates are correct. US coke production is taking the place of coke imports, which are down by 38 percent through June.

3.2.4 Total Brown Coal Demand

Table 5 - Brown Coal Demand (million tonnes)

		2003 m.tonnes	2004 m.tonnes	change	2005e m.tonnes	change
EU(19)		391	391	0.0%	386	-1.3%
OECD	Total	631	622	-1.5%	631	1.5%
World		918	907	-1.2%	912	0.5%

Source: IEA Statistics

106. World growth in demand for brown coal increased slightly by 0.5 percent in 2005, reversing the 2004 decline. Increases in demand in Thailand, India and Turkey counteracted declines in most other countries and regions of the world including Germany, which accounts for nearly 20 percent of world demand.

107. In **Germany,** Lignite is mainly used for power generation, followed by utilisation in processing plants. Between 1990 and 1999, demand more than halved to 163 million tonnes, but has been at a level of around 180 million tonnes for each of the past five years. 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. In the year 2005, as much as 47 percent of Germany's power generation was based on coal, with 25 percentage points of this accounted for by domestic lignite.

108. In **Turkey**, lignite is consumed mainly in thermal power stations, but is also used by industry, households and for commercial heating. Lignite use increased by almost 35 percent between 1990 (45 million tonnes) and 2001 (61 million tonnes), but declined sharply to 51 million tonnes in 2002 as a consequence of natural gas volume commitments in supply agreements. The share of lignite in electricity generation reached its highest value of 47 percent in 1986, but had declined to 15 percent by 2004 owing to an increase in the usage of natural gas, and to some extent hard coal, in electricity generation.

109. Lignite use in 2005 increased sharply to 56 million tonnes, an increase of over 20 percent on the previous year. The main reasons for this were:

- the start of trial operations at Elbistan B Power station, which has 4X360 MW installed capacity;
- Can Power Station (2x160 MW capacity), where trial operations started in 2004, lignite consumption increased to 832 000 tonnes/year in 2005 and full capacity operation commenced in June 2006;
- maintenance at some natural gas power stations; and
- decreased operation at of hydro-electric resulting from water shortages.

Lignite consumption at Elbistan B and Can power stations will increase further during 2006, while other power stations will continue to benefit from improvements in lignite preparation and delivery introduced during 2005.

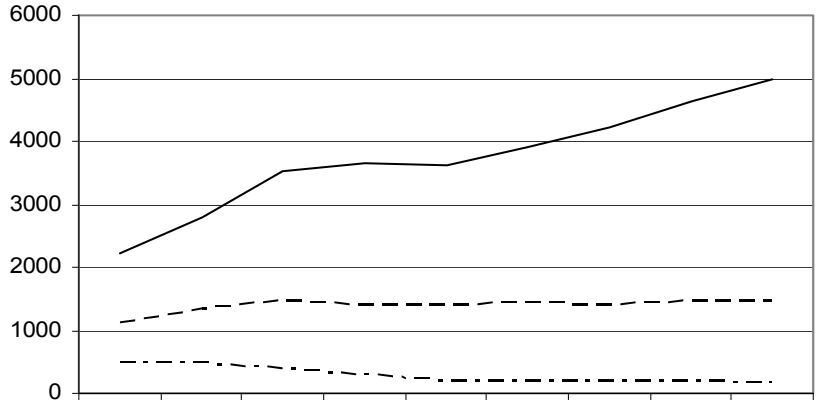
3.3 Coal Supply Developments

3.3.1 Hard Coal

Chart 2 - Hard Coal Production

(million tonnes)

Source: IEA Statistics



	1973	1980	1990	1995	2000	2002	2003	2004	2005e
EU(19)	471	488	368	289	202	189	186	181	169
OECD	1117	1336	1456	1405	1395	1433	1404	1452	1470
World	2235	2802	3532	3656	3619	3896	4224	4631	4973

110. World production has continued to grow strongly over the last four years, with growth of over 7 percent in 2005 supplementing the previous year's growth of almost 10 percent. Overall, hard coal production has increased by 1,350 million tonnes since 2000, a growth of over 6.5 percent on average in each of the five years since then. Close to three quarters (1,000 million tonnes) of this growth was in China. OECD countries' production has remained broadly stable since 1990, while the steady decline in EU (19) countries' production accelerated slightly through 2005.

111. According to IEA estimates, **China** produced 2,225 million tonnes of hard coal in 2005, 13.5 percent more than in 2004, accounting for nearly 45 percent of the world total. Exports were 72 million tonnes in 2005, a 15 million tonnes reduction on 2004.

112. In August 2005, China's State Administration of Coal Mine Safety ordered over one fifth of China's mines to close until they can meet required safety standards, and anticipated that the total number of suspensions would reach 7,000. The total number of mines in China is about 26,000 and, as most of the suspended mines are very small, there has been only a marginal effect on total production.

113. The National Development and Reform Commission announced in May 2006 plans for a major coal industry restructuring that will result in the closure of many small mines and the formation of five to seven major coal-producing conglomerates, each with a production capacity of 100 million tonnes/year, during the 11th Five-year Programme period (2006-2010). The NDRC foresees coal production reaching 2.45 billion tonnes/year by 2010, with improved technical and efficiency standards and a mortality rate reduced to 1.6 deaths/million tonnes.

114. The NDRC has also announced a US$5 billion coal exploration fund aimed at expanding coal reserves by an additional 170 billion tonnes by 2020. China currently has 288 billion

tonnes of commercially recoverable coal reserves, with total coal resources estimated at 5.5 trillion tonnes.

115. **South African** hard coal production increased by 0.9 percent in 2005, reaching 245 million tonnes (IEA estimate 240 million tonnes), with estimates of 176 Mt sold domestically to Eskom (115 Mt), Sasol (41 Mt) and others (20 Mt) and the major portion of the balance exported.

116. There are 31 billion tonnes of mineable reserves in-situ, although infrastructure weaknesses, especially rail and port, and the distance of reserves from ports constrain competitiveness in the export markets. However, increased domestic power station and export demand will once more create the opportunity for old and new coal mines to increase production.

117. There is a continuous search by economic empowerment entrepreneurs for viable blocks of reserves to establish new mines, assisted by the Mineral and Petroleum Resources Development Act and the Mining Charter. A number of large BEE mining companies, previously only involved in gold, diamonds and platinum mining, are exploring brown-field and green-field opportunities in coal. Some of these companies have made agreements with existing independents and are waiting for opportunities to grow;

118. **Columbian** hard coal production increased nearly 13 percent to 61 million tonnes in 2005. Over 90 percent of production is exported, increasingly to customers in the southern states of the USA.

119. 2005 saw **Indonesian** coal production and exports exceeding many forecasters' expectations. Exports continue to grow at a rapid rate, with official figures pegging the increase at 19 percent year on year.

120. **Australian** production grew by over 5 percent to 300 million tonnes in 2005, although many producers have experienced lower production in the first half of 2006 as the driest May on record in the Hunter Valley hindered coal washing and open cut mining operations.

121. Infrastructure developments are closely observed by Japanese buyers, and Japanese companies have interests in many of the projects. New, mainly coking coal, mine developments include Boggabri, Wilpinjong, North Wambo, Minerva, Carborough Downs, Broadmeadow, Broughton, Poitrel, Millenium, Lake Lindsay, Vermont, Rolleston and Clearmont; and there are also expansion plans for existing mines. Development schedules have been delayed at some of the projects, mainly due to a worldwide shortage and cost increases of consumables including fuel, explosives and tyres; and to shortages of skilled labour.

122. Expansion plans for loading ports (Dalrymple Bay, Hay point, Newcastle and Gladstone) have been announced, and it is expected that infrastructure bottlenecks will be resolved hopefully within 2-3 years.

123. In the **United States of America**, **total coal production** in 2005 totalled a record 1,133.3 million short tons (1,028.1 million tonnes), 1.9 percent above coal production in 2004 which itself was a 3.7 percent increase on 2003. Hard coal (bituminous and sub-bituminous) production totalled 1,053.2 million short tons (955.4 million tonnes) and brown coal (lignite) production was 80.1 million short tons (75.3 million tonnes).

124. Production increased in most coal producing states as demand continued to outstrip supply, but was affected by several weather events and flooding caused by heavy rains and three major hurricanes. Coal production from the Powder River Basin was affected by a major train derailment in the spring and then by track repair. Repairs continue into

2006 causing some continued disruptions. Through August 2006 however, production was up by 4.2 percent in the Appalachian states, 5.7 percent in the Interior region, 3.1 percent in the western region and by 3.8 percent overall.

125. To meet demand in 2005, production of coal was supplemented by increased imports and use of inventories. Coal imports increased again to 30.5 million short tons (27.7 million tonnes) and inventories at consumer locations fell by approximately 3.4 million short tons (3.1 million tonnes) to the lowest overall level since 1997. Producer inventories fell by 6.7 million short tons (5.9 million tonnes). It should be noted that the decline was not as steep as in 2004 and that, by the end of the year, consumers were able to add slightly to inventories.

126. The EIA has forecast that production in 2006 will increase to 1,153.8 million short tons (1,046.7 million tonnes), an increase of 1.8 percent, and production levels though August indicate that the industry is on track to produce slightly more than forecast. The actual production levels are again short of the industry's capacity to produce coal but will mark the first year since 2001 that supply has exceeded demand by even a small level. Neither weather nor transportation has as yet presented the same challenges as in 2005. However, transportation bottlenecks continue to exist, especially as additional track maintenance work is completed in the Powder River Basin; and weather again has been a factor, especially as it affects the transportation network.

127. Imports continue to increase in 2006, but not at the rate of the last two years and should total approximately 33 million short tons in 2006, up 3 million short tons or 10 percent on 2005 levels (the EIA forecasts imports of 38 million short tons for 2006). Inventories are expected to show the first year-on-year increase since early in this decade.

128. **Canada**'s coal industry saw a resurgence in 2005, triggered by global demands for coal in steel manufacturing and for power generation. Record high coking coal prices were a primary contributor to increases in production from Canadian coal mines and exports increased accordingly. As a result of consumers carrying high stocks following 2005 purchases, there was an 8 percent fall in nine months to September 2006.

129. Canada's ***total coal production*** was 67.3 Million tonnes in 2005, a slight increase on the 66.5 million tonnes produced in 2004. As of May, 2006 production was on track (26.4 million tonnes) to equal 2005 levels.

130. The 2005 production increase was mainly attributable to the Provinces of Alberta and British Columbia, which produced 28.6 Million tonnes t and 27.5 Million tonnes of coal respectively in 2005. Production from Saskatchewan has remained at its 2004 level.

131. Almost all of the coal production from British Columbia and some from Alberta was exported, mostly to steel mills in Asia and Europe. Saskatchewan's and most of Alberta's output was consumed domestically for power generation, typically from mine mouth operations. Ontario in central Canada continued to import coal from western Canada and the United States for power generation. In eastern Canada, the Provinces of New Brunswick and Nova Scotia produced limited amounts of coal predominately for coal-fired power generation.

132. There were 24 coal mines in operation in Canada at the end of 2005, with most large-scale coal mines located in western Canada. British Columbia currently has 10 coal mines in operation: Greenhills, Fording River, Line Creek, Elkview, Coal Mountain, Quinsam, Willow Creek, Dillon, Trend Small and Basin. Alberta is home to 9 coal mines: Obed Mountain, Cheviot Creek, Coal Valley, Highvale, Whitewood, Genesee, Paintearth, Sheerness and Grande Cache. Saskatchewan has 3 mines: Poplar Rover, Boundary Dam and Bienfait. New Brunswick has one coal mine and Nova Scotia has several small-scale mines without significant output.

133. In **Germany**, according to IEA estimates, hard coal production declined by nearly 4 percent to 28 million tonnes in 2005. In line with a follow-up agreement to the 1997 Coal Agreement, state-subsidized German hard coal output will be reduced to 16 million tonnes by 2012 (annual output in 2005 was 28 million tonnes). Under the coalition agreement concluded between the governing parties on 11 November 2005, additional savings and adjustments for the period after 2008 are to be examined and decisions on the future of German hard coal are due to be taken in autumn 2006.

134. In **France**, coal extraction having ceased in April 2004 with the closure of the last pit in Lorraine, production is now limited to products recovered from coal tips and ponds that are used in the SNET's power stations. This amounted to 617 thousand tonnes in 2005 and 242 thousand tonnes in the first 4 months of 2006.

