

# Carbon Capture and Storage: Essential for our Future or a Trojan Horse for Big Oil?

by Hugh Richards (GlosCAN), May 2018

This was the title given to a Stroud Green Party 'Coffee House Meeting' held at Star Anise Café in Stroud on Friday 13 April 2018. It was organised by Rod Nelson and Martyn Cutcher, and the main speaker was Tim Dixon, who is Programme Manager of the IEAGHG (based in Cheltenham), with a short counter-presentation given by Sarah Lunnon of Stroud Green Party (and member of the GlosCAN Steering Group).

The purpose of this attempt to summarise the event is to try to distil out the main issues from a political/campaigning perspective, rather than get into technical aspects, and to make this summary intelligible (and useful, I hope) to readers who were not present. Apart from my concluding statement, I have tried to keep my own opinions and input out of this account, except where I have felt it necessary. [I have put such personal input in square brackets, like this.]

## MAIN SPEAKER'S BACKGROUND

First, some background on the main speaker, Tim Dixon, and on IEAGHG. [IEAGHG](#) is the IEA Greenhouse Gas Research and Development programme. It was set up by the International Energy Agency, which is an agency of the Organisation for Economic Cooperation and Development (OECD). IEAGHG is funded by industry and governments of OECD and non-OECD member countries. IEAGHG is a research and development organisation focussing on Carbon Capture and Storage (CCS) but does not advocate for CCS. Tim Dixon has worked for IEAGHG for about ten years, having previously worked in a secondment into the Civil Service to help develop the UK and EU regulatory regimes for CCS and before that for the UK Department of Energy's Energy Technology Support Unit, which used to manage government-funded research into various forms of energy, including renewables and hot-dry-rock geothermal. Education and outreach are not part of IEAGHG's mission and Tim was giving of his own time to be involved in this event.

[In that context, it is understandable that the 'slides' he used in his presentation were quite technical and not tailored to this particular audience. He agreed to share the slides with the organisers, and they may be [viewed here](#). I suggest they should be seen as providing a general impression of his presentation, which I think was pitched at the right level for the audience, but did not explain every detail or acronym on the slides. One particular point that could be misunderstood is the reference on Slide 34 to 'Aquifers throughout' as potential 'CO2 sinks' in the UK context. This is referring to 'deep saline aquifers' (see Slide 2), not aquifers with fresh water resources.]

## MAIN SPEAKER'S PRESENTATION (TIM DIXON)

Tim's [presentation](#) (as linked to in previous paragraph) sought to address the

following broad questions:

- 'What is CCS?' [and how is it regulated] – Slides 2-9
- 'Why CCS?'- Slides 10-25
- 'Where is CCS happening?' - Slides 26-35
- 'What are the challenges to CCS?' - Slide 36.

In addressing the 'What is CCS?' question, the presentation was evidently intended to provide confidence that deep injection of CO<sub>2</sub> into geological strata is a routine operation in the current oil and gas industry, that significant leakage back to the surface will not be an issue, and that CCS is and will be more tightly regulated than the oil and gas industry.

In addressing the 'Why CCS?' question, the presentation emphasised that the global 'energy' and 'industry' sectors account for over 50% of current greenhouse gas emissions, mainly from 'point sources' of CO<sub>2</sub> that could be amenable to CCS. These include electricity generation from fossil fuels and manufacture of steel, cement and chemicals. In future, CCS combined with bio-energy (BECCS) could be a significant 'Negative Emissions Technology' that removes CO<sub>2</sub> from the atmosphere. Tim also mentioned 'direct air capture' of CO<sub>2</sub> from the atmosphere, but described that technology as 'not yet available'.

In addressing the 'Where is CCS happening?' question, the presentation was evidently intended to convey the message that there are numerous pilot and demonstration-scale CCS projects around the world, with a wide variety of CO<sub>2</sub> sources, CO<sub>2</sub> capture technologies, and CO<sub>2</sub> end-users.

The final main Slide (No. 36) presents challenges faced by CCS in going from demonstration scale to the huge number of 'full scale' schemes that would be needed for CCS to play anything like the role envisaged in the IPCC's scenarios for meeting the Paris Agreement goals. [I think it would be fair to say that Tim identified the single largest factor as the first one listed, namely the 'low or inexistent carbon price'; that is, the failure of the true costs of fossil carbon emissions to be borne by either the producers or users of fossil fuels, cement, etc.]

## **COUNTER-PRESENTATION (SARAH LUNNON) AND RESPONSES**

Sarah's presentation considered the following basic questions:

- Does CCS work?
- If so, why has uptake been so slow?
- Do we really need CCS?

[I will present Tim Dixon's subsequent responses inter-leaved with Sarah's questions.]

