THE NEW POWER INTERVIEW

Dr Jeff Chapman, director of the Carbon Capture and Storage Association (CCSA)

Carbon capture and storage (CCS) is seen as a technology that promises much for a world wanting to reduce its carbon emissions. However, there are very few proven examples that demonstrate that it can deliver at a large scale...yet. The UK Government wants to encourage more CCS plant and as *New Power's* latest monitor shows (see issue 39) there are plenty of planned power projects that intend to use CCS. *Dr Jeff Chapman* is one of the technologies' most articulate advocates and has seen interest in CCS ebb and flow over the years. *Dr Dominic Maclaine* asked him what has to happen for the technology to deliver at a large scale?

Another year, another launch of a carbon capture and storage (CCS) competition it seems. Well perhaps not every year but for much of the previous decade or so the incumbent government seems to have very publically launched a competition for CCS developers, which then has, quietly, died a death.

And, seemingly oblivious to the rather inauspicious conclusions of previous competitions, in April this year, the Coalition Government launched another one. And to show that they are deadly serious this time not only did they avoid launching it on April Fool's Day (just – it was a Sunday) they also launched a UK CCS Roadmap to boot. They mean business it seems.

So why then when asked why so many CCS competitions have not delivered, does the CCSA's director start laughing?

"Because it's difficult," Dr Jeff Chapman chortles.

He then becomes deadly serious and cites reasons why the competitions have failed.
The lack of a robust price for carbon is the first reason he gives first. "The price of carbon has clearly not delivered in the EU Emissions Trading Scheme (ETS) but it has also failed to deliver in other trading schemes elsewhere in the world most notably in the US."

He notes that the EU ETS is in nowhere near sufficiently robust enough to base investment decisions on even though carbon capture is recognised in the Clean Development Mechanism (CDM) and the price of Carbon Emission Reduction certificates (CERs).

However that could soon change in the UK he believes.

"The UK Electricity Market Reform (EMR) programme recognises that and the incentives to build projects in the UK will be based on CfD (Contracts for Differences) Feed-in Tariff (FiTs) for clean electricity. Of course it has yet to be proven but at least CfDs have got a track record in other areas. CfDs have been applied in other countries and there are plenty of examples where CfDs have been part of the marketplace. We all know that FiTs work, even Renewables Obligations work - either way it is putting a value on clean electricity.

"But unlike other technologies such as renewables there has so far not been a system of incentivising investment in CCS projects by paying for each clean kilowatt hour of electricity produced," he says. "That distinguishes the system that is being adopted in the UK from that which has been adopted elsewhere in the world.

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"We need a market mechanism," he says bluntly. "We have chosen in the UK to move away from the Renewables Obligation to a feed in tariff system and I think we could see a FiT system for CCS."

And if the government gets it right the UK could lead the way to a global take-up of CCS he believes.

"I think other countries are now looking to the UK and the methods that we have adopted to support CCS in the power sector," he says. "Not only is it important to us to make a success of this for our own benefit but also the eyes of the world are on the UK to demonstrate that CCS will be financeable through this method."

First of a kind costs

Chapman approves of the government's CCS commercialisation programme in the UK which hopefully should go some way to tackle the big, first of a kind costs associated with building CCS plant.

The programme is part of the CCS roadmap and will provide £1 billion to reduce the cost of CCS so that it can be deployed in the 2020s. The support will be provided through a combination of direct capital grants and projects being able to earn revenue from the sale of their low carbon power in the reformed electricity market.

The European Commission's NER 300 Programme has also made funding available. In the first phase (funded from the sale of the 200 million EU emissions allowances) the NER is intended to support up to eight CCS and 34 renewable technology proposals across the EU. The UK submitted seven UK CCS applications for consideration under the NER process, although one (Longannet) was later withdrawn.

The NER will support a maximum of three projects in each country. However, the low carbon prices seen in the last few months mean that the total amount of NER funding is likely to be lower than was originally anticipated, and the total number of CCS projects that will be supported is likely to be much less than originally planned.

However aside from lower than anticipated carbon prices Chapman believes that CCS developers faces some daunting challenges. "The obvious one is that the technology has not been put together in such large pieces so far and in an integrated way. There are a lot of commercial risks attached to that which are also very big."

The challenges for developing CCS are even greater perhaps than those faced by renewables - even offshore wind he believes.

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"If you want to prove renewable technologies you can do it on a small scale," he says. "There have been plenty of CCS pilot plants built and we all know that it can be done but we've now got to move into big investments. It is an order of magnitude bigger than most renewables. It's even much bigger than offshore wind and even offshore wind is based on a well proven technology. Windfarms have been proven to work - the question is how to make them stand up in a marine environment. They may even face bigger challenges than CCS projects."

