

Energy

Carbon capture

The government has been frustratingly lukewarm on carbon capture and storage technology, but there are some hopeful signs, finds **Tanya Blake**

Carbon-capture technology has been maturing over the years, with several large-scale pilot tests occurring around the world, capturing ever more carbon. So what's holding it back from commercialisation?

One company that holds a prominent position in carbon-dioxide separation technology for industrial processes is Carbon Clean Solutions Ltd (CCSL). The company's patented APBS chemical significantly reduces the environmental impacts of power plants when compared with other CO₂ separation techniques; it is proven to capture 90% of CO₂ and can drive down operating expenses of power plants by 30%.

Moreover, the non-corrosive properties of CCSL's chemical allow power plants to be designed and built with carbon steel, which is four to five times cheaper than stainless steel, so there is less capital expenditure for investors.

"People say carbon-capture costs are too expensive – so that is one of our main focus areas," says Prateek Bumb, director at CCSL. "Now we have developed a molecule that has reduced the expense by 50%."

CCSL's drop-in chemical has been proven at pilot scale in the UK, US, Germany, the Netherlands and India. In November 2015, the company launched a pilot programme alongside Norway's Statoil at Technology Centre Mongstad (TCM), the world's largest carbon-capture demonstration facility.

"CCS costs have been falling over a period," says Aniruddha Sharma, chief executive of CCSL. The best technology in the market would be around £60-£65 per tonne of carbon capture. We are already around £40 per tonne, and that's where we are offering commercial guarantees to the customer."

Sales potential

For many in industry, a good motive to invest in carbon-capture and storage (CCS) technology is being able to sell on, or reuse, the CO₂ that they capture from their industrial processes. A grant from the US Department of Energy is allowing CCSL to build a large-scale carbon-capture plant, integrated with a reuse plant to demonstrate the concept, targeting customers who need cheaper CO₂ as a raw material, says Bumb.

