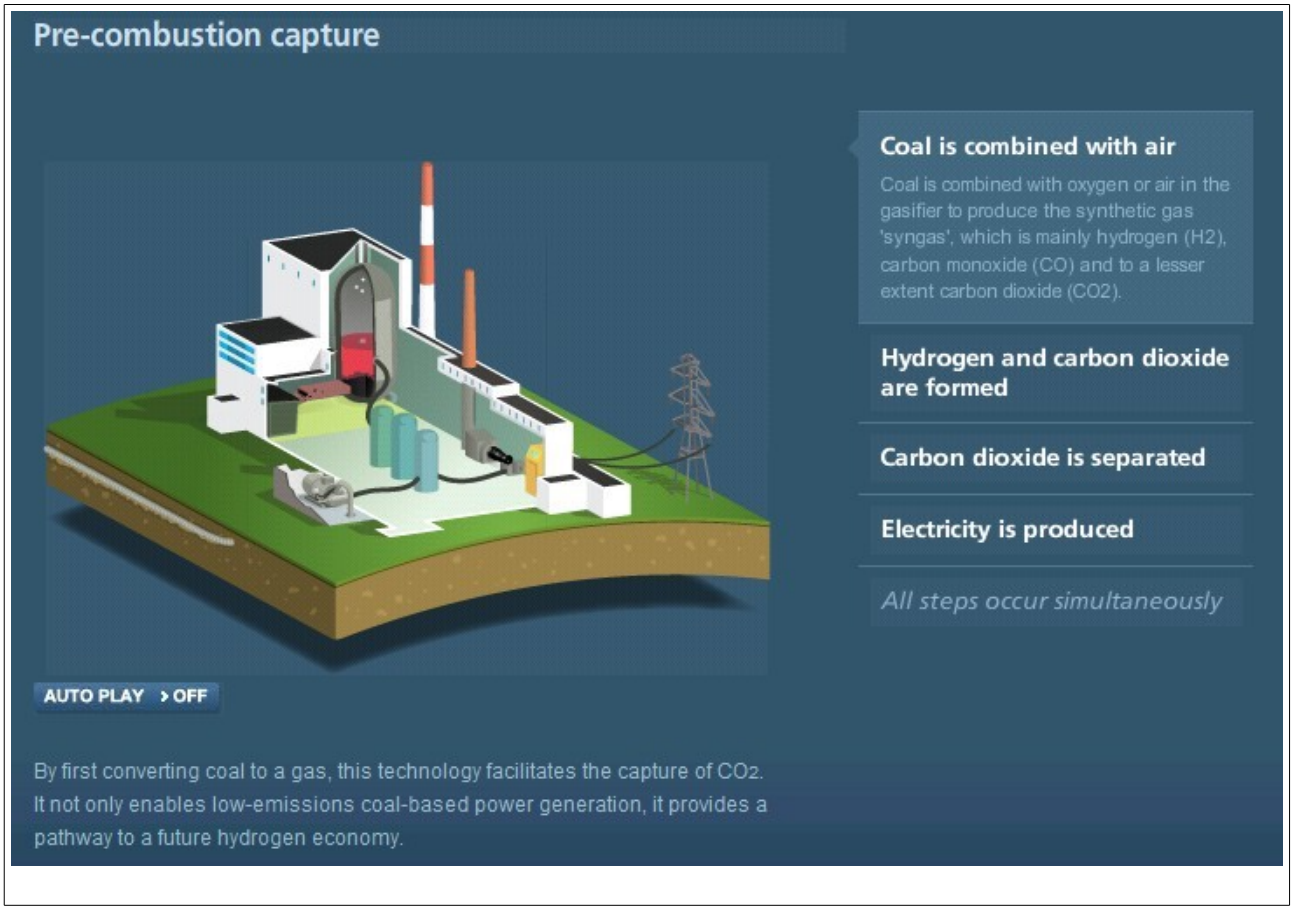
Climate Change and Clean Coal Technologies

Some Questions for the Australian Coal Association



To: Barry Hooper
Sent: Thursday, March 05, 2009 4:15 PM
Subject: Fw: Future Coal and The Carbon Pollution Reduction Scheme

Dear Barry,

I sent the email below to the Australian Coal Association on 17 February, and have not yet received any reply.

However, the ACA newsletter "NewGenCoal News – March 09" provides a link to a media release of 19 February 2009 - **"MAKING CARBON CAPTURE MORE AFFORDABLE"** - that gives you as a contact for further information.

