"Clean" coal

What's the story?

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Disclaimer

While much public information regarding "clean coal" technology is biased by commercial interest, this booklet is biased by the authors' view that catastrophic climate change must be avoided.

What is “Clean coal” and why is it being promoted?

- The term “clean coal” means different things to different people. Those who claim that “clean coal” can help solve the global climate change crisis are referring to a process called “Carbon Capture and Storage” (CCS), also known as “geosequestration”. This refers to the capture of carbon dioxide emissions from a coal- or gas-fired power plant or other industrial source, transport via pipelines or haulage, and storage of the gas underground or in the ocean, in isolation from the atmosphere (**1**).

- Coal produces 25% of the world's energy (including transport and heat), and 40% of the world's carbon dioxide emissions from fuel combustion (**2**). Coal is responsible for 88% of Australia's electricity generation, and 75% of Australia's greenhouse emissions from energy (including transport and heat). (**3**)

- Coal exports are both Australia's most lucrative commodity export (**4**), and our biggest contribution to global climate change, producing as much greenhouse pollution as all domestic sources combined (**5**).

- The need to reduce global greenhouse emissions, and the perceived inability to cease or reduce reliance on coal, has lead both major parties in Australia to throw their support behind CCS as their primary response to the challenge of climate change.

How much, and how soon, can CCS cut greenhouse emissions?

CCS is unable to achieve substantial reductions in global greenhouse emissions in the first half of this century, and will not be available in the critical period between now and 2020 when global emissions cuts are essential. Most studies predict that CCS will reduce the amount of growth in emissions until 2050, not reduce actual emissions levels.

- The Intergovernmental Panel on Climate Change has found (**6**) that “With greenhouse gas emission limits imposed, many integrated assessments foresee the deployment of CCS systems on a large scale within a few decades from the start of any significant climate change mitigation regime,” and that “notwithstanding significant penetration of CCS systems by 2050, **the majority of CCS deployment will occur in the second half of this century**” (**7**) [emphasis added].

- The Massachusetts Institute of Technology has calculated (**8**) that **“**With CCS more coal is used in 2050 than today, while **global CO_2 emissions from all sources of energy are only slightly higher than today’s level** and less than half of the [business as usual] level (**9**)” [emphasis added]. The MIT report was premised on the belief that “coal will continue to play a large and indispensable role in a greenhouse constrained world (**10**),” and its conclusions assume “universal, simultaneous participation” with “high CO_2 prices” (**11**). The rises in energy emissions despite falling emissions from coal are presumably due to emissions increases from oil and gas.

- The Australian Bureau of Agricultural and Resource Economics conducted an appraisal (**12**) of the Asia-Pacific Partnership on Clean Development and Climate (AP6), an alliance of 6 nations, including Australia, that are together responsible for around half of global greenhouse emissions. The AP6 aims to facilitate swift development and deployment of energy efficiency and CCS technologies. ABARE predicts that AP6 has the potential to “reduce” global emissions in the year 2050 to between 11 and 23 percent lower than they would otherwise have been (**13**). This translates into a **doubling of greenhouse emissions compared to today's levels**. ABARE's estimate assumes CCS deployment in all new coal plant in Australia, the US, and Japan from 2015, and in China, India, and South Korea from 2020. This seems hopelessly unrealistic, and it should be noted that the Federal ALP's enthusiastic embrace of CCS aims merely for commercialisation by 2030 (**14**). The ABARE study also assumes massive growth in energy consumption and continued dependence on fossil fuels, with a major expansion of nuclear power, and a relatively minor role for renewable energy.

How much, and how soon, do greenhouse emissions need to be cut?

Global greenhouse emissions need to be reduced much sooner and by a far greater amount than is achievable relying on CCS technology.

- Scientists, governments, and civil society groups around the world agree that the **global average temperature cannot be allowed to reach 2°C above the pre-industrial temperature**. At this level and above, the impacts of climate change accelerate greatly (**15**) (**16**) (**17**), and the risk of crossing a climate "tipping point" increase steeply (**18**) (**19**). At the "tipping point", the earth's forests and oceans cease to soak up carbon, and begin to release it instead, triggering unstoppable runaway climate change. The 2° avoidance target has been adopted by the European Union, and acknowledged by the NSW Government and others.