135. In **Spain,** annual hard coal production was 11.9 million tonnes in 2005 (including 3.35 million tonnes of sub-bituminous coal which is included in IEA statistics for brown coal production). Production will be steadily reduced by 2.9 million tonnes in total (24 percent) by 2012, in line with the recently agreed "National Plan for the Coal Strategic Reserve 2006-2012 and New Model of Integral and Sustainable Development for the Mining Areas".

136. In the **United Kingdom**, indigenous hard coal production continued to decline during 2005, being18 percent below the 2004 figure. Deep-mined production fell by 24 percent and opencast by 13 percent. Geological and operations difficulties at deep mines meant that, for the first time ever, more coal was mined by opencast operations in 2005. Coal imports rose by 21 percent. In the first quarter of 2006, a resurgence in deep-mined production resulted in total hard coal production over 8 percent higher than a year earlier.

137. At the end of 2005 there were 8 major deep mines in production, of which 7 are owned by UK Coal and the other is the independent Tower Colliery in Wales, and 4 small deep mines. Opencast production continues to decline due to the increasing difficulty in securing the planning permissions necessary to develop new sites.

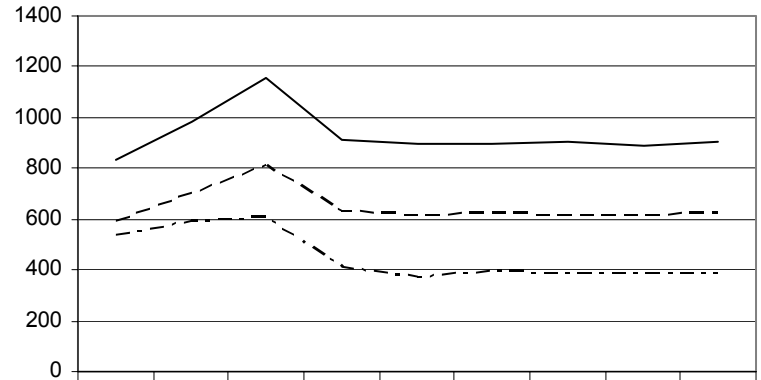
138. **Turkey** has approximately 1.3 billion tonnes of hard coal reserves (41 percent proved), managed by Turkish Hard Coal Enterprises (TTK). Existing production capacity is 5 million tonnes/year and actual production in 2005 was just over 2 million tonnes.

3.3.2 Brown Coal

Chart 3 - Brown Coal Production

(million tonnes)

Source: IEA Statistics



	1973	1980	1990	1995	2000	2002	2003	2004	2005e
EU(19)	537	592	605	407	373	390	387	388	382
OECD	590	699	807	626	614	622	616	613	625
World	836	986	1158	914	893	894	903	893	905

139. World production of brown coal has remained broadly stable at about 900 million tonnes a year over the last ten years, with little variation in the regions from which it is produced.

140. **Germany** remains by far the world's largest producer of brown coal, although IEA estimates suggest a 2.2 percent reduction in 2005 to 178 million tonnes. However, this is within the range of annual production level volatility experienced over the last few years and Germany still accounts for 20 percent of world production. Lignite production from approved opencast mines can be maintained at present levels for the next 40 years and it is fully competitive for base-load power generation.

141. **Turkey** produces both hard coal and lignite but lignite is by far the more important of these, with production spread throughout almost all regions of the country. Total reserves amounted to 9.3 billion tonnes in 2005, of which Turkish Coal Enterprises (TKI) has 2.5 billion tonnes, the Electricity Generation Company (EUAS) 4.8 billion tonnes and the private sector 2 billion tonnes.

142. Existing production capacity is 73.5 Million tonnes/year and actual lignite production reached its highest value as 65 Million tonnes in 1999. It has decreased steadily in recent years as demand its use in power stations declined, but production increased by 40 percent in 2005 to reach 57.5 million tonnes.

143. A Project on the Development of Existing Mineral and Geothermal Reserves and Exploration of New Deposits has been initiated to explore new lignite deposits within 20 regions. It will carry out research and prospecting studies in 30.000 km^2 in total and do 170,500 m of drilling between the years 2005 and 2010.

144. The state-owned electricity generation company (EUAS) produces lignite entirely for its own power stations. The state-owned Turkish Coal Enterprises (TKI) supplies nearly 80 percent of its coal production to power stations and sets the market price, with lower prices charged to its guaranteed lignite-fired power plant market. Lignite production will increase in future years to meet Turkey's growing power requirements.

3.4 Trade and Prices

3.4.1 Freight Market

145. Maritime dry trade represents a flow of approximately 4.7 billion tons in 2006[3], a rise of 30 percent compared with the year 2000. Goods transported in bulk carriers comprise:

- iron ore, steam and coking coal, cereals, bauxite and phosphate (1.7 billion tonnes)
- sugar, fertilizers, scrap and steel (860 million tonnes)

146. Coal (722 million tonnes) and iron ore (700 million tonnes) dominate maritime dry bulk trade. The major coal exporting countries are Australia (231 million tonnes), Indonesia (108 million tonnes), Russia (79 million tonnes), South Africa (73 million tonnes), China (72 million tonnes) and Colombia (56 million tonnes), altogether representing 619 million tonnes exported in 2005, 86 percent of global hard coal seaborne trade.

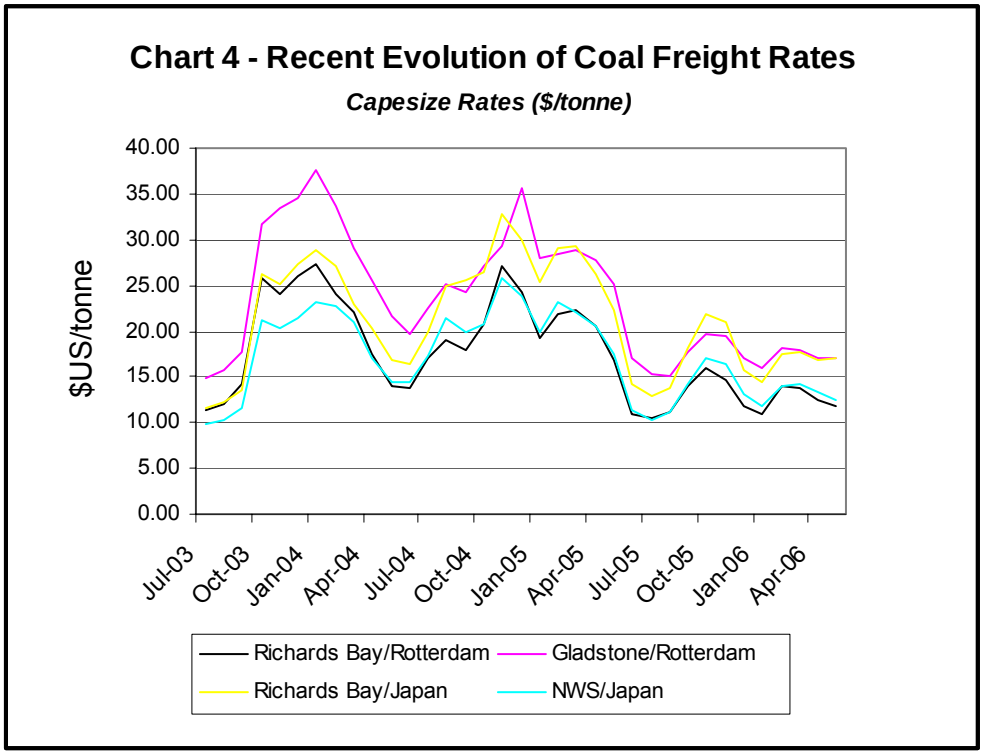
147. Australia and Brazil are the major exporters of iron ore, together accounting for 520 million tonnes. The main iron ore importing country is China, whose imports went up from 70 million tonnes in 2000 to 315 million tonnes in 2006.

148. Capesize freight rates had been relatively low and stable in the 1990s, at about US$10/tonne, but have increased and become more volatile since the end of 2003 due to:

- massive demands for iron ore imports into China which caused loading and unloading port congestion and queuing of up to six weeks, reducing the availability of holds by approximately 20 percent;
- higher demand for steel, coal and iron ore as a result of increased European car production;
- upward pressure on prices from increases in harbour expenses, movements in the $US exchange rates and oil prices;
- weather factors including very hot summers or particularly rigorous winters, which increase electricity requirements and steam coal imports, and the disruptive effects of coastal hurricanes in the USA and Australia; and
- longer transportation distances, as more supplies to the Atlantic basin are sourced from the Pacific basin, reduce the number of journeys possible from a given vessel fleet.

149. Chart 4 illustrates this recent volatility in freight rates by reference to routes from South Africa (Richards Bay) and Australia (Gladstone and Newcastle) to Europe (Rotterdam) and Japan.

[3] Of this, 2 billion tonnes is dry cargo not carried in bulk (containerised cargo and break-bulk).



150. Ship-owners have benefited from the very lucrative market of the last three years and invested in new vessels, despite the prices of new vessels almost doubling in the last 5 years. New orders for panamax and capesize carriers increased by 25 percent in the past two years. Scrapping rates for older, fully-amortized, bulk carriers have also reduced as a result of higher freight demand.

151. These developments should increase the supply of available holds and ease freight market prices. However, the success of the Chinese government in moderating infrastructure investment and the growth of its steel production, together with the potential requirements of a growing market in India for raw material imports, remain significant uncertainties for the global freight market.

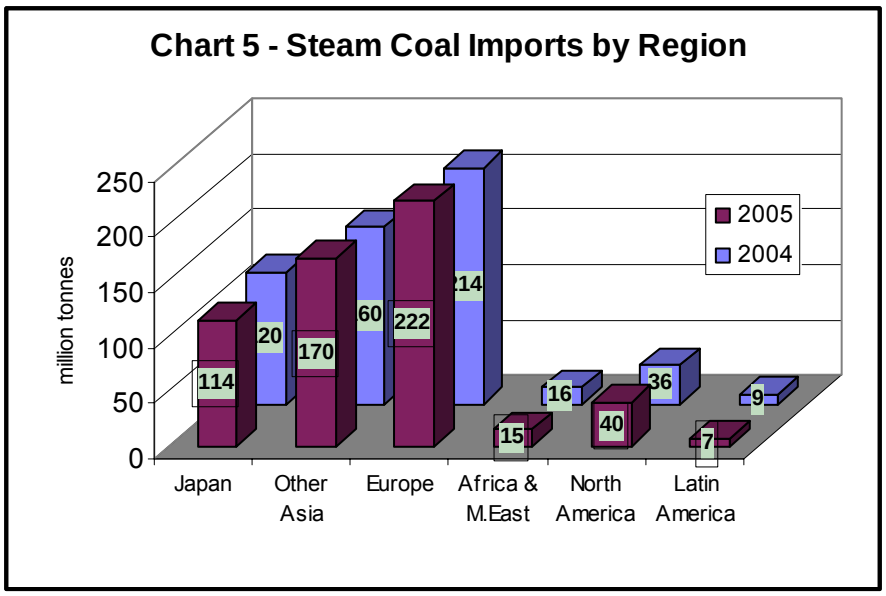
3.4.2 Trade Volume

152. According to IEA statistics, world hard coal trade increased by about 4.2 percent (31 million tonnes) in 2005, with coking coal trade growing at a faster rate than steam coal trade.

153. World **steam coal** trade grew to 548 million tonnes during 2005. Global demand for **seaborne** traded steam coal grew by approximately 19 million tonnes (4 percent) to about 493 million tonnes in 2005, continuing its relentless growth. Over the last 8 years, seaborne steam coal trade has grown by over 70 percent in total (average 7.1 percent/year).

154. Chart 5[4] illustrates the changes in 2005 steam coal trade by import region.

[4] The changes in imports by region shown in Chart 4 & Chart 5 do not equate to changes in total imports due to differences in the balancing item in the IEA trade matrices for 2004 and 2005, not shown in the charts.



