

**IEA Coal Industry Advisory Board**

**MEETING OUR ENERGY NEEDS**  
*driving forward coal's role in a clean, clever and competitive energy future*

**IEA, Paris on 9 November 2005**

workshop report presented to UNECE on 2 Feb 06 by:  
**Brian Ricketts, IEA Energy Analyst - Coal**

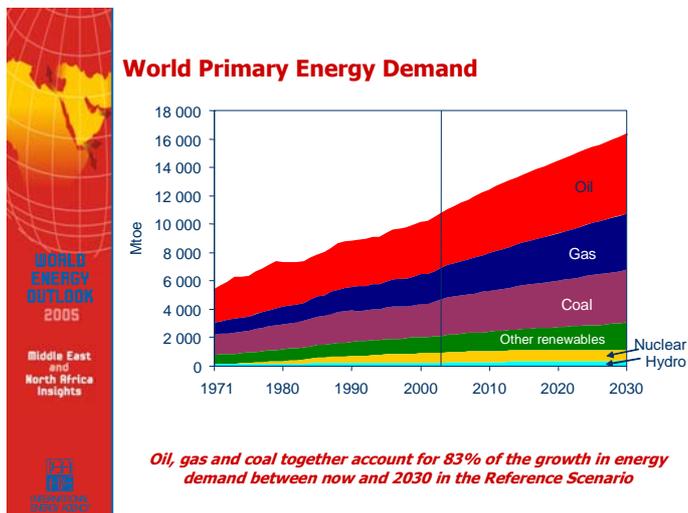
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Thank you for this opportunity to report on one of the IEA Coal Industry Advisory Board's recent activities and give you some visibility on what it plans to accomplish over the coming year.

Currently, there are forty CIAB Members, each holding a senior position in a coal-related enterprise, and each supported by an Associate member. The efforts of a small group of Associates are crucial in making the CIAB a productive body and bringing its insight and advice to the attention of the IEA.

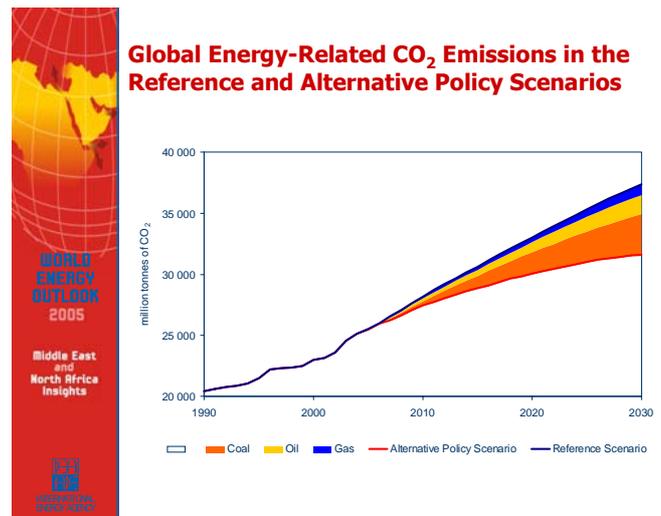
This year, for the first time, we held a CIAB workshop to explore issues related to the growing political pressure to move more swiftly to alleviate energy security concerns and to tackle climate change. Around one hundred invited participants came together in Paris, representing industry, governments and financial organisations – an excellent turnout including some key policy advisors.

With this presentation, I hope to give you a flavour of the debate that took place at the workshop – some seven hours of debate compressed here into just 15 minutes. I'll also briefly introduce the CIAB's work programme for 2006.



First off, Hideshi EMOTO of the IEA Economics Analysis Division (EAD) presented *World Energy Outlook 2005* (WEO). In the *Reference Scenario* world primary energy demand grows by one half (53%) between now and 2030, or an average of 1.6% per annum. Fossil fuels meet 83% of the additional demand, with natural gas use growing most strongly at 2.1% per year and overtaking coal as the world No. 2 energy source. Oil remains No. 1 – the single largest fuel, meeting the world's insatiable demand for transport fuels. However, crude oil quality falls, so refining capacity must increase to accommodate more medium-sour and heavy-sour crudes. Coal use is forecast to grow at 1.4% per year, from 5,200 million tonnes to

7,300 million tonnes. Hydro and nuclear energy grow very slightly. Renewables grow strongly from their low base.