- Depending on who you ask, global emissions must be reduced by between 50% (**20**) and 80% (**21**) by 2050, compared to 1990 levels, in order to keep warming below 2°. **They must peak and begin to decline within about 10 years**.

- Because Australia's per capita greenhouse emissions are among the highest in the world, and because a just solution to climate change requires global per capita emissions to converge at a sustainable level, Australia's emissions need to be reduced far more than the global requirement. **Australia must reduce its domestic emissions by 95% by 2030** (**22**) (**23**).

Other issues with CCS:

– *Problems with capture*

- It is possible to capture most (80-90%) of the carbon dioxide from a coal-fired power station, but it would require the power station to burn 11-40% more coal than it would have otherwise (**24**). This would result in greater quantities of other pollutants being emitted (sulpher, particulates, etc), and would require 11-40% more coal to be mined to supply the same amount of energy, further increasing the impacts of coal-mining on communities, land, water, and biodiversity. Consider also that if coal production in NSW continues to increase at the present rate, reserves will be exhausted in the year 2040 (**25**)

- Retrofitting existing plants with CO_2 capture is expected to lead to "significantly reduced overall efficiencies than for newly built power plants with capture", and would therefore require even more than the 11-40% fuel increase of new CCS plants (**26**).

– *Problems with storage*

- It is known that CCS would leak, in small amounts of about 0.1 to 1% per year. After many years of accumulated carbon dioxide storage, small percentages of leakage would represent large actual emissions, and could exceed sustainable greenhouse emissions levels on their own (**27**). Imagine that all CO_2 emissions from fossil fuels were sequestered from the year 2010 (next to impossible, but this is a hypothetical example), and the sequestered emissions leaked at the rate of 1% per year. By 2060, one year's emissions of leaked carbon dioxide would equal the world's currrent emissions from all sources – 27 Gtpa (**28**).

- This creates profound problems of intergenerational equity and liability. The next generations may well be left with severe climate change fuelled by the leakage of decades of previous generations' greenhouse pollution, and be totally helpless to stop it. Also, since coal-fired power stations operate for only a few decades, whereas CCS storage sites would require monitoring and maintenance in perpetuity, who will assume responsibility for CCS sites once the coal company has moved on?

- The MIT report on the other hand, is "confident" that large scale CCS projects can be operated safely. However the report worries that "no CO_2 storage project that is currently operating has the necessary modeling, monitoring, and verification capability to resolve outstanding technical issues, at scale (**29**)." In other words, we still don't know if it will work.

- The volume of greenhouse pollution that would need to be buried is vast and unprecedented. While CCS proponents often point out that carbon sequestration projects are already in operation, the largest CCS experimentation project in existence (Sleipner, in Norway) currently buries 1 million tonnes per annum (Mtpa) of carbon dioxide (**30**). Current global emissions from fuel combustion are 27 billion tonnes per annum (Gtpa) (**31**). Burying just 3.6 Gtpa per year (or just 13% of present emissions) would require injection of 50 million barrels of CO_2 per day (**32**). This compares with current global oil production of 79 million barrels a day (**33**).

- There is no suitable geology for carbon dioxide storage within 500km of the Hunter Valley and Sydney Basin regions of NSW, or of Port Augusta in South Australia. These regions account for 39% of Australia's greenhouse pollution from electricity generation (**34**).

– *What will it cost?*

- The costs of capture, pressurisation, transport, and storage of carbon dioxide are estimated at about US$30 per tonne. That means that either conventional coal-fired power stations would need to be banned, or a $30 per tonne carbon price would need to be imposed to make CCS economically viable (**35**).

– *Diversion of resources*

CCS is incapable of contributing to the swift and wholesale reductions in greenhouse pollution that are needed, but is receiving full government support to the detriment of other options that can contribute as needed.

- Australia has two government-funded Cooperative Research Centres for CCS research, three CRCs for exploration and exploitation of coal and other resources, but no CRCs for renewable energy, energy efficiency, or demand management (**36**).

What are our other options?

The scale of action required to avoid catastrophic climate change is formidable, but not unprecedented. The effort Australia must make is comparable to the war effort of the 1940's, involving mass public participation and mobilisation of resources. As occurred for the war effort, consumption of energy will need to be rationed. There are very capable renewable energy technologies available that are vital to cut greenhouse emissions, but the rate at which emissions must fall is such that deployment of renewable technologies may not occur fast enough, especially if demand is allowed to increase at present rates. Growth in energy demand must be halted and reversed.