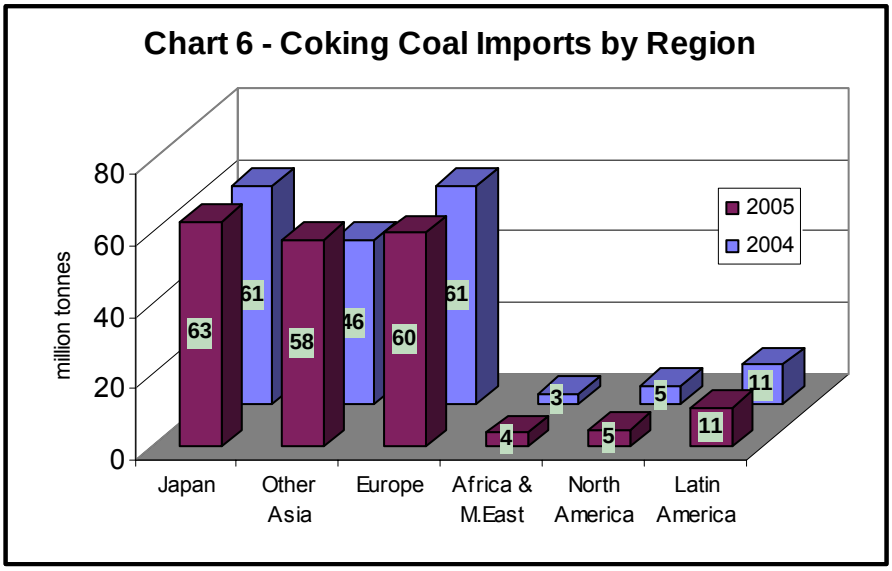
155. In the **Atlantic markets** consumers imported 20 million tonnes of seaborne traded steam coal, an 11 million tonne increase on 2004. Imports into the USA and central/south America increased, but the most significant increase was in imports into Europe, which grew by 8 million tonnes. This increase was driven by high gas prices, encouraging electricity generators to switch to coal, and reductions in domestic coal production. This effect was most noticeable in the UK, which accounted for the vast majority of the European increase and where coal imports now comfortably exceed domestic production each year. Indications are that demand remains strong into 2006, with power station coal demand up 17 percent and total coal imports up 29 percent in 2006Q1 from 2005Q1.

156. Steam coal exports from South Africa reached over 71 million tonnes in 2005 despite rail problems, and heavy rains in the first quarter, an increase of 8 million tonnes on 2004. However, exports in the first half of 2006 have been significantly reduced as a result of derailments, production problems and wet weather. The volatility of the US$/Rand exchange did not significantly affect the coal export revenue which, at about 21 Billion Rand, was 46 percent more than in 2004.

157. In Colombia the strike at Drummond's La Loma mine cost several million tonnes of lost output in 2005, with total Colombian exports reaching only about 54 million tonnes, while exports grew by only about 2 million tonnes during the first ten months of 2006 (well below companies' initial targets). This increase was all accounted for by increased USA demand. The new port at Barranquilla is expected to increase export capacity by about 8 million tonnes/year from March 2007.

158. **Pacific market** growth increased by over 5 percent to 314 million tonnes in 2005, driven by growing populations and their quest for increased standards of living. China reduced its exports by 14 million tonnes while Indonesian exports increased by 24 million tonnes, increasingly supplying to Atlantic markets. Growth in the Pacific market is continuing, with indications that H12006 growth could be a much as 10 percent on H12005.

159. World **coking coal** trade grew by 17 million tonnes to 227 million tonnes during 2005. All this growth was in **seaborne** trade, which reached 209 million tonnes and three quarters of the additional demand was met by Australian exports. Canada's exports to Asia grew by 24 percent in 2005, with the increase largely accounted for by increased demand from Japan and Korea Chart 5 illustrates the changes in 2005 coking coal trade by import region.



160. The following table shows **United States** coal exports in 2004, 2005 and for the first six months of 2006 (million short tons):

Table 6 – US Coal Exports (million short tons)

	2004	2005	Jan-Jun '05	Jan-Jun '06	change '06/'05
to Canada					
Metallurgical	3.781	4.464	1.732	1.952	+12.7%
Steam	13.548	14.910	6.011	7.017	+16.7%
TOTAL	**17.329**	**19.374**	**7.742**	**8.969**	**+15.8%**
to Overseas					
Metallurgical	23.059	24.215	13.540	11.770	-13.1%
Steam	6.978	5.916	3.421	2.318	-32.2%
TOTAL	**30.037**	**30.131**	**16.961**	**14.088**	**-16.9%**
Total Exports	**47.367**	**49.505**	**24.702**	**23.056**	**-6.6%**

161. US Exports increased to 49.5 million short tons in 2005, due almost entirely to an increase in exports to Canada. An increase in metallurgical coal exports to European Union countries and to India offset a decline in shipments to Japan. Steam coal exports to non-Canadian destinations declined to nearly all destinations except Romania, with the steepest decline in shipments to Japan.

162. US shipments of both metallurgical and steam coal to Canada have increased again in 2006, but seaborne exports declined sharply during the first six months of 2006 due mainly to a decline in shipments of both steam coal and metallurgical coal to Asian nations.

3.4.3 Market Prices

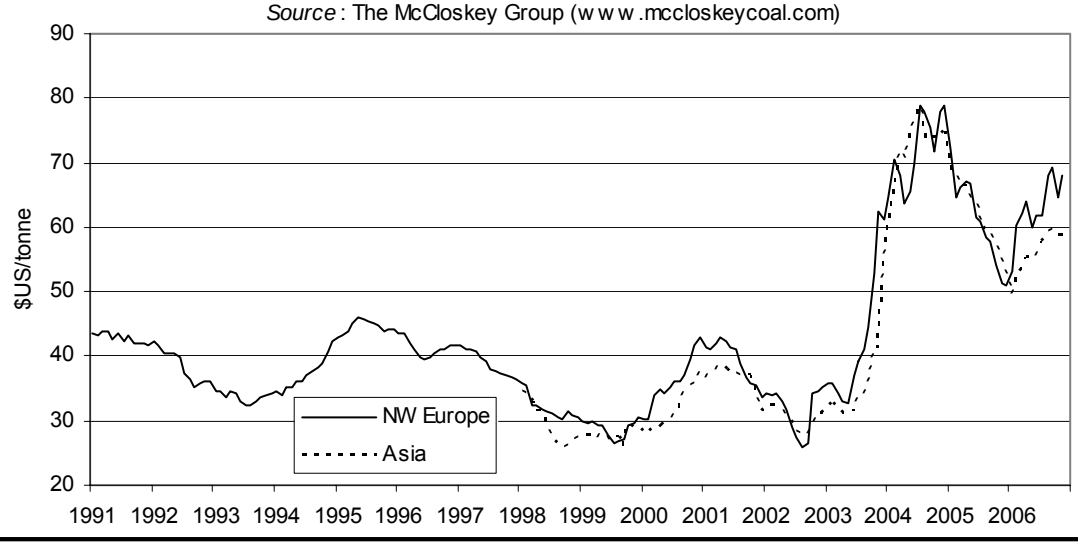
163. World steam coal trade has developed rapidly over the last 25 years and market transparency has increased with the introduction of electronic trading systems and price indices. There seems little sign of this growth abating.

164. In the early days of market growth, companies invested in coal production and transportation infrastructure in anticipation of international coal demand expanding.

However, following a period of lower market prices in the decade to 2002, companies in coal exporting counties have typically not invested in these developments until a sustainable increase in demand has been identified. Although these investments are now being made, the rapid increases in coal demand seen from countries such as China in the last few years have inevitably put upward pressure on prices and have increased market price volatility. This is illustrated by Chart 7 below.

Chart 7 - MCIS Steam Coal Marker Prices

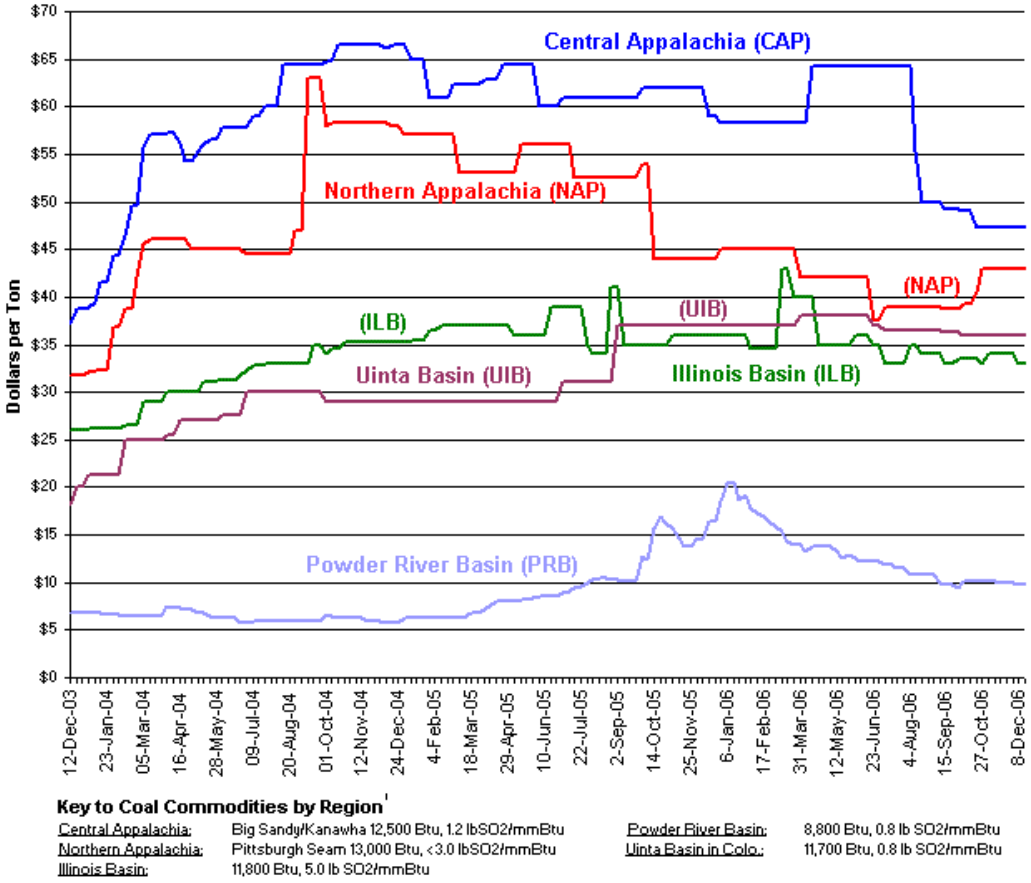
Source : The McCloskey Group (www.mccloskeycoal.com)



165. International steam coal prices peaked in the second half of 2004 with the ARA CIF delivered price reaching about US$79/t. Prices delivered to European distribution ports were on a declining trend during 2005 and ARA CIF delivered price was down to $51/tonne by the end of the year, with Asian market prices apparently following the Atlantic market. However, prices increased again to $68 tonne by August 2006. These changes illustrate that, while remaining fundamentally competitive, the markets remain finely balanced and prices are vulnerable to short term changes in the supply/demand balance.

166. In the **United States**, limited information is available on spot prices for selected coal types in Central Appalachia, Northern Appalachia, the Illinois Basin, Power River Basin and the Colorado Unita Basin. The information is prepared by “Platts Coal Outlook” and is available graphically on the US Energy Information Administration (EIA) web site (www.eia.doe.gov). Information for the three years to end-2006 is reproduced below.

Chart 8 – Spot Prices for US Coal 2003- 2006



Source: US Energy Information Administration

167. The price of Powder River Basin coal rose steadily during 2005, almost quadrupling from the level of just over $5/tonne seen for most of 2003 and 2004. Fundamental factors driving the increase included months of diminished PRB coal shipments due to rail problems, entrenched coal inventory shortages in the consuming sectors, capacity constraints for Appalachian low-sulphur coal, sustained high oil and natural gas prices, and high SO_2 allowance prices that reached a new record high of $1,630 per ton on 9th December 2005. 2006 has seen the PRB price decline steadily again to $10/tonne.

168. Northern Appalachian, Illinois Basin and Unita Basin coal prices declined slightly during 2006, but remained close to late 2005 levels. Northern Appalachian coal prices had declined steadily during 2005 and this was followed by a dramatic reduction in the price of the lower-sulphur Central Appalachian coal in August 2006. Since then, prices of all coals have remained broadly constant, reflecting weak demand and other factors. These include the reduction in deliveries from the high consumer stock re-building levels earlier in the year, relatively mild weather and the commissioning of new and re-opened coal production capacity following the prolonged period of high prices. Coal stocks in the electric power sector still equated to 49 days' supply at the end of October, higher tan they had been at the same time in either of the previous two years.