Infrastructure dilemma

The other big investment needed for CCS is the associated infrastructure – the pipes and stores that will be used to deal with the CO_2 produced by the power plant.

"That is a big first of a kind cost," says Chapman. And the dilemma faced by government and infrastructure providers such as National Grid is how to address economies of scale he says. The plan at the moment is to connect up plant that are clustered together - one is mooted in the north east - connect them all up and pipe the CO_2 off to be stored under the north sea probably – the most likely sites are depleted oil and gas fields or saline aquifers. It sounds logical but it is far from easy, believes Chapman.

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"There is no point in laying small pipelines for just one plant," he says, "you may as well lay big pipelines so that you can put other CO_2 into it. But there is no point in building a big pipeline unless at the end of the pipeline you have got a store that has been proven in some way to store many tens of millions tonnes of CO_2 per annum over many decades. That is quite a tall order."

A lot of desk studies have been carried out recently that have looked at how and where to store the CO_2 he says, citing the work carried out by the Energy Technologies Institute, but the work now needs to move up a level, he believes.

"We have got a lot of geological information from around our shores," he says. "But a lot of effort now needs to be put into identifying storage strategically and proving this out. Once we get the pipelines and stores laid in to position not only is the basic investment accounted for but also a lot of the risk is ameliorated."

He thinks that there are no technical difficulties about monitoring and verification of CO_2 storage.

"The biggest issue for storage is that of the commercial risk and of being able to inject CO_2 into a store over the lifetime of a project which might be for decades."

Massive carbon benefits

Power plants using CCS consume more energy than normal power stations, since a high proportion of energy is used during the capture phase however the carbon benefits of having a pipeline infrastructure in place could be massive and less expensive, in terms of carbon saved, than investing in offshore wind farms he says.

"If you look at the large sources of industrial CO_2 around Humberside for instance there are 60 million tonnes that are easily identifiable," he says. "But given the right infrastructure around there you could collect 50,000,000 tonnes of CO_2 annually and dispose of it for storage. That is 10% of the U.K.'s emissions in one go. That is the biggest emissions cluster in the UK but if you started to apply the same logic around all river estuaries, which are where the emissions tend to be clustered, then you can make a huge dent in the UK's emissions at a good price."

Chapman estimates that the UK is probably paying £200 a tonne of CO_2 to offset carbon emissions by building offshore wind farms and £500 per tonne of CO_2 by using photovoltaics. He calculates that, using government and Committee on Climate Change figures, the cost of capturing CO_2 from a steelworks on Humberside could be about £60 a tonne.

"If you are spending £200 a tonne through one policy, £500 a tonne through another policy why on earth aren't we getting on and saving emissions at a much lower price where we can -especially now because there isn't much money around.

Action is needed quickly he believes. "The sooner we get on and get that infrastructure in place, the sooner we will be able to benefit from low cost emissions reduction."

A national good?

Having such a network of pipelines and stores was deemed to be a 'national good' and should be treated as such concluded a committee led by Lord Oxburgh convened by Charles Hendry when he was in opposition.

So should new incentives be put in place to achieve this? Chapman is aware that that action must be taken quickly. Is it still possible to achieve the UK Government's carbon reductions target and cut 300,000,000 tonnes a year of CO_2 by 2020?

"Not by 2020," he says. "300 million tons is half of the emissions of the UK and that is not going to be achieved by 2020. That is potentially a 2030 target. The CCC has said that if you want to achieve this the kind of cuts that are necessary you really have to attack the sector which you can do something about first - which is the power industry which have to be decarbonised by 2030. And if we're going to do that a large proportion of that will have to be CCS. We are not going to end up at 2030 with just a whole lot of renewable and nuclear plant, there has got to be lots and lots of fossil fuel plant including a lot of new gas plant all with CCS."

Chapman says the CCSA estimates that to decarbonise the power sector by 2030 would imply that between 20 and 30 GW of new fossil fuel plant will have to be fitted with CCS. "In reality it may have to be more than that because the contribution from nuclear is uncertain. We have already seen that Eon and RWE have pulled out of the Horizon project (see feature page 6) so there remains a question mark there."

Currently about 20% of the UK's electricity is comes from nuclear power. "That is going to tail off very rapidly if we don't get some new plant built so there is a big gap to fill there. Everywhere in the world investment is needed in power generation but no more so than the UK. It really is becoming absolutely critical."

Personal profile

Dr Jeff Chapman established the CCSA in 2006 with a group of 11 founder members. Since then the Association has grown to include 70 organisations consisting of representatives from oil and gas, power generation, coal, steel, cement, industrial gases, pipeline operators, shipping lines, equipment suppliers, contractors, management /environmental /engineering consultants, finance, insurance, law, regional agencies and academic institutions.

Dr Chapman currently sits on various committees, steering groups and advisory boards in the UK, Europe and internationally