This media release makes some observations -

> One of the barriers to commercial uptake of the [Carbon capture and storage (CCS)] technology is the current high cost, partly due to the amount of extra energy needed, known as the **energy penalty**, when adding carbon capture to existing power stations.
>
> > "Currently about 80 per cent of the cost of CCS systems is in capturing the CO2," said Barry Hooper, CO2CRC Chief Technologist. "Reducing capture cost is therefore the most effective way to make significant savings to the overall cost. Process integration is one of several pathways our research teams are pursuing to drive down capture costs."
> >
> > The CO2CRC team, which included researchers from Monash University, used process integration studies to identify minimum energy targets. They considered the heat and cooling requirements of the power plant and capture plant holistically, rather than individually, and found that initial energy penalty estimates could be significantly reduced.
> >
> > This is the first such comprehensive study in the CCS area and the technique is applicable to both retrofitted and new carbon capture plants.
> >
> > *This work has been performed by CO2CRC as part of the Latrobe Valley Post Combustion Capture Project (LVPCC) under the Victorian Government ETIS Brown Coal R&D fund and in association with consortium partners International Power, Loy Yang Power and CSIRO.*

The underlined passages above show that there had not previously been an effective attempt to quantify important price-performance characteristics of this technology - and yet considerable funds have already been spent on a "Post Combustion Capture Project".

Perhaps you could help with supplying at least some of the information I requested from Mr. Hillman in my email of 17 February. I am particularly interested in a comparison of the CO2CRC analysis you have now carried out for post-combustion CO2 capture - and an equivalent analysis for the pre-combustion CO2 capture configurations. With hydrogen-fuelled combined-cycle electricity generation, the thermal efficiency of power generation is increased to at least 50%. The brown coal power stations for which you have evaluated post-combustion CO2 capture achieve significantly less than 40% thermal efficiency. This means that it is possible that pre-combustion CO2 capture might even result in an **"energy bonus"**, instead of an "energy penalty" that is incurred with post-combustion capture.

Please note the error on the Website of the Australian Coal Association in its description of pre-combustion CO2 capture. This should not be used as a starting point for your analysis of the "energy bonus" or "energy penalty" of a pre-combustion CO2 capture with combined-cycle gas turbine power generation.

The Australian Coal Association's website (http://newgencoal.com.au/solutions_carbon-capture-storage_pre-combustion-capture.aspx) contains the following image -

"Syngas" (also known as "water-gas") is, of course, the product of reacting coal with steam - not air or oxygen. The partial combustion of oxygen and coal is to supply the thermal energy needed for the steam/coal reaction which is endothermic . If air is used instead of oxygen for this combustion then the CO2 capture is made more complicated by the need to deal with the dilution of the CO2 caused by adding large quantities of atmospheric nitrogen.

This misunderstanding about the production of "Syngas" by the Australian Coal Association might help explain the curious investment in coal-drying technology for Victoria's brown-coal power stations. There seems little point investing in coal-drying technology and using energy to dry the coal - when the first step of pre-combustion CO2 capture requires the water (steam) to be added back into the coal...

Please contact me if you have any questions or wish to discuss any of the matters raised in this email, or my email (copied below) to Mr. Hillman. (Contact details are included at the end of the email forwarded below.)

Kind Regards...

----- Original Message -----
To: info@australiancoal.com.au
Sent: Tuesday, February 17, 2009 7:49 PM
Subject: Future Coal and The Carbon Pollution Reduction Scheme

Mr Ralph Hillman, Executive Director,
Australian Coal Association
Level 3, MTAA House
39 Brisbane Avenue
BARTON ACT 2600

Dear Mr Hillman,

I would like to see a draft project plan for the upgrades needed to one existing large coal-fired power station to capture and store CO2.

The draft project plan needs to show the alternatives available and indicative cost comparisons of each. (For example, pre-combustion CO2 capture in one alternative, and post-combustion CO2 capture in another.)

Given the higher efficiency of Combined-Cycle Gas Turbine (CCGT) power generation - the pre-combustion CO2 capture alternative needs to be provided with at least 2 variations:

1. Direct firing of the existing power station's boilers with hydrogen, and
2. Addition of hydrogen fuelled gas turbine(s), with the existing boilers and steam turbines being used as the second cycle of the CCGT configuration.

The existing furious activity researching all manner of "clean(er?) coal" technologies is characteristic of a situation where no clear objective has been identified.
The draft project plan with indicative cost comparisons will help make it clear what steps are needed to clean up existing coal-fired power stations, and which of the possible alternate steps are simply not cost-effective enough to warrant further scrutiny. For example, an upgrade for post-combustion CO2 capture may be 2-3 times more expensive than any of the pre-combustion CO2 capture options.

There is a further important use to be made of the draft project plan -

> The Carbon Pollution Reduction Scheme follows the Kyoto model for global carbon trading and mostly relies upon disincentives with the aim of reducing green-house gas emissions. This objective may be inadequate, and irrespective of this problem, the mechanism upon which it relies can be modified and improved. A good case may be made for Australia to supplement this scheme in ways that have quite different and additional mechanisms, and with a far more prudent objective.

The viability and form of a supplementary scheme depends upon the cost comparisons of the available alternate steps for cleaning up an existing power station...

The supplementary scheme may be able to be devised in such a way that it improves the profitability of coal power stations - and the logic behind it will be difficult to argue against.

Please contact me if you have any questions on this request for information, or if you wish to discuss any of the matters alluded to above.

Kind Regards...