4 ISSUES RELATED TO COAL

4.1 Sustaining the Role of Coal

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

170. A compelling economic and social case can be made for sustaining the role of coal in the future energy mix, given that it is an affordable, reliable and secure source of energy. All fossil fuels must address the challenge of climate change – most important for coal because it is the most carbon intensive fossil fuel. The following paragraphs highlight recent developments that reflect the challenge which has been accepted by the industry to reduce the emissions from the use of coal in fulfilling its role in the future energy mix.

4.1.1 Policy and the Role of Coal

United States of America

Energy Policy Act 2005

171. The 2005 Energy Policy Act, the most comprehensive energy bill in a decade, has provisions designed to expand quantity and diversity of United States energy supplies as well as enhance the efficiency with which energy is used. Coal specific provisions include authorization for basic coal and coal combustion research and development, for demonstration of advanced coal technologies and for carbon capture and sequestration research. Additionally, the bill included tax incentives in the form of investment tax credits for advanced coal combustion plants and integrated gasification combined cycle plants (electricity generators and industry) and introduced a loan guarantee program for new technologies including coal to liquids technologies.

172. Due to limitations on budget and monetary resources, actual Congressional appropriations for coal programs for the US Fiscal Year 2007 (beginning October 1, 2006) will fall short of the amount envisioned by the energy bill. However, the funds that are available will allow continuation of the coal R&D program and an expansion of the carbon sequestration research program. Guidelines for the loan guarantee program have been issued, as have guidelines that will be used to qualify projects for investment tax credits. Applications for these tax credits are over-subscribed.

Climate Change

173. The 2005 Energy Policy Act was, in a sense, a climate bill as it included a wide range of provisions to encourage investments in R&D, conservation, efficiency and new advanced technologies that will serve to lower greenhouse gas intensity. The Act also included a climate change title designed to develop a strategy to deploy these same technologies in developing countries in part by identifying barriers to export of US technology and finding ways to remove those barriers. Implementation of these provisions is underway.

174. The Administration continues to advance policies and programs to support a technology based voluntary emissions intensity goal of achieving an 18 percent reduction in emissions per unit of GDP by 2012. The voluntary partnerships including in the Climate Vision and Climate Partner programs are an important part of this effort domestically. Internationally, the Carbon Sequestration Leadership Forum, the Methane to Markets

Partnership and more recently the Asia Pacific Partnership on Clean Development and Climate are important centrepieces of the Administration's programs. The Administration remains strongly opposed to mandatory carbon reduction programs.

175. Concerns over the availability and high price of natural gas and oil precluded serious consideration of mandatory climate controls on the Senate floor in 2006 although many Senators, most notably Senators John McCain (R-AZ) and Jeff Bingaman (D-NM) still strongly support such legislation. The tenor of the 2007 debate will be driven by the outcome of the 2006 Congressional elections. But no matter which party is in the majority, mandatory climate controls (possibly based on a cap with trading and a safety valve on price) will be the subject of more than one legislative proposal in the Senate. There are likely to be similar proposals introduced in the House of Representatives.

176. Individual states and/or regions, especially in the Northeast and on the West Coast, are taking action to control carbon emissions and/or to establish an emissions trading system. Specifically, the North Eastern states have developed a Regional Greenhouse Gas Initiative (RGGI) that requires participating states to cap emissions at 2002-2004 levels by 2014, with subsequent additional reductions. Each state participating in RGGI must now pass implementing legislation. California recently moved toward eventual adoption of a mandatory cap and trade bill under which the California Air Resources Board will, after a period of evaluation, set carbon reduction benchmarks for electric utilities and other industry. The success of the cap and trade program appears to depend on other states following California's lead.

Canada

177. Canada is now involved in the Asia Pacific Partnership, has stepped away from its Kyoto commitments and has formulated an alternative plan. It does not have a specific policy on coal.

178. Energy policy is market-based and oriented towards sustainable development. A major goal is to achieve both environmental and economic excellence in any energy project brought to market. Canada's Energy Policy has three main objectives:

    - Security – ensure access to affordable, reliable and secure sources of energy;
    - Prosperity - ensure that the energy industry contributes to the prosperity and quality of life for all Canadians; and
    - Environment - ensure that environmental considerations are always considered when developing energy projects.

179. The Energy Policy emphasises reliance on competitive markets to allocate resources and determine prices. Energy and other resources are owned by the Provinces in which they are located. Each Province must develop its own Energy Policy (Alberta, with its predominately carbon based economy, has its own Coal Policy). Regulation and targeted investment will be used as necessary to ensure that markets work.

180. New challenges are emerging, with security concerns higher than they have ever been. Refocusing of the policy initiatives around at-home investment, energy efficiency and emergency preparedness are being reviewed.

Australia

181. In June 2004, the Prime Minister articulated Australia's energy policy in the "*Securing Australia's Energy Future*" White Paper. An element of this policy was the announcement of a A$500 million Low Emission Technology Demonstration Fund (LETDF) to encourage large scale demonstration of step change technologies.

182. The first round of successful projects was announced in October 2006 and it includes funding for a lignite drying and Post Combustion Capture pilot project, a black coal mine methane and coal seam carbon capture and storage project and a black coal oxy-fuel and carbon capture and storage project.

183. In April 2006, the Australian Coal Association announced that black coal producers had agreed to establish a $A300 million COAL21 Fund to support low emission technology projects via voluntary levy on saleable black coal production. This fund complements the LETDF and State Government funding of A$300 million from Queensland and around A$100 million from Victoria for low emission technologies.

184. The high profile and pubic exposure of the Stern Report and other high profile climate change messages has elevated climate change issues to the forefront of public debate in Australia. Increasing emphasis and media exposure is being focussed on Australia's future energy mix, energy security and sustainability of our resources sector in a carbon constrained world.

185. The Australian Government has responded by instigating a number of high level public/private taskforces and inquiries on uranium mining and nuclear energy, carbon capture and storage and more recently carbon trading.

186. The Government has also bolstered support for its technology approach to climate change by committing A$100 million for projects under the Asia Pacific Partnership on Clean Development and Climate. Coal continues to be Australia's largest single export commodity and the source of the majority of electricity generated domestically.

New Zealand

187. New Zealand ratified the Kyoto Protocol in December 2003. The government had introduced a preferred policy package of measures to contribute towards New Zealand meeting its target under the Kyoto Protocol of reducing its emissions to 1990 levels or otherwise accounting for the excess emissions. That policy package included as its foundation a broad based carbon tax capped at $15/t/$CO_{2e}$ on most sectors, with the agricultural sector being exempted.

188. It became clear by 2004 that New Zealand was very likely to substantially exceed its 1990 levels during the first commitment period (2008-2012) under the Kyoto Protocol. The deficit has been estimated as around 64mt/CO_{2e}.

189. Following the general election in September 2005 the incoming coalition government undertook a comprehensive review of domestic climate change policy, the results of which were considered by Cabinet in December 2005. It was agreed that the broad based carbon tax would not go ahead, both because it would achieve little in reducing gross emissions and because of lack of inter-party support. Further work was undertaken by officials with the following announcements on reviewed policy being made in July 2006:

    - A National Energy Strategy is to be developed. The terms of reference were released for consultation. The focus is on identifying strategic directions and priorities in face of uncertain future events and developments. The NES will provide government leadership for the energy sector to respond to long-term challenges of energy security and climate change, and to put New Zealand on a pathway towards creating an energy system that establishes renewable sources of energy and energy efficiency as key priorities. Interlinkages with the development of climate change policies and the National Energy Efficiency and Conservation Strategy ("NEECS") were explicitly acknowledged.
    - A replacement NEECS is to be announced. The emphasis is expected to be on

incentives and regulation focussing on actions that deliver energy efficiency, reduce energy use and promote prudent energy conserving behaviours. There will be more support and incentives for the development of new renewable energy generation among other initiatives.

- Replacement policies for a broad based carbon tax are to be developed and consulted on. The focus is to be initially on the development of a strategic framework for climate change; forestry policy to address the increased rate of deforestation (one of the reasons New Zealand will be in deficit in the first commitment period); measures to improve fuel efficiency and import standards for vehicles; development of adaptation strategies for New Zealand together with a communication programme.

190. Parallel to these work streams the government will be consulting on alternatives to the broad based carbon tax with a focus on a narrow based tax on large final emitters (possibly defined as emitting 250,000 tonnes or more of CO_2 per annum) and on fossil fuel electricity generators. Means of incentivising renewable electricity generation will also be considered.

191. The timing of consultation on all these work streams is unclear, though it appears that the government is determined to take what time is necessary to produce enduring and lasting policy.

Japan

192. An "Oil and Coal Tax" was introduced at a rate of 230 yen/tonne of coal in October 2003. It has since increased to 460 yen/tonne in April 2005 and will increase to 700 yen/tonne in April 2007. The tax is regarded as an environmental tax.

193. In October 2005, Japan's Ministry of Environment proposed introduction of a new Environmental Tax with a rate of 2,400 yen/tonne of carbon from 2007. However, it was not agreed because:

    - Industry strongly opposed it, as before;
    - policies that push up energy prices were avoided under historically high oil prices; and
    - the Japanese Government has advocated "small government" under Prime Minister Koizumi.

194. In May 2006, the Japanese Ministry of Economy, Trade and Industry (METI) produced a Clean Coal Technology (CCT) road map that foresees the introduction of commercial IGCC plant after the mid-2010s, IGFC plant after 2020 and dissemination of carbon capture and storage (CCS) after the 2030s.

South Africa

195. The Department of Minerals and Energy is currently doing the second national integrated energy plan for the country. The Integrated Energy Plan (IEP) addresses energy demand balanced with energy supply, transformation, economics and environmental considerations in concurrence with available resources. The plan focuses on South Africa's energy needs from a holistic prospective and determines to what extent reliance should be placed on the different energy sources such as coal, gas, renewable energy and nuclear. The National Energy Regulator is also completing the National Integrated Resource Plan which focuses on the electricity portion of the energy requirements for South Africa.

Europe

196. Recognising an increasing awareness of rising European energy import dependencies, high prices on international energy markets today and growing human influence on climate change, the EU-Commission published a new Green Paper "*European Strategy for Sustainable, Competitive and Secure Energy"* in March 2006 (*COM(2006) 105 final/2006, 8th March*).

197. Based on the three objectives *Sustainable Development, Competitiveness and Security of Supply* this consultation document identifies six priority action areas where a common European response is needed:

- ***First*** - implementation of full competition in European electricity and gas markets these markets by July 2007. There is a need for more interconnections to allow freer trade between Member States, a European grid code to ensure common rules and standards for cross border trade and a European Regulator and a European Centre for Energy Networks.

- ***Second*** - security of supply and solidarity between Member States in the event of a crisis, with improved demand/supply balance transparency for gas and electricity. The Commission proposes establishment of a European Energy Supply Observatory, publication of the level of community oil stocks and the creation of a new crisis mechanism.

- ***Third*** - a comprehensive Strategic EU Energy Review to analyse all possible options (renewables, coal and nuclear energy) for the energy mix in each member state and in the community as a whole.

- ***Fourth*** - focus on energy efficiency under the slogan "*doing more with less*" and increased use of renewable energy sources to mitigate human influence on climate change. In addition to existing energy efficiency measures, the EU proposes an Action Plan on Energy Efficiency to reduce EU's energy use by 20 percent by 2020 and promotion of an International Agreement on Energy Efficiency, involving both developed and developing countries in collaboration with the IEA and the World Bank.

- ***Fifth*** - a new Strategic Energy Technology Plan to accelerate the development of promising energy technologies and help bring them to market.

- ***Sixth*** - a common external energy policy involving:
  - *the identification of new infrastructure required for the security of European energy supplies;*
  - *the development of a European Energy Community Treaty,*
  - *a new energy partnership with Russia;*
  - *a new rapid Community Mechanism for coordination of reactions within the framework of a situation impacting EU supplies;*
  - *deepening energy relations with major producers and consumers; and*
  - *an international agreement on energy efficiency*.

198. The 7th EU Research Framework Programme (FP 7) will cover the period 2007-2013 and is under discussion by the EU Parliament and Council. Its €54.5 billion total budget is much higher than the €16 billion of the four years FP6 and it will be organised in four specific programmes: Co-operation, Ideas, People and Capacities. Within the "Co-operation Programme", "Energy" is a key thematic area with a budget of €2.4 billion that

specifically includes coal technology research as well as research into renewables, hydrogen and nuclear energy.