The growing use of fossil fuel means CO<sub>2</sub> emissions are forecast to rise from 24 Gt in 2003 to 37 Gt in 2030 in the *Reference Scenario*. We recognise that this is not a sustainable scenario. So, in the *World Alternative Policy Scenario*, we've looked at the impact of new environmental and security-related policies. For OECD countries, these would include all measures currently under consideration. For non-OECD countries, it assumes energy efficient technologies are deployed more quickly.

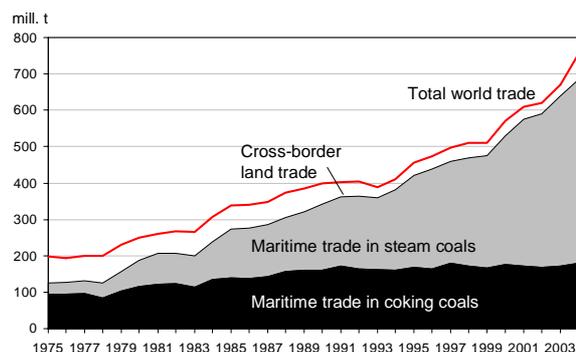
World energy demand growth falls to an average of 1.2%pa (down from 1.6%pa). An important finding for Members of the CIAB is the reduction in future demand for coal.

In the *Alternative Scenario*, coal demand growth falls to an average of 0.4%pa (down from 1.4%). This means coal demand would grow just 400 Mt between 2004 and 2030 to 5,600 Mt.

It is this reduction in coal use that has most impact on CO<sub>2</sub> emissions, as shown by the above chart. And much of the reduction in growth, shown by the orange wedge, comes from China where natural gas is assumed to displace coal. The implications for the coal industry should be clear – significantly reduced growth potential if these alternative policies are adopted, UNLESS advanced technologies are deployed – technologies that are not included in the WEO modelling work such as CO<sub>2</sub> capture and storage (CCS).

Next year, in WEO2006, the EAD will model the effect of CCS deployment and the results will be of great interest to the coal industry and the energy industry as a whole.

**Developments in world hard coal trade, 1975 - 2004**

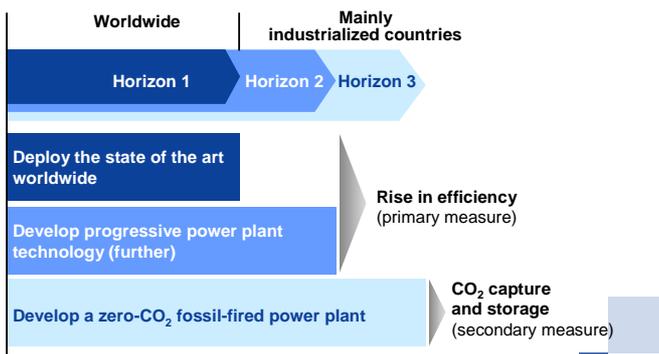


RWE Power • PFM-IB GZ D05/0182-PCP-E - 4

We then heard from RWE Power who gave an upbeat presentation on the world trade in hard coal. Dr Hans-Wilhelm SCHIFFER confirmed the growing importance of cross-border trade in hard coal – 750 Mt in 2004. It has nearly quadrupled over the last thirty years and now represents 16.5% of all hard coal consumed, with Australia, South Africa and Indonesia being key exporters. Chinese exports have moved in response to local demand and international prices, which were historically high in 2003 and 2004, but have since moderated.

Hans SCHIFFER expects that with the new capacity additions planned and anticipated over the coming years, we can expect coal to remain very competitive with natural gas for power generation – the main market for coal.

## Strategies of CO<sub>2</sub> reduction in coal-based power generation



RWE Power • PFM-IB GZ D05/0182-PCP-E - 5

To conclude, Mr SCHIFFER presented RWE's strategy to reduce CO<sub>2</sub> emissions from coal-fired generation. He saw three time horizons:

- First – the stepwise replacement of existing power plants with state-of-the-art technologies.
- Secondly – development of new technologies with efficiencies >50%.
- And the third horizon – CO<sub>2</sub> capture and storage, perhaps being deployed after 2020 in industrialised countries.

The question of timescales was a recurring theme throughout the workshop. There was a growing concern, expressed by Justin MUNDY an advisor to the UK Government, at the sheer volume of new coal-fired power plant construction, particularly in China, and the apparent delay before IGCC with CO<sub>2</sub> capture and storage could be used to deal with the almost exponential rise in CO<sub>2</sub> emissions. The term "carbon lock-in" was used to describe the future emissions from coal-fired plant built today without the option for carbon capture in the future.