Some options that are already available to make significant reductions in greenhouse pollution are:

- Carbon rationing – setting a quota for our national carbon emissions and distributing the rights to emit that carbon on equitable basis. Such an approach is achieving increasing support around the world, for example by the UK Environment Secretary David Miliband (**37**).

- Concentrated Solar Thermal (CST) technology – focusing sunlight to boil water to drive turbines to create electricity. CST energy can be thermally stored and released as needed, and the Australian CRC for Coal in Sustainable Development estimates that a CST power plant of 35km x 35km in a high sun-incidence, low cloud-cover location could **produce enough power to satisfy Australia's entire present demand** (**38**)**.** That's about the same area that 12 – 25 coal-fired power stations and their associated coal mines would occupy (**39**). The same report also states that CST will be as cheap as conventional coal-fired power when global capacity reaches 5000MW, which may be achieved in 2013.

- Efficiency – stop wasting energy. Considered the quickest, cheapest, and easiest way to cut greenhouse pollution. The European Union reckons it could painlessly save 20% of present energy use (**40**). The Council of Australian Governments' National Framework on Energy Efficiency (**41**) has found that **“energy consumption in the manufacturing, commercial and residential sectors could be reduced by 20–30% with the adoption of current commercially available technologies with an average payback of four years** (**42**)**.”**

One recent report commissioned by Greenpeace found that a combination of energy efficiency and a suite of renewable energy technologies could **reduce global greenhouse emissions from 1990 levels by 50% by 2050** (**43**). This is approaching the 80% reductions that are required, and which could presumably be reached if the strategy in this report was accompanied by stronger efforts to reduce demand and ration carbon emissions.

Another recent report (**44**), by the Centre for Alternative Technology in the UK, went further still, demonstrating in detail how the UK could **reduce its emissions to zero by the year 2027**. The report was the result of a year-long collaboration by over a hundred people and its strategy does not require a return to the dark ages or a decent into poverty. It relies on a total shift to renewable technology (mainly offshore wind turbines) for electricity generation, and a shift to an electric transport system. Through major energy efficiency initiatives and the introduction of a carbon rationing scheme, stationary energy demand is projected to halve by 2027.

Clearly, it is possible to escape reliance on fossil fuels. Indeed, as catastrophic climate change looms, it is imperative.

Discussion and recommendations

There is no room for tokenism, empty rhetoric, or part-way measures when it comes to solving climate change. To reduce greenhouse emissions only partially, or to merely slow the rate of growth in emissions will fail to avert catastrophic runaway climate change as surely as would taking no action to cut greenhouse emissions at all.

All scenarios that rely on CCS to combat greenhouse pollution project emissions to continue to rise for decades to come. When CCS proponents talk of “reducing emissions”, they actually refer to reducing the rate of growth in emissions. Actual greenhouse emissions would continue to grow for many years if governments chose to rely on CCS.

CCS is manifestly incapable of achieving reductions in greenhouse pollution of the speed and scale that are required. If the issues of leakage, liability, and intergenerational equity can be resolved, then perhaps one day in a few decades time – after wholesale reduction in greenhouse pollution have already been achieved – then CCS will have a role to play in keeping emissions at sustainable levels. However, that is a big “if”.

Considering what is known about the scale of greenhouse pollution cuts required, and the inability of CCS to contribute to those reductions, the following policies are needed:

- A moratorium on new coal mines, new coal-fired power stations, and new coal-export infrastructure – at least until CCS can be proven a viable and reliable approach to achieving necessary greenhouse pollution cuts.
- Cessation of public money for CCS research and development, an end to public subsidies for coal exploration, exploitation, and consumption, and the redirection of these funds into deployment of renewable energy, energy efficiency, and demand reduction schemes.
- Government-sponsored studies on the options for alternative employment, economies, and lifestyles in regions where the coal industry now dominates. Such studies should feed into a National/State plan for a Just Transition away from coal, into the identified sustainable alternative industries.
- Legislated targets for reducing State and National greenhouse emissions by the levels required – 80% by 2020 and 95% by 2030, or yearly reduction of an average 4-5%.
- Development of a detailed and independent strategy to achieve those greenhouse targets.

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