199. Within the Energy thematic area, the EC Directorate for Research announced on 1st December 2005 a Technology Platform for Zero Emission Fossil Fuel Power Plants, whose vision is for fossil fuel power plants with zero CO_2 emissions to be deployable commercially by 2020 and which has provided significant input to the EC FP7 Energy Programme. The body brings together energy companies, equipment suppliers, users, consumers, financial institutions, regulators, public authorities, researchers and civil society to develop common research goals and to identify and remove obstacles to the creation of highly efficient power plants with near-zero emissions. These power plants will drastically reduce the environmental impact of fossil fuel use, particularly coal, and will include CO_2 capture and storage as well as clean conversion technologies leading to substantial improvements in plant efficiency, reliability and costs.

200. The Finnish President Tarja Halonen has announced that future European energy supply and security will be one of the principal topics within the scope of the six month Finnish EU Council Presidency beginning on 1st July 2006 and followed by Germany.

Germany

201. The "National Energy Summit", initiated by the Federal Government at the beginning of April, is the start of a comprehensive energy policy debate, due to be completed by the second half of 2007. The German chancellor, Mrs. Merkel, and several ministers as well as high-level representatives of the energy sector, of industrial and private electricity consumers, of renewable energies, of energy research, of environmental associations and of trade unions are all taking part. The main topics are security of energy supply, investment in a sustainable supply of electricity, competitive energy prices and further improvements in energy research and energy efficiency in Germany.

202. Participants at the Energy Summit agreed that increasing dependence on energy imports, rising energy prices and global climate change represent major challenges for energy policy. The Federal Government and the economic sector, in a joint attempt to tackle these challenges, established three Working Groups (national and international aspects of energy policy as well as energy research and energy efficiency). Furthermore, to encourage European and international co-operation, the German government will actively pursue security of energy supply and climate change during its EU presidency and its presidency of the G8 Summit in 2007.

203. At the Energy Summit, an offensive on innovation in the energy sector was announced (with an increase of over 30 percent in funds available for energy research by 2009) as well as an action programme on energy efficiency (especially promotion of building renovation). Energy supply enterprises simultaneously announced major investments in new, modern power stations and, for the first time, in a CO_2-free power station (an RWE Power and Vattenfall Europe project).

204. Coal has a crucial role in maintaining supply security. In 2005 as much as 47 percent of Germany's power generation was based on coal; 25 percentage points domestic lignite, 10 percentage points German hard coal and 12 percentage points imported hard coal. German lignite production can be maintained at current levels from approved opencast mines and is fully competitive for base-load power generation.

205. In line with the 2003 agreement, state-subsidized German hard coal output will be reduced from 28 million tonnes in 2005 to 16 million tonnes by 2012, with additional savings and adjustments post-2008 to be examined.

206. During the first half of 2006, an important topic for coal was the presentation of the new

energy taxation law, implementing EU energy taxation guidelines and including, for the first time, the introduction of a coal tax (at a rate of €0.33/GJ). This affects coal consumption by industry as well as household and small-scale consumers, but not coal input for steel production. Coal use for power generation, in line with other fuel inputs such as gas and uranium, is not subject to input taxation but power output will be taxed as previously.

207. The issue of the future use of nuclear energy was only dealt with in passing at the Energy Summit. Diverging positions on this issue were represented within the major coalition of Union and Social Democrats. The Federal Government agrees, however, to seek a solution during this political term for the safe stocking of radioactive waste and to find answers to questions by means of the new energy policy global concept, to what extent appropriate replacement capacity is available for the nuclear power stations to be decommissioned under Germany's current Atomic law.

208. An amendment to the Atomic Law, under which electricity generation from existing nuclear power plants is limited to the equivalent of a 32 year plant life, is not expected during the current legislative period (to 2009). Utilities will at best be able to benefit from existing flexibilities with regard to transfer options for agreed residual power quantities.

209. For renewable energies, the Federal Government aims to increase their share in power generation from 10 percent in 2005 to at least 20 percent in 2020. Under the Act on Granting Priority to Renewable Energy Sources, the grid operator has to pay specified minimum prices for electricity generated by installations favoured by the Act.

Spain

210. The "National Plan for the Coal Strategic Reserve 2006-2012 and New Model of Integral and Sustainable Development for the Mining Areas" was signed on 28th March 2006. It is an agreement between the Ministry of Industry, the Unions and the Coal Producers Association that will govern future hard (including sub-bituminous – 3.35 million tonnes produced in 2005) coal production, with the last two years being indicative as the EU subsidies plan only lasts until 2010. Its major provisions are:

    - Annual coal production will be reduced by 24 percent (equivalent to 2.9 million tonnes) during the period, to reach 9.2 million tonnes/year by the end of 2012.
    - The work force will be reduced by 36 percent to 5,302 in 2012
    - There will be a 13 percent reduction in subsidies (equivalent to €46.9 million), to €324.2 million by the end of 2012, with close to a 3 percent reduction in each of the first 2 years. As now, the subsidies will comprise both direct production subsidies and subsidy of costs linked to mine closures and re-development of mining areas.

211. Spanish energy policy continues to favour renewables and natural gas. No new coal-fired power plants are planned. Combined Cycle Gas Turbine capacity will increase from 12.5GW at the end of 2005 to some 28GW by 2011. Similarly, wind power is expected to grow from some 10GW at the end of 2005 to reach some 20GW in 2010.

United Kingdom

212. The UK Government Energy Review Report 2006 built upon the long term policy goals set out in 2003 and identified two major long term energy challenges:

    - "tackling climate change"; and
    - "delivering secure, clean energy at affordable prices, as we become increasingly dependent on imports for our energy needs".

213. The Government believes the competitive market framework remains sound but that within that framework there is a need for new policy initiatives. These measures, for large scale generation, include making a strong commitment to carbon pricing in the UK and clearly stating the Government position on new nuclear build.

214. A strong focus is given to managing the increased dependence on oil and gas imports.

215. The Government states that "the future for coal must be to become cleaner." The investment in existing coal-fired capacity to comply with new EU legislation is recognised and the Government will convene a coal forum "to find solutions to secure the long term future of coal-fired generation and UK coal production". UK Treasury is undertaking a review of the case for a Government supported commercial-scale clean coal demonstration.

Turkey

216. Turkey is a candidate for EU membership and is trying to increase its use of indigenous energy resources and harmonize Turkish legislation on Coal with EU legislation. Currently, the coal sector is subject to a re-construction programme, designed to introduce more competition, and new lignite washery plants are being installed.

217. In accordance with national energy policy, coal policy is based on developing the exploration and exploitation of coal and its economic, secure, reliable and environmentally friendly use as one of the country's main indigenous resources. The priorities are:

- developing existing indigenous energy resources especially in the coal sector;
- restructuring the coal mining sector;
- privatizing some inefficient and inactive coal mines; and
- promoting the adoption of clean coal technologies in the utilization of coal in thermal power plants, household and industry.

218. There are no legal restrictions on mine operation by the private sector and the coal sector is open to foreign investment. Turkish Coal Enterprises (TKI), the largest state owned lignite producer, has been in profit since 1995 and does not benefit from direct subsidies. It is being re-structured by consolidating its operational units and facilities to improve productivity. Operations at small, loss-making mines will be ceased and they will be offered to the private sector. Inactive mine deposits which are suitable for electricity generation will be leased to the private sector.

219. At the beginning of 2006, TKI had 47 licensed coal deposits (15 active, 12 leased, 20 inactive mines). Since 2002, production at eight small mines has ceased and they have been leased to the private sector, one inactive mine has been sold and one inactive mine deposit has been leased to private sector. Three more deposits are at the bidding and evaluation phases for electricity generation use. The policy of leasing inactive mine deposits to private sector, or transferring these licenses back to the government office if not successfully tendered, has been followed.

220. Following enactment of the most recent Mining Law, TTK (the state owned hard coal producer) is also able to transfer its rights to private undertakings. Their new mine sites have been given to private undertakings under a royalty payment arrangement.

4.1.2 Industry Actions to Sustain the Role of Coal

United States of America

221. The US coal industry is an active participant in the Asia Pacific Partnership for Clean Development and Climate, Coal Mining Task Force. The industry will be involved in implementing all elements of the work plan with special emphasis on coal mine health and safety, coal beneficiation and methane recovery.

222. The US industry has been instrumental in advancing support for a new coal conversion industry, an industry that could increase coal demand by more than 300 million short tons by 2030 to produce synthetic gas and clean liquid transportation fuels. Several bills that would provide incentives to accelerate construction of these facilities have been introduced and will be considered seriously in 2007. As well as working with the Congress the industry has been supporting Department of Defense use of coal for aviation fuels and worked with the Southern States Energy Board to develop a strategy for expedited permitting and construction of these facilities.

223. In conjunction with the government, the utility industry and developers, the coal industry has developed a revised technology roadmap or strategy for research and development of technologies that advance the goals of electricity production and near zero emissions. This road map will facilitate the demonstration and commercialization of advanced technologies and implementation of carbon capture and sequestration technologies.

224. In cooperation with the Department of Energy, universities, and other industry participants, various coal industry representatives are participating in seven regional carbon sequestration partnerships. Phase 1, completed in 2005, characterized domestic sources and sinks of carbon dioxide. Phase 2, which began in 2006 and will extend for four more years, is intended to be a period of technology validation through small-scale injections of CO_2 into various geological strata to test techniques of monitoring, mitigation and verification.

Japan

225. JCOAL has been active in promoting CCT by holding the "14th Clean Coal Day" in Tokyo on 5-7 September 2005, the “3rd Clean Coal Seminar” in July 2006 and inviting pilot coal projects to ensure the stable and clean supply of energy.

4.1.3 Coal-to-Liquids

226. Coal-to-liquids (CTL) has attracted renewed attention because of recent high oil prices and concerns over the security of energy supplies[5]. CTL has a long history in South Africa and Sasol now converts 40 million tonnes of coal per year to produce 160,000 barrels per day (bpd) of crude oil equivalent using the commercially-proven indirect liquefaction process. In the USA, companies are moving ahead with projects that seek to reduce the country's dependence on imported oil, encouraged by a variety of Federal and state government incentives. Japan is supporting development of CTL projects using its technology in countries such as China, where new CTL projects are being actively developed.

[5] Further information regarding developments in coal-to-liquids can be found in the proceedings of the CIAB workshop “COAL-TO-LIQUIDS an alternative oil supply?”, held on 2nd November 2006 at the IEA offices in Paris.

United States of America

227. Coal in the United States is increasingly viewed as an important domestic fuel that can give the nation a greater degree of energy independence and thus more security from both an energy and economic view point. As a result, interest in constructing plants to convert coal into synthetic gas or liquid transportation fuels is increasing rapidly. There is bi-partisan support for introducing this technology into the US and several legislative proposals have been introduced to provide loan guarantees, tax or other financial incentives to expedite construction of the first few plants.

228. While it is unlikely that any of these proposals will pass in 2006, due to a shortened Congressional session in an election year, it is likely that these proposals will be considered quickly when a new Congress convenes in 2007. The Department of Defense is evaluating use of coal based transportation fuels and is testing a coal based liquid for air transport. Many state governments are considering incentives to bring coal conversion plants to their individual state.

Japan

229. Japan's Ministry of Economy, Trade and Industry (METI) will provide coal liquefaction technologies to China, which has announced plans to invest about US$15 billion in coal-to-liquids (CTL) plants over the next 5-10 years as part of an effort to reduce dependency on oil imports. The plants have the potential to supply about 5 percent of China's total current oil requirements.

230. METI will supply NEDO technology derived from three liquefaction processes developed by the Sunshine Project following the 1974 oil crisis. NEDO will join with Chinese energy companies Datang International Power Generation Co. and Xinwen Mining Group to conduct feasibility tests on the efficiency of their liquefaction processes. The two Chinese companies plan to invest close to US$1 billion and start operating a liquefaction plant by about 2010.

231. METI is also discussing CTL technology transfer with countries such as Indonesia, India and the Philippines.

China

232. China is developing new projects in earnest, with a major construction project underway in Inner Mongolia. This plant, using newly-developed direct liquefaction technology and scheduled for commissioning in 2008, will produce one million tonnes of oil products each year (20,000 bpd) with a planned expansion to 100,000 bpd. The project forms one component of a strategy that will limit oil imports to below 50 percent of China's demand by 2020 when direct and indirect coal liquefaction plants are expected to meet 10-15 percent of the forecast 450 million tonnes (9 million bpd) annual oil demand. However, as in other energy sectors, the scarcity of capital and skills is considered to be a major hurdle.