Some participants had the pragmatic view that commercial clean coal technologies could be more widely employed now to stem the rise in global CO<sub>2</sub> emissions, whereas others looked to the deeper cuts that could come in just a few years when CO<sub>2</sub> capture and storage is shown to be viable. Pursuing both options was advocated by some, in which case the concept of a "capture-ready" plant becomes crucially important, to keep both options genuinely open.

We were fortunate to have Mr Zhiyong JIN from the Chinese Embassy in London. He presented up to date data on the energy scene in China, including this chart showing the recent, phenomenal growth in coal-fired generation. In the four years to 2004, output from thermal power stations grew by 700 TWh – equivalent to the output from 90 GW of coal-fired plant or 150 large generating units. Almost one new unit every week – to use a popular measure of this growth.

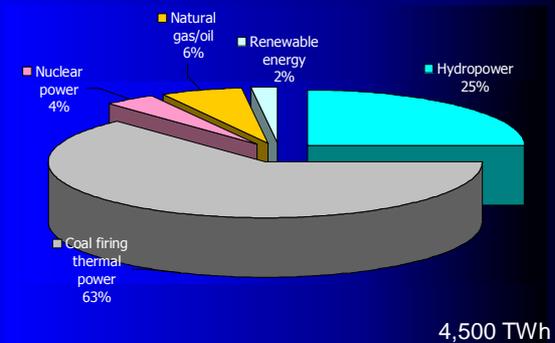
## Coal-fired power generation from 2000 to 2004



Presentation by Jin Zhiyong in IEA-CIAB

Perhaps not surprisingly, China is now the largest emitter of CO<sub>2</sub> after the USA.

## Power generation structure in 2020



Presentation by Jin Zhiyong in IEA-CIAB

Having now almost reached the end of China's 10th five-year plan, Mr JIN reported on the targets of the 11th plan (for 2005-10) with electricity demand forecast to grow at 6%pa – and then at 4%pa over the next period, eventually reaching 4,500 TWh in 2020. To give you some feel for the magnitude of this number, electricity demand in the USA today stands at roughly 4,000 TWh (25% of the world total).

Chinese manufacturing and construction capacity would clearly need to be enhanced to meet the demand for new plant. He also reported on the need to improve the fleet efficiency from the current low figure of 30% – mainly due to the large number of smaller units below 200 MW – 8,396 in all. Compare this 30% with the 40-45% efficiency that can be easily achieved with commercial plants today.

When questioned how China would improve the fleet efficiency, Mr JIN pointed to the one hundred supercritical units of 600 MW already planned with greatly improved efficiency.

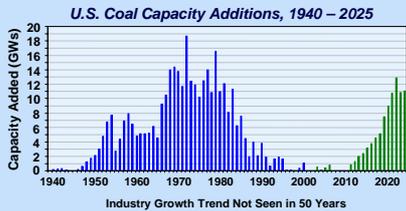
What is also remarkable from this chart is that coal and hydro remain dominant in China. Whilst there is a moderate effort to develop nuclear power, by 2020 it will still only account for 4% of supply – this being double today's 2%. As in many OECD countries, China is also enforcing renewable energy (notably wind and biomass), but again, its generation share in 2020 is not expected to be significant, despite a 10% target for TPES.

Mr Michael MUDD of AEP and Chief Executive of the FutureGen project presented this project alongside other important US initiatives.

## New Coal Plants will be required in the U.S.



- Construction has not kept pace with growth
  - 70% load growth in past 25 years
  - Lagging investment in generation and transmission infrastructure
- Existing plants are approaching their operating limits
  - Nuclear: 1990, 66% capacity factor      2004, 91% capacity factor
  - Coal: 1990, 59% capacity factor      2004, 74% capacity factor
- Demand expected to grow another 20% over next 10 years
  - U.S. set new record for power demand week ending Jul. 23, 2005



8

In recent years, construction of coal-fired plant has fallen off in the USA, but he anticipated a resurgence in the near future and, certainly, many new projects have been announced. He acknowledge that this view was at odds with that of the US Energy Information Administration, which still forecasts new gas build, BUT assumes gas at \$3-4mmBTU (c.f. today's spot price of \$13/mmBTU).