Addressing the question 'Does CCS work?', she asked what proportion of CO<sub>2</sub> is captured. Tim Dixon responded that this is typically about 90%. She also noted that Greenpeace oppose CCS, claiming leakage from demonstration sites. Tim

Dixon referred to the IPCC's report (Slide 7) that concludes that more than 99% of injected CO<sub>2</sub> would be retained over thousands of years, with the CO<sub>2</sub> becoming more permanently trapped over time (Slide 4). Sarah expressed scepticism about industry assurances of minimal leakage, citing the recent diesel vehicles emissions scandal as evidence that industry cannot be trusted to quantify emissions honestly.

In addressing the question 'Why has uptake of CCS been so slow', Sarah seemed [to me] to be assuming that this was to a significant degree due to lack of confidence in the technology. Tim Dixon responded to the effect that the main reason is a lack of effective policy by Governments; industries (including oil and gas) will only do CCS at scale if incentivised by financial rewards ('carrot') or compelled to do so by regulation ('stick').

[The 'carrot' for many CCS demonstration schemes often includes economic use of the CO<sub>2</sub> for enhanced oil recovery, which is at best a 'niche' market and at worst resulting in further CO<sub>2</sub> emissions from the additional oil produced.] Tim Dixon also noted an unexpected recent announcement by the US Government on new tax incentives for CCS. [One industry observer (David Hone at Shell - [blog](#)) has described this as a 'game-changer' for CCS.]

'Stick' approaches to compelling CCS mentioned by Tim Dixon include the 'Lula' project (Slide 30), where the Brazilian government would only permit exploitation of an offshore natural gas reservoir with high CO<sub>2</sub> content if the CO<sub>2</sub> extracted with the hydrocarbon gas is separated and re-injected. [However, this does nothing for the CO<sub>2</sub> emissions from use of the extracted natural gas as fuel.]

Addressing the 'Do we need it?' question, Sarah challenged the assertion made by CCS advocates that there are some industrial sources of CO<sub>2</sub> emissions that cannot be substantially reduced without CCS, such as manufacture of steel and cement. She suggested that as the costs of renewable electricity generation fall, it should become economic to use 'surplus' renewable electricity to generate hydrogen which could be used in an alternative steel-making process, and that this was being pursued in Sweden. [I think this may have gone outside Tim Dixon's knowledge base, and he did not respond on this.]

It had been identified earlier in the evening's proceedings that Green Party policy supports CCS in certain contexts. However, in summing up, Sarah suggested that taking CCS forward may be an unnecessary risk.

## **Q&A / DISCUSSION AND FOLLOW-UP**

The Q&A/Discussion session following the presentations was very diverse and I will not attempt to summarise it.

After the event, Rod Nelson (Green Party) and Fred Miller (GlosCAN) wrote some personal reflections, appended below, and Tim Dixon wrote a short [blog-post](#) on the IEAGHG website, the text of which is also appended below.

Following up on a question I asked about the possibility (raised in Tim Flannery's book 'Atmosphere of Hope') of intrinsically stable CO<sub>2</sub> hydrate sequestration in deep ocean-floor sediments, I forwarded the relevant [technical paper](#) to Tim

Dixon, in case IEAGHG need to be more aware of it.

**Rod Nelson wrote ...**

*'The most powerful message for me out of last night's meeting was the notion that, were CCS required by governments to be implemented at major power stations and other important emission locations, it would substantially increase the price of electricity. In a fair and competitive energy market, this course of action would strongly favour renewable energy implementation and renewables research. The renewable energy providers have shown themselves to be capable of significant and increasing contribution to an energy mix. Renewables are both cheaper and more important than the entrenched and vested interested-driven power industry has painted them for decades. The word 'baseload' has been bandied about, often untruthfully, as an important objection to renewables without the major structural investments required to overcome the problem. The nuclear industry seems to have opportunistically stolen the crock of gold. Looking at the emissions debate from another perspective, it is a dereliction of responsibility to future generations on the part of any government which has a stated commitment to CO2 emission reduction NOT to require installation of CCS at major emission sites.*

*It looks as though CCS - for all its awkward problems, imperfections and difficulties - should provide a powerful campaigning point in favour of renewables. If a government level commitment to CO2 reduction is anything more than hot air, fear of energy price rises are probably preventing CCS implementation. In effect, government fear over short term energy price rises is subsidizing the fossil fuel industry at the expense of non-emitting technologies which would provide the long term lowest cost option.'*

**Fred Miller wrote ...**

*'I felt Tim Dixon put the case very well and made useful positive points.*

*He was criticised by some in the audience for not accepting that soil carbon can have a CCS role, in response to which he quoted the IPCC who state that it is not known how long carbon would stay in the soil, above a few centuries. For what it is worth, I think that soil carbon does have a role to play (especially if peat-growth in wetlands is included in the equation) but just as a part of a whole array of actions we need to take, including probably, in my opinion, CCS.*

*Tim Dixon pointed out that CCS is framed as having a role in several different ways:*