233. The use of coal to produce an alternative to oil as a transport fuel will require CO_2 capture and storage (CCS) if significant increases in CO_2 emissions are to be avoided. This is not a priority in China, but there may be a willingness to apply the technology if some way could be found to cover the economic cost.

4.1.4 Emissions Trading

United States of America

234. The United States has not, and is not likely to, embark on an official carbon emissions trading program developed by the government although a number of companies are engaged in informal carbon trading programs and at least one regional carbon trading program is about to begin and a program is expected to be implemented in California as the result of legislation passed in late summer 2006.

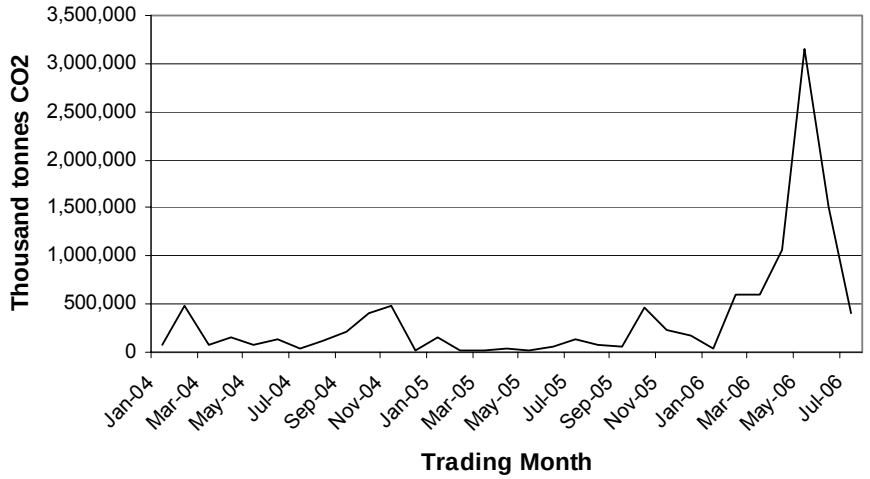
235. As a private industry example, the Chicago Climate Exchange has been established as a self-regulatory, voluntary organization that manages a market for trading greenhouse gas emissions. Although located in the US, Chicago Climate Exchange participation is multi-national. The exchange began continuous electronic trading of greenhouse gas emission allowances in December 2003.

236. Trading volumes have been very volatile but in 2006 have averaged well over 500,000 metric tons per month. The highest trading month recorded was May 2006 when over 3 million tonnes of CO_2 was traded (see Chart 8 below).

Chart 8 - Chicago Climate Exchange monthly CO2 emissions trading volume, all vintages

(thousand tonnes)

Source: www.chicagoclimatex.com

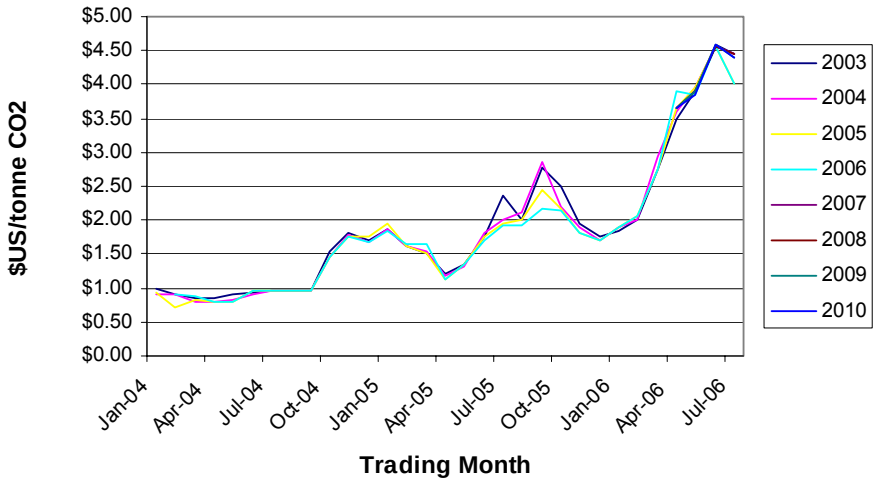


237. The prices for allowances were volatile but on an increasing trend during 2005. After declining at the end of that year, they have increased sharply during 2006 and now average more than $4.00 per tonne (see Chart 9 below).

Chart 9 - Chicago Climate Exchange monthly CO2 emissions closing price by vintage

($US/metric tonne)

Source: www.chicagoclimatex.com



238. A number of US-based corporations, including major coal-burning power generators, buy and sell CO_2 emissions credits on the exchange for purposes that include achievement of voluntary reductions pledged under the Climate Change Initiative which has been established in the US as an alternative to participation in the Kyoto Protocol. Experience gained by US firms in trading of SOx and NOx emission allowances under the nation's clean air protection programs aid participation in the exchange's CO_2 emission trading programs.

239. The NOx and SOx emissions trading programs that have been in effect in the USA since the mid-1990s, as an integral component of the national strategy to achieve mandated emission reductions, continue to operate effectively. A new mercury trading program will be initiated under the Clean Air Mercury regulations released in 2005.

Australia

240. A draft discussion paper and emission trading (cap and trade) model developed by a state/provincial government taskforce was released for comment in 2006 but has **not** been endorsed by at least two state governments or the Commonwealth government.

241. In December 2006, the Prime Minister announced the formation of a joint government/business task group to advise on the nature and design of a workable global emissions trading system in which Australia would be able to participate. The task group will advise and report on additional steps that might be taken, in Australia, consistent with the goal of establishing such a system. The group is expected to report to government in May 2007.

Japan

242. Last year, the Japanese Government released the Kyoto Protocol Target Attainment Plan, which contained various specific measures to reduce GHG emissions from all kinds of activities nationwide. Regarding economic instruments, this plan advocates pursuit of an optimal policy mix, including consideration of a carbon tax and emissions trading, to maximize results at minimum cost. However, both these coercive measures have been opposed by industry in favour of self-action to mitigate emissions of CO_2.

243. Since April 2006, the Japanese Ministry of Environment has started a GHG inventory system for business facilities whose GHG emissions exceed a certain standard (equivalent to consumption of heat and electricity greater than 3,000kL oil equivalent per

year). But this system is not deemed to be linked to the introduction of a cap and trade system in the future.

South Africa

244. The Designated National Authority (DNA), required to approve proposed Clean Development Mechanism (CDM) projects in South Africa, has been established in the South African Department of Minerals and Energy. Sustainable Development criteria have been developed and implemented. A number of projects have been funnelled into the pipeline. As coal plays a dominant role in South Africa's energy mix, it is possible that potential CDM projects related to coal will be submitted.

Europe

245. At the end of April 2006, the cost of CO_2 emission permits crashed from a level close to €30/tonne to about €11/tonne over a period of a few days as several countries including Germany, France and the Czech Republic announced that they had undershot their quotas. France emitted 131 million tonnes of CO_2, compared to its 150.4 million tonne cap. Germany apparently undershot its quota by 21 million tonnes (4 percent) and offered to make retroactive cuts to its 2005 allocation. After a short period of volatility, prices settled at €15-17/tonne. Commentators have suggested that this sudden crash in prices as countries undershot their quotas will encourage the European Commission to take a tougher line for Phase 2 (2008-12).

Germany

246. The European CO_2 emissions trading scheme has a crucial effect on the future use of coal in Germany. The Federal environment and economics ministries have agreed on the key points of the National Allocation plan 2008-2012 for the Federal Republic of Germany. Adoption by the Federal cabinet was scheduled for 28 June 2006.

247. In the plan, the CO_2 emission budget for installations covered by emissions trading is estimated at 482 million tonnes of CO_2 per year. Allocation of the allowances for existing plants will be free of charge, based on the average emissions during the years 2000 to 2005. Compared to reference period emissions, allocations will be reduced by 1.25 percent for productive industry installations and CHP installations (compliance factor of 98.75 percent), while energy sector plants will be subject to a 15 percent reduction (compliance factor 85 percent).

248. The CO_2 allowance allocation rules have been shaped to provide an incentive for building new power plants. New installations going on stream in the period 2008 to 2012 are granted free-of-charge allocations of CO_2 emission allowances, which will remain unchanged for 14 years, on the basis of a product-related benchmark derived from the best-available technology (BAT). The electricity benchmark is 750 g carbon dioxide equivalent/kWh, derived from the weighted average of emissions from modern power plants. The equivalent benchmark for power plants which can use gas is 365 g carbon dioxide equivalent/kWh.

249. When new plants are built, annual emission allowances allocated to the old installation may be transferred to the new installation for a period of four years, following which the new installation will be granted free-of-charge allocations for ten years on the basis of historic emissions. If no relevant reference data are available, allocations will be derived from this plant's specific emissions and the corresponding standard utilization factor (7.500 h).

United Kingdom

250. The EU Emissions Trading Scheme has been operational since 1st January 2005. In Phase I, UK coal power stations were given an annual allowance equivalent to a coal burn of 37mt, 24 percent lower than their 2004 consumption. The UK National Allocation Plan for Phase II (2008-2012) of the EU ETS has been published for consultation. This will further reduce the allocation to the Electricity Supply Industry (ESI) sector, to deliver the overall UK reduction and allowances for future auctioning by Government. The benchmark for all new plant will continue to be CCGT technology.

4.1.5 Power Station Emissions Control/Mining Regulations

United States of America

EPA Regulatory Initiatives

251. On 10th March 2005 the Environmental Protection Agency (EPA) issued the Clean Air Interstate Rule (CAIR) which addresses air emissions from power plants that move across state boundaries. CAIR permanently caps emissions of sulphur dioxide (SO_2) and nitrogen oxides (NOx) in the eastern US (29 eastern states and the District of Columbia). When fully implemented in the 2015-2020 time frame, SO_2 emissions will be reduced by 70 percent and NOx emissions by over 60 percent when compared with emissions in 2003.

252. A companion rule, the Clean Air Mercury Rule, was issued on 15th March 2005. This is the first federal rule to permanently cap and reduce mercury emissions from coal fired power plants. This rule makes the United States the first country in the world to regulate mercury emissions from coal plants. When fully implemented in 2028, the mercury rule will result in a reduction of mercury emissions from utilities by approximately 70 percent (from 48 tons to 15 tons) when compared with 2003

253. In late fall 2005, EPA updated the Regional Haze Rule to meet requirement of the 1977 Clean Air Act aimed at protecting visibility in 156 national park and wilderness areas. This regulation gives states the option to develop an emissions trading program to meet the Clean Air Visibility Rule's Best Available Retrofit Technology (BART) requirements, although the trading option has been challenged in the courts. There are 251 power plants in the east that are affected by the ruling. Fifty four of these already have BART equipment and 55 additional plants will install this equipment. Approximately 142 units will comply through a trading program.

Mining Regulations

254. On 16th June 2006 the Mine Improvement and New Emergency Response (MINER) Act was signed into law, representing the first major revision to the federal mine safety laws since the Federal Mine Safety and Health Act became law in 1977. The MINER Act provisions include:

- a requirement that each underground coal mine develop and update a written emergency response plan;
- a requirement that each underground coal mine make available two experienced rescue teams capable of a one hour response time;
- a requirement that wireless two-way communication and electronic tracking systems be available within three years;
- extending MSHA authorities; raising penalties for offences; and

- creation of a scholarship program to mitigate the anticipated shortage of trained miners and MSHA enforcement personnel.

Canada

255. The Canadian coal industry has made progress with respect to environmental concerns such as the disturbance of land, acid mine drainage, greenhouse gas (GHG) emissions, and the production of particulate associated with the burning of coal. Some coal mining companies have already been recognized for their successful environmental management programs.

256. New coal mines and mine expansions are required to have environmental assessments under provincial legislation and, in some cases, also require a federal environmental review under the Canadian Environmental Assessment Act. Environmental assessments ensure that mining activities, such as the removal of vegetation, relocation of overburden, construction of roads, storage of waste rocks, reclamation of previous mined areas, and mining operations, are done in a way to manage the negative effect on the environment.

Japan

257. Conventional air and water pollutants emission standards relating to thermal power stations have not been changed over the last year. Discussion of a possible future ambient standard for mercury emissions is continuing at government level, but no specific guidelines have yet been proposed.