## FutureGen Project Key Features



- Commercial-scale 275-MW Plant
- 1 million tons/year CO<sub>2</sub> captured and sequestered
- Co-production of H<sub>2</sub> and electricity
- "Living laboratory" to test and validate cutting-edge technologies
- Public-private partnership
- Stakeholder involvement
- International participation



Source: Adapted from NETL and DOE

9

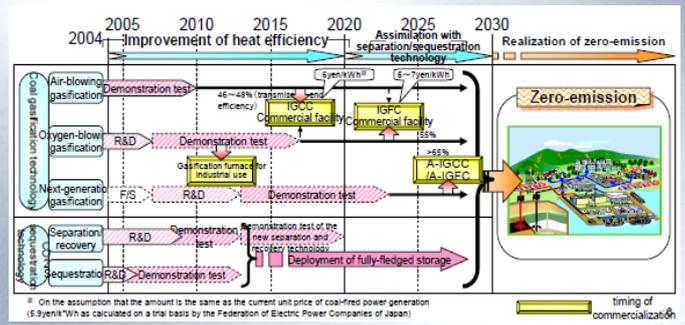
Last December, the US DOE reported the signing of an agreement with FutureGen's industrial partners which now includes the Chinese Huaneng Group, alongside AEP, BHP Billiton, Foundation Coal, Peabody, Consol, Kennecott and Southern Company. Mike MUDD gave his first-hand account of this billion dollar project, its ambitions and progress. With the agreement now signed, a site will be selected over the coming year and permitting progressed. Through the FutureGen project, advanced technologies will be demonstrated that should lead to cost reductions and improved performance of the next generation of IGCC plants.

In Japan, Mr NAKAGAKI, President of EPDC or JPower was able to report good progress with the EAGLE project. This acronym stands for Coal Energy Application for Gas, Liquid and Electricity. Not the snappiest title to describe what is an important initiative that targets 55% electrical generation efficiency from coal using a SOFC, together with carbon capture. However, Mr NAKAGAKI only expects this to deliver zero emissions some time after 2030.

## METI's Clean Coal Cycle(C3) Initiative

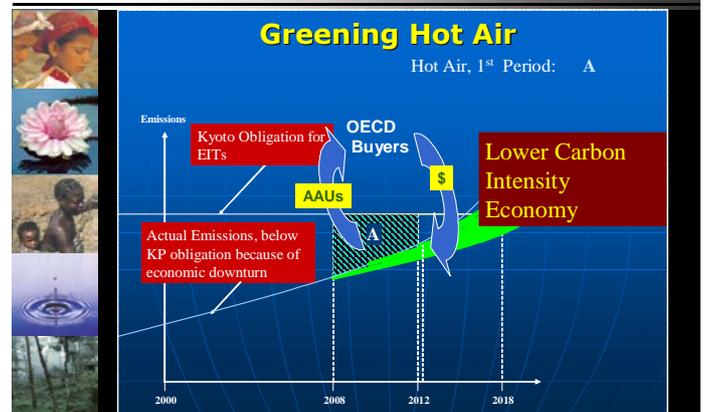


### Roadmap for the development of innovative CCT for realizing Zero Emission Utilization



Dr Ken NEWCOMBE from the World Bank presented his big-thinking on how carbon finance could fund major improvements to the efficiency of power generation plants in transition economies. We know that these economies are well below their Kyoto commitments and have surplus Assigned Amount Units (AAUs) to sell – up to 7 billion tonnes. Emissions from OECD countries are, in general, above their commitments, by around 3 billion tonnes of CO<sub>2</sub>. Yet, OECD countries are reluctant to trade, unless the purchase is linked to climate-friendly investments. NEWCOMBE presented a scenario whereby, through investment in improved power plant efficiency, the transition economies can significantly lower their carbon intensities using the capital receipts from selling AAUs, and thus release even more AAUs to trade – the solid green area on the chart.

### Explaining the Greening of AAU Proposition for Eastern Europe



Dr NEWCOMBE suggested that this "greening" of AAUs could, in principal, provide the funding to upgrade the coal-fired fleet in Eastern Europe, with new investment of about \$30 billion over the next 4-5 years. The capacity of Eastern Europe to absorb this investment is questionable, but the theory is good and we will no doubt hear more from the World Bank on this over the coming months as they develop their thinking in response to the G8 agenda.