- Firstly, to pump down and help get oil/gas out of the ground, thus partially offsetting that fossil carbon emission.*
- Secondly, linked to permissions (e.g. Brazilian example) for oil, gas or coal extraction, in order to partly or completely offset that fossil C emission.*
- Thirdly, as bio-energy with CCS (BECCS), which is a plant crop, grown and then burnt to give energy, whilst the carbon dioxide, from its burning, is*

*captured and stored.*

*He made the point that the sustainability of bio-energy and BECCS is questionable because it could displace food growing, forests and other carbon stores.*

*He also explained that:*

- some industries (cement and steel) need a carbon source to make their product, not just as a source of energy.*
- the initiative for CCS has not come from the fossil fuel companies, rather it is from limited government grants, which is why it has not developed further.*
- the process of pumping CO<sub>2</sub> into rocks does not have the risks of fracking: there is no fracking fluid, and nothing comes out as a result of CO<sub>2</sub> going in.*
- there is a possibility of the CO<sub>2</sub> re-emerging, but there is no evidence that it does yet, if it is within the right rocks layers with an impermeable cap layer over it. Studies are now being undertaken to assess natural CO<sub>2</sub> emission from volcanic areas, and how it comes about.*
- the CO<sub>2</sub> when pumped into appropriate water-permeable rocks, dissolves in the water that exists between the particles of rock. And over time, (a portion of?) this CO<sub>2</sub> in solution reacts with minerals and forms solid carbonates, which are very secure as a solid for millions of years in the rock.'*

*In addition to the above, Sarah Lunnon's counter-presentation contained, amongst other points, one particular phrase about an elegant solution to the problem of extracting energy from fossil fuels and using some of that energy to put the carbon back into the rocks which I thought was rather good. Her words roughly were: '....surely the elegant solution to getting carbon into the rocks is to leave it in the rocks!.. surely that is the most energy efficient way of doing it.'*

***Tim Dixon wrote... (blog-post on [www.ieaghg.org](http://www.ieaghg.org))***

*I was invited to give a talk to a local Green Party meeting who wanted a debate on CCS. This was the Stroud Green Party, Stroud being a town in the scenic Cotswold Hills known for its number of green councillors, independent spirit and high level of environmental awareness. They titled the debate "CCS - Essential for our future or a Trojan horse for big oil". They have recently been campaigning against a waste to energy plant (now being constructed) which prompted me to get more up to speed on the interesting Norwegian work for the Klemetsrud plant in order to share with them. It was an interesting evening, friendly, but with strongly-made counter-points against CCS by a Green Party member in the debate, and a somewhat sceptical audience. I was given fair opportunity to respond to all the points made, and to the many good questions from the audience. I could see a twinkle in their eyes when they realised that fitting capture on coal and gas power plant would raise their electricity prices and so may assist renewable electricity's competitiveness. After the lively debate had ended, I was most surprised to be informed that a 'straw poll' had been taken and*

*found all asked now wanted the Green Party to support CCS. Nice feedback to receive! Also, this is the official policy position of the UK's Green Party, to most members surprise. Many thanks to the Stroud Green Party for an interesting and lively debate.*

## **PERSONAL CONCLUSION**

I have written before on the subject of CCS, in items linked from a recent [GlosCAN blog-post](#) (scroll down to November 2016). Before the event, I was (despite my geological background) unsure about the technical feasibility of CCS, and I found Tim Dixon's presentation helpful in that regard.

In light of the event, I still think that climate campaigners should advocate strongly for the true costs of fossil carbon emissions to be borne by the producers of fossil fuels and hence by their users. One sign that a 'carbon price' has reached the right level might be large-scale roll-out of CCS, whether in response to 'carrot' or 'stick' incentives/enforcement. That said, in a truly carbon-constrained global economy, a carbon price that makes CCS self-funding may make fossil fuel use with CCS uneconomic in comparison to other energy sources; principally renewables. The use of fossil fuels with CCS in coming decades might then turn out to be a lot less than the IPCC scenarios for meeting the Paris goals envisage.

However, as long as carbon prices are allowed to remain so low as to be ineffective, and unabated fossil fuel extraction and use remain not only legal but positively encouraged by many governments, I am not optimistic that this will happen.

Curiously CCS is not included among even the 'regrets' technologies reviewed by Paul Hawken and others in the '<http://www.drawdown.org/>' project. Given that they include 'waste to energy' among the 'regrets' technologies that they see a need for, I do not understand the rationale for omitting CCS.

Finally, at the risk of showing my ignorance, I confess that, immediately after the event, I was struck by the thought that the much-hated 'waste to energy'/incinerator plant being built at Javelin Park might in time be re-purposed as a biomass power plant with CCS, perhaps with a pipeline taking the CO<sub>2</sub> to gas tankers/barges on the Gloucester-Sharpness ship canal that would take it away for injection into depleted gas reservoirs in the Irish Sea. Now there's a pipe-dream! Yet it's not so different from what is planned in Norway (see Tim Dixon's Slide 35).