258. There or currently no CO_2 emission standards or caps, but construction of new coal-fired power plant in Japan may face restrictions in the future. The government last year developed a national action plan to observe Kyoto protocol commitments, requiring each industry sector to submit a reduction target for GHG emissions. The Federation of EPCOs, which consists of Japanese Power Utilities, set a reduction target for the electricity industry. This February 2006, the Minister of the Environment disallowed the planned construction of a new pulverised coal-fired plant (2x 500MW units) by an IPP company, which was outside the assumptions made for the emissions reduction plan. But this new PCF plant is out of the assumption of the reduction plan. This affair has been recognized as an extreme reaction against coal fired power plant but indicates that there may still be impacts, albeit less extreme, on other construction plans in the future.

South Africa

259. The Department of Environmental Affairs and Tourism has partly enacted the National Environment Management: Air Quality Act 39 of 2004. The aim of the Act is to “reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto”. Ambient air quality guidelines have been gazetted for comment and a national air quality framework is under development.

United Kingdom

260. The application of the EU Large Combustion Plants Directive (LCPD) has been clarified and power station operators have made asset decisions. As a result of this, 20.5 GW of plant was opted-in and will now have FGD installed and 11.2 GW has been opted out and will face limited operational hours and closure by the end of 2015.

261. In addition to the LCPD, all generating plant must be authorised under EU Integrated Pollution Prevention and Control (IPPC) legislation in order to operate from 2007 onwards, requiring the use of Best Available Techniques to reduce plant emissions. Operators submitted applications under IPPC in Q1 2006. These applications are currently in a determination period with the Environment Agency, with new permits expected by the end of the year.

4.2 Investment in Coal Supply, Transportation and Use

United States of America

262. According to information published by the Energy Information Administration, companies are opening new mines and expanding existing mines to meet the forecast increase in demand. EIA's preliminary data show that in 2005, for the second consecutive year, the number of operating mines increased. Recent investment announcements indicate that the trend will continue. Announcements include Peabody Energy's Wildcat Hills mine in Southern Illinois (now operating), an announcement by Drummond Company that it is exploring opportunities in Illinois, and mining permit applications for capacity in West Virginia by Consol Energy, Frasure Creek Mining and D&L Coal Company.

263. The railroads are making significant new investments in both equipment and improved track to serve both existing and new business. For example, Norfolk Southern has added over 500 locomotives and invested $800 million over the last four years; The Burlington Northern Santa Fe Railroad and the Union Pacific are expanding the joint line that carries coal from the Wyoming Powder River Basis, both are adding cars and locomotives to the fleet serving the coal markets; the CSX railroad has purchased 100 new locomotives in 2006, is purchasing new railcars, accelerating its railcar rebuild program and adding new track. All railroads have expanded their hiring and training programs.

Canada

264. In northeast B.C., Western Canadian Coal Corp's Wolverine mine received the required regulatory approval and started mine construction in April 2005, with production due to begin in July 2006. The mine's designed production capacity is 2.4 million tonnes, increasing to 3 million tonnes in 2007.

265. Northern Energy & Mining Corp completed its Trend Small mine construction at the end of 2005 and production began in January 2006. The design capacity of the mine is 1 Mt of coking coal.

266. In southern B.C., construction of Compliance Energy Corp's Basin mine was also completed and the mine is ready to produce in 2006. It is a thermal coal mine with a designed capacity of 400,000 tonnes/year.

267. Cline Mining Corp's Lodgepole mine project is located in the Crowsnest Coalfield of south-eastern B.C. The project area contains approximately 155 Mt of coal reserves and resources; and the expected production is 2 million tonnes/year of coking coal. The company is anticipated to obtain the EA and regulatory approval in 2006 and start mine construction in 2007.

268. Hillsborough Resources Limited announced that BC Hydro accepted a tender offer of 184 MW of electrical power under BC Hydro's recent call for tenders. The AES - Hillsborough application is a coal/bio-mass concept, using circulating fluidized bed technology. The power project will be located at Hillsborough's Wapiti thermal coal property some 40 kilometres northeast of Tumbler Ridge. Coal from the Wapiti property will be the principal fuel source under a long term exclusive supply agreement, with bio-mass fuel being derived from forestry activities in the area. The coal supply requirements of the power plant are planned at 550,000 to 600,000 tonnes per annum.

269. After 36 months of construction, Alberta's new coal-fired power plant, Genesee Phase 3, was completed and began commercial operation on March 1, 2005. The $695 million, 455 MW power plant is the most technologically advanced coal-fired power plant ever built in Canada. It is equipped with $90 million of clean air technologies, reducing

nitrogen oxide emissions by 50 percent, CO_2 emissions by 18 percent, and a significant amount of sulphur dioxide emissions. In total, green house gas emissions at the plant have been reduced by 52 percent compared to emission levels of current standard coal-fired power plants. It also prevents 99.8 percent of particulates (fly ash) from releasing to the atmosphere. The Genesee Phase 3 plant uses sub-bituminous coal from the adjacent Genesee mine.

270. In January 2005, Luscar released a public disclosure document, in which it proposes a two-unit, 1000-megawatt coal-fired electricity generation plant and associated coal mine and coal preparation plant. The project is referred to as the Bow City Power Project and is located near Bow City, Alberta, approximately 180 km southeast of Calgary. The project is based on the Brook Power project originally proposed by Fording Inc. in 2000 and later acquired by Luscar as the result of a coal industry restructuring in 2003. Phase 1 is to construct a 500MW unit, a surface mine and a coal preparation plant with expected completion in 2010. Phase 2 is to build a second 500MW unit and a second dragline, and to expand the mine and preparation plant. The second phase is expected to be completed in 2014.

271. The Keephills 3 project is a proposed 450 megawatt (MW) coal-fired generating unit that will be located on the same site as the existing Keephills power plant. It is key to ensuring Alberta's growing electricity needs are met with a reliable and cost-effective source of power. Building on the success of the Genesee 3 project, TransAlta and EPCOR will again be partners in the new facility, which will use supercritical boiler technology and therefore have lower CO_2 dioxide emissions per MW than a conventional coal plant.

272. Keephills 3 is currently in the planning phase and is pending final approval from the boards of both companies as well as regulatory approval. It is expected to be commissioned in 2011.

Australia

273. Investment in Australian coal infrastructure is expected to continue in FY2005 and beyond. In May 2005, the Queensland Government decided to make an additional capital investment of Aus$2,100 million to improve infrastructure such as coal export railways and loading ports which, added to the Aus$1,400 million which the Government had already committed for improving infrastructure, brings the total amount to about Aus$3,500.

274. Of the Aus$2,100, Aus$1,000 will be used to restore the railway systems of Gooneylla, Blackwater and Moura as well as expansion of port facilities at Gladstone, Hay Point and Abbot Point, and the remaining Aus$1,100 million is for the construction of a 69km railway line between Gooneylla and Newlands to resolve the problem of the "missing link" between coal mines in the northern Bowen Basin and Abbot Point. After completion of these infrastructure projects, the railway transportation capacity for coal export in Queensland will expand to 215 million to 235 million tonnes per year in FY 2009/10.

Japan

275. Japanese companies' investment in overseas coal production continued during 2005:

- Mitsui announced in September 2005 that it had entered into a Joint Venture Agreement with the Russian company, Evras Group S.A. to acquire a 30 percent interest in the Denisovskaya Underground Project in the Republic of Sakha. The Project will commence production in the autumn 2006 and reach its full production of 3.6 million tonnes per annum in 2008. Two-thirds of the production will be coking coal for export to Asian markets and one-third will be thermal coal for domestic consumption.

- In October 2005, Mitsui announced the development of the Lake Lindsay Project in Queensland, Australia, in which Mitsui has a 30 percent interest and Anglo Coal holds the remaining 70 percent. The Project is expected to start production in the latter half of 2006, reaching its full production of 4 million tons per annum of mainly coking coal in 2008.
- Mitsui Matsushima has incrementally increased its shareholding of the Indonesian company, PT Separi Energy, to reach 20 percent by June 2006. PT Separi Energy commenced coal production from the Jembayan Mine, East Kalimantan, in March 2005 and plans to produce 2.5 million tonnes per annum of thermal coal in FY2006, increasing to 4.5 million tonnes per annum in FY2008.

South Africa

276. Final approval for the expansion of RBCT from 72 million tonnes capacity per annum to 92 million tonnes was signed by RBCT and the National Port Authority in November 2005. This agreement will make it possible more for Black Economic Empowerment (BEE) in the coal industry to participate in the coal exporting market. The 20 Mt capacity expansion, referred to as Phase V, will cost R1.1 billion and is expected to be complete by July 2008.

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

278. Although the number of Black Economic Empowerment (BEE) mines has increased, their contribution in terms of total production is still very small. With the establishment of the bigger BEE mines, involving companies such as Eyesizwe, Shanduka, African Rainbow Minerals, Mvelaphanda and others, a greater shift to BEE ownership is expected. A large number of small BEE companies have acquired reserve blocks and have opened a number of collieries. As a result of the RBCT expansion, there will be more BEE mines opening in 2006 and during the period 2006 to 2009, when the new capacity will become available.

279. Eskom has embarked on an extensive capacity expansion plan and coal-fired generation will form part of the new investment in power plant. Three mothballed coal power stations, Camden, Grootvlei and Komati, which were placed into reserve during a period of high excess capacity on the Eskom system, are being returned to service. Work has commenced on this project and the first unit from Camden came into commercial operation in July 2005. When fully operational by 2011, these stations should provide an additional 3,600MW of capacity.

280. Feasibility studies for new power stations over the longer term (2007 – 2010) are well advanced. Projects include combined cycle gas turbine plants, each with a minimum capacity of 1,800MW (base load). An investment decision has been made to build a minimum of 2,100MW coal power plant in the Lephalale area and planning advanced for a 1,330MW Braamhoek pumped storage facility in the Drakensberg on the border between Free State and KwaZulu-Natal.

Germany

281. Power consumption in Germany is currently projected to rise only slightly. There is a need, however, to invest in the renewal of the existing power plant portfolio. Projects under construction and those for which there are concrete plans and which are to be started up by 2012 alone have a net capacity of up to 15,800 MW. Of this total capacity, 5,000 to 8,000 MW will use hard coal, some 3,000 MW lignite, 4,500 MW gas and

300 MW other energies. All planned coal-based power plants are CCT projects.

Spain

282. All existing coal-fired electricity generating capacity will be maintained but there will be no new construction. The smallest (150 MW) and oldest nuclear plant was closed on 30th April 2005 but there is now a perceived need for new nuclear plant.

United Kingdom

283. Despite the predictions of many analysts, coal continues to provide a third of the UK's electricity requirements, and in the first three months of 2006 the proportion reached 45 percent. Power plant acquisition has continued with purchasers coming from both the larger energy companies and Banks and Investment Funds.

284. CCGT planning applications continue to be submitted and interest in nuclear and cleaner coal/CCS technologies has increased. The recent announcement of intention to build new CCGT plant at Langage (Centrica, 1,010MW) and Marchwood (ESB, 850MW) signals the start of renewed activity in power station construction. Substantial amounts of new plant will be required over the next decade, to replace the capacity which will be lost through the closure of a significant portion of the UK's nuclear fleet and of coal- and oil plant opted out of the LCPD. It is expected that most of the early build will be CCGTs.

285. Clean coal projects (some including CCS) at early stages of formulation include the RWE 1,000MW supercritical retrofit at Tilbury, the E.ON 450 MW IGCC in Lincolnshire, the Powerfuel 430MW IGCC at Hatfield and the Progressive Energy 800MW IGCC at Teesside. In November 2006, Centrica plc, which operates the largest UK fleet of gas-fired power stations, paid Progressive Energy £7.15 million to acquire an option in the Teesside project, bringing substantial expertise to the potential development of this combined IGCC/CCS project.

286. In October 2006, E.ON UK announced plans to build two new 800MW supercritical units at its Kingsnorth coal-fired power station in Kent, reducing carbon emissions by almost two million tonnes a year compared to the existing units if built. The new units would operate at an efficiency of 45 percent and above, and would be carbon capture ready.

287. The new units would start generating commercially once the existing four 485MW units had ceased operation by the end of 2015. The company is also considering making the new units capable of burning biomass with coal, although that would be dependent on the continuation of the current framework for biomass co-firing. They would also be fitted with a flue-gas de-sulphurisation plant and selective catalytic reduction; and could eventually be fitted with amine 'scrubbers' or other carbon capture technology to remove the CO_2 before emission.