Dr NEWCOMBE also spoke on the Kyoto Clean Development Mechanism which he felt had failed to live up to expectations for many reasons. He saw the window of opportunity now closing for large projects and, in any case, noted the bias against coal-related projects.

With post-Kyoto negotiations now in progress, Dr NEWCOMBE proposed these solutions to ensure that carbon trading can support the deployment of clean coal technologies.



## What is needed for carbon trading to drive clean coal?

- An early agreement on the post-2012 climate management regime that includes carbon trading and long-term carbon value.

If this is too difficult, then:

- Supplementing CDM with a “Market Continuity Facility” to buy post-2012 vintage CERs to guarantee 10-year contracts, and
- OECD commitment to grandfather CDM assets into the post-2012 era.

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## CIAB Working Groups for 2006

- **Zero Emissions Technologies**  
Chair: Bill Koppe, Anglo Coal
- **Best Practice**  
Chair: Andy Lloyd, Rio Tinto
- **Enhancing Energy Security**  
Chair: Milton Catelin, World Coal Institute
- **Creating Commercial Drivers for CCTs**  
Chair: Deck Stone, Arch Coal

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What came through most strikingly in Ken NEWCOMBE's presentation was the recognition that the focus of the World Bank, and other multi-lateral agencies, on renewable energy solutions over the last decade was no longer sustainable. Solving the greenhouse challenge demanded that coal become part of the solution, not simply the problem. And, in his view, carbon financing, through carbon trading, is the only source of financing of a sufficient size to support clean coal technology deployment and CO<sub>2</sub> capture and storage.

And these are the areas of activity:

- CIAB Associate member, Mr Bill KOPPE of Anglo Coal has proposed a global atlas of CO<sub>2</sub> storage potential, including that in China. It will, out of necessity, be carried out in collaboration with others, and with the possible support of the Australian Government. The aim is to disseminate information and data from geological surveys carried out by others.
- The CIAB will report on the gap between common practice and best practice, including a dialogue with non-member countries. To begin with, a workshop in New Delhi is planned for May 2006 in collaboration with the World Coal Institute (WCI). Membership of the CIAB will be reviewed to bring in new members from China, India, Russia and other key coal-producing and coal-consuming countries that are currently not represented.
- The CIAB will join with the IEA Working Party on Fossil Fuels and the WCI on energy security issues, complementing work that the IEA is already engaged with.
- Finally, the CIAB will continue its work on investment, extending this to look at market mechanisms and, in particular, the CDM (strongly requested by Japanese Members).



## Workshop issues

- Growing political pressure to reverse the growth in CO<sub>2</sub> emissions.
- So, how to ensure coal's continued contribution to global energy supply security and affordable energy?
- What gains can be made now with the wider adoption of more efficient, clean coal technologies?
- When can CO<sub>2</sub> capture and storage be commercialised - before or after 2020?
- What should be the balance between industry-led initiatives and government-led initiatives?
- What form will post-Kyoto policy measures take and is the coal industry engaged?

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To sum up, these are the issues that the coal industry clearly needs to address given the range of views expressed at the workshop.

There IS a growing political pressure to reverse the growth in CO<sub>2</sub> emissions - the G8 Communiqué merely reinforced this. Given this, how can coal ensure its continued contribution to global energy supply security and affordability? Coal faces competition from other energy sources and must respond with a clear vision of its own, cleaner future.

These issues are well-aligned with the IEA's own G8 work, and the CIAB's 2006 work programme will usefully support work at the IEA.

The full workshop report is available on the CIAB website: [www.iea.org/ciab](http://www.iea.org/ciab).

Thank you.

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*Mr Brian Ricketts joined the IEA in July 2005 as coal analyst working in the Long-term Office's Energy Diversification Division. Following a six-year apprenticeship in aerospace engineering, when he also qualified as a chartered mechanical engineer, Brian joined Alstom in 1987 where he was responsible for dynamic modelling of power systems. In 1997, he joined UK COAL as project engineer to work on a new integrated gasification combined cycle, coal-fired power station to be built in Yorkshire. In seeking planning permission for this ambitious project, Brian was sucked into the political lobbying process and subsequently led UK COAL's lobbying on a number of issues, most notably on the EC Large Combustion Plants Directive. He has worked closely with the UK Department of Trade and Industry, advising on coal markets and all matters relating to clean coal technologies. Brian holds a Masters degree in business administration from the Open University.*