Turkey

288. To compete with imported coal, TKI has installed additional lignite washing, packing and briquetting facilities in addition to its existing capacity. TTK's hard coal will be washed by private contractors.

289. The public utility EUAŞ has made use of clean-coal technologies at its power plants. The latest example is the Çan Power Plant, where the main coal burning unit uses fluidised bed technology that will be used to evaluate the burning characteristics of low quality indigenous coals. Fluidised bed combustion technology will be used for the new private sector power plants.

4.3 Developments in Clean Coal/Near Zero Emissions Technology

290. On 3 November 2006 an amendment was agreed to Annex 1 to the London Protocol, following discussion of a proposal by Australia and support from other countries. As a result, sub-seabed geological sequestration of CO_2 will be permissible under the terms of the 1996 Protocol to the London Convention after 10 Feb 07; making it legal under international environmental law. Given appropriate initiatives and goodwill, potential legal obstacles to CCS can now be quite quickly dealt with.

291. The amended Annex 1 refers to the stream being "overwhelmingly" CO_2 and allows "incidental associated substances derived from the source material and the capture and sequestration processes used". The London Convention's Scientific Group is tasked to develop specific guidelines for the assessment of CO_2 streams for disposal into sub-seabed formations.

United States of America

292. A number of new coal-fired plants are being planned. According a June report of the Department of Energy's National Energy Technology Lab, 153 plants totalling 93GW capacity and representing $136 billion in investment have been announced. Most of these plants will come on line after 2010. The states with the greatest number of plants are Illinois and Texas. Although many of these plants will use advanced coal combustion technologies, several companies (including American Electric Power, Xcel, Basin Electric Power Cooperative, and Cinergy/Duke) have announced plans to construct commercial scale IGCC plants.

293. To encourage the broad commercialisation of clean coal technologies, the Energy Policy Act provides a $1.8 billion authorization for the Secretary of Energy to carry out the Clean Coal Power Initiative (CCPI) for projects that demonstrate advanced coal-based power generation and that can achieve significant emissions reductions. It mandates that at least 60 percent of the $1.8 billion CCPI funding will be used for projects using gasification technology to increase efficiency and meet stringent environmental performance standards.

294. On 30th November 2006, $1 billion of federal tax credits were awarded to nine utility companies for advanced coal and gasification projects and an additional $650 million in tax credits for similar projects will be available in 2007.

295. Earlier, in February 2006, the US DOE awarded Clean Coal Power Initiative funding to Southern Company, in partnership with the Orlando Utilities Commission and Kellogg, Brown and Root, to design, construct, and demonstrate an IGCC power plant. The 285MW unit, which is scheduled to operate by 2010, will employ transport reactor technology that is capable of efficiently using low-rank, high-moisture, and high-ash content coals. These coals, which include lignite and sub-bituminous coals, make up half of proven coal reserves. The project is one of four selected in October 2004 under CCPI and will be the third IGCC plant in the US.

296. The Office of Fossil Energy's (OFE) National Energy Technology Laboratory (NETL) will manage the project for DOE. Initial funding of $13.8 million will support project start-up activities through March 2007. The total cost of the 10-year project is $557 million, of which DOE will contribute $235 million.

297. Several coal companies and utilities are participants in FutureGen, a partnership between the Department of Energy and industry that will cooperate in construction, operation, and evaluation of technologies in a zero emission coal fired plant consisting of an integrated gasification combined cycle plant that is intended to produce hydrogen and electricity and sequester carbon dioxide in geologic formations. The private sector

consortium and the DOE have signed their agreement and are in the final stages of site selection.

298. At the request of the US Secretary of Energy, the National Coal Council (an industry advisory body to the Secretary of Energy) is undertaking a study of technologies available to avoid, or capture and store, carbon dioxide emissions. It will focus on technologies available to the existing fleet of coal-based electricity generation plants as well as new and innovative technologies needed for future plants, and will be completed by May 2007.

Canada

299. Natural Resources Canada has made financial contributions to Canadian Clean Power Coalition (CCPC) projects, which aim to demonstrate that coal-fired power can be produced with emission levels similar to a modern natural-gas-fired turbine plant and that CO_2 can be captured and stored by applying commercial technologies. The goal was to retrofit current coal-fired electricity generation plants while maintaining overall efficiency at or above the current levels and remaining cost-competitive with other power generation technologies.

300. The CCPC completed the projects' feasibility study in 2004 and concluded that:

- coal-fired generation plant emissions can be comparable to natural-gas-fired power plants;
- technology limits will be pushed;
- life-cycle impacts and costs are significant;
- retrofit costs' range from $730/kW to $1100/kW; and
- new plant (greenfield) costs will be over $2700/kW.

301. On 30th October 2006, SaskPower, Babcock & Wilcox Canada and Air Liquide signed an agreement to jointly develop oxy-fuel technology for a proposed CAN$1.5 billion 300MW clean coal power plant. Following research and feasibility work, SaskPower will make a decision by mid-2007 on whether to proceed with the plant, which could be in service by 2011.

Australia

302. There has been a number of significant project developments in Australia including:

- The ***Hazelwood project*** , a A$430 million demonstration project that will retrofit brown coal drying technology and a pilot post-combustion capture (PCC) and storage facility.
- ***CS Energy's*** A$188 million Oxy-Fuel Demonstration Project to retrofit an existing power plant. The project involves burning coal in an oxygen-rich environment to produce electricity. The resulting exhaust gases, which include a high concentration of carbon dioxide, can be captured and stored underground
- The ***Fairview Power Project,*** to extract methane from coal and then bury the carbon dioxide emissions, will receive $75 million through the Fund. The A$445 million project will commence in April 2007 and is scheduled to be completed by 2015.
- The ***Monash Energy Project*** will construct a coal to liquids (CTL) plant which will gasify brown coal and convert the output gas to liquid fuels. A demonstration plant is proposed, which could lead to a commercial plant which would include carbon capture and storage (CCS) using depleted oil and gas wells in the Bass Strait. Major shareholders are Anglo and Shell.

- The ***Zerogen Project*** is a clean coal project demonstrating integrated gasification combined cycle (IGCC) and carbon capture and storage (CCS). The project will generate approximately 70MW and store 320,000 tonnes of CO_2 per annum at a proposed site in the Northern Denison Trough.
- The ***HRL Project*** is proposing to build an integrated drying, gasification combined cycle (IDGCC) plant processing brown coal. The plant will utilise a drying technology which has been tested at pilot scale in the Latrobe Valley.
- A 5MW coal gasifier being proposed by the ***Queensland Centre for Low Emissions Technology*** to investigate performance of Australian coals and to do leading edge gas separation work. Total project cost is around A$120 million.

New Zealand

303. Solid Energy announced on 9th November 2006 its intention to survey potential land-based CO_2 storage sites in Otago and Southland, as part of its 20-year, NZ$100 million, investment in clean coal technology. The initial six-month analysis of detailed geological data will be undertaken using expertise developed through the Australian-based Cooperative Research Centre for Greenhouse Gas Technologies ©2CRC), in which Solid Energy is a participant.

304. New Zealand has vast opportunities for underground storage of CO_2 in depleted gas reservoirs and in deep coal seems, development of which would enable use of the country's large lignite reserves.

Japan

305. CCT development has been strongly pursued in Japan, primarily focusing on high-efficiency coal use technologies. Most coal-fired power plants commissioned since the mid-1990s have adopted Ultra Supercritical (USC) technology and currently 20 USC plants are in operation, contributing to Japan's highest average efficiency amongst the developed countries.

306. Regarding future power generation technology, 10 Japanese power utilities jointly launched an IGCC demonstration program, including construction and operation tests of 250MW demonstration plant from FY2004 through FY2009. Total expenditure will be US$1 billion.

307. Another project on Integrated coal gasification fuel cells system (IGFC), the "EAGLE Project", has been conducted at a pilot-scale plant of 150ton/d coal feed by NEDO (New Energy and Industrial Technology Development Organization) and EPDC (Electric Power Development Co.) between FY1998 and 2006.

308. Furthermore, R&D programs for 700°C class advanced-USC which are lead by JSME (the Japan Society of Mechanical Engineers) will be started from 2007 as a government-funded project, targeting commercial deployment after 2020s.

309. More and more R&D programs on CCS technologies have been started in Japan:

    - Demonstration test for CO_2 capture from coal flue gas using Amine-based solvent (Mitsubishi Heavy Industries, 2005 ~ '06)
    - Japan-Australia joint program: Oxy-fuel combustion and CCS project in Australia, (Japan Coal Energy Center et al, 2004 ~)
    - CO_2 geological sequestration into a saline aquifer, (Research Institute of Innovative Technology for the Earth (RITE), 2000 ~'07)
    - CO_2 storage and Enhanced coal mine methane recovery project, (Japan Coal

Energy Center, 2002 ~ '06)

South Africa

310. South Africa joined the Carbon Sequestration Leadership Forum. The Department of Minerals and Energy facilitated a stakeholder workshop to obtain input into an overall strategy on carbon capture and storage in South Africa. Further work needs to be carried out in this area.

311. Eskom's new coal power plant is proposed to be supercritical. Research into Underground Coal Gasification and other clean coal technologies continues.

Germany

312. RWE and Vattenfal are pursuing different concepts for the implementation of the zero-CO_2 coal-fired power plant concept. Vattenfall is planning a 30MW pilot installation with an oxyfuel process that will go on stream at Schwarze Pumpe in 2008. Based on the experience thus acquired, it is planned to have an industrial scale demonstration installation operational in 2015.

313. RWE intends to build the first large-scale power plant worldwide with integrated coal gasification, CO_2 separation and CO_2 storage. The coal-fired power plant with an expected gross output of around 450 MW could come on stream in 2014 if planning and implementation proceed smoothly. The selected technology is IGCC technology with integrated gasification.

314. First concrete planning steps have already been initiated. The use of hard coal and the gasification of lignite are to be explored and tested in parallel and the results of the research will determine RWE's decision in the second half of 2007 as to the primary energy source for the world's first zero-CO_2 power station and the plant's site. Preference is given to lignite, one of Germany's non-subsidised domestic energy sources.

315. RWE will also be breaking new ground by opening up an onshore CO_2 depository. In this context, the company will be driving forwards the development of criteria for evaluating the suitability of a depository in geological terms.

316. In parallel to the large-scale power station with integrated carbon gasification, downstream CO_2 separation and storage, RWE is currently also intensifying its development activities for CO_2 scrubbing for lignite and hard coal in conventional steam power plants. Behind a conventional power plant, a CO_2 scrubber is installed to extract the CO_2 from the flue gas. The CO_2 is then stored at underground sites. The proposed budget is approximately €90 million and, if development is successful, this process could be used to upgrade existing power plants and could be installed during the construction of new zero-CO_2 steam power plants.

317. A decisive precondition for comprehensive implementation and continuation these capital-intensive initiatives will be that politicians grant coal a long-term perspective by setting non-discriminating underlying conditions.

United Kingdom

318. The UK government's Carbon Abatement Technology (CAT) Strategy involves a call for projects. There are now 5 serious clean coal projects being developed in the UK, including the RWE NPower retrofit project at Tilbury and an E.ON project at Killingholme.

319. The Energy Research Partnership, involving industry and government, and a clean coal

trade association have been set up. The ERP is co-chaired by Sir David King, Chief Scientific Advisor to the government and Paul Golby, CEO of E.ON UK. A National Institute of Energy Technologies is also being set up.

5 CONCLUDING REMARKS

320. The information given in the body of this paper has been compiled with the help of CIAB Associates and using some 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. Section 1 of the paper summarises the high level messages derived from this work and from other work published by the CIAB during the last year.

321. During 2006, the CIAB published *"Case Studies in Sustainable Development in the Coal Industry",* in which the coal industry detailed examples of progress being made towards sustainable development in many areas. It illustrated that many coal industry commercial objectives – cost-effective achievement of environmental standards, technology research and development, technology transfer and collaboration along the value chain – are also issues that governments can approach positively, in consultation with industry, so that coal is able to have a long term role in sustainable development.

322. The CIAB has continued to give considerable thought to how it can support the IEA Secretariat in delivering responses to the G8 Summit action plan and the particular challenges for coal. Progress with the 2006 work programme has been in support of the goal to usefully aid the IEA as it undertakes its own work to address the priorities emerging from the IEA Ministerial meeting and the G8 summit.

CIAB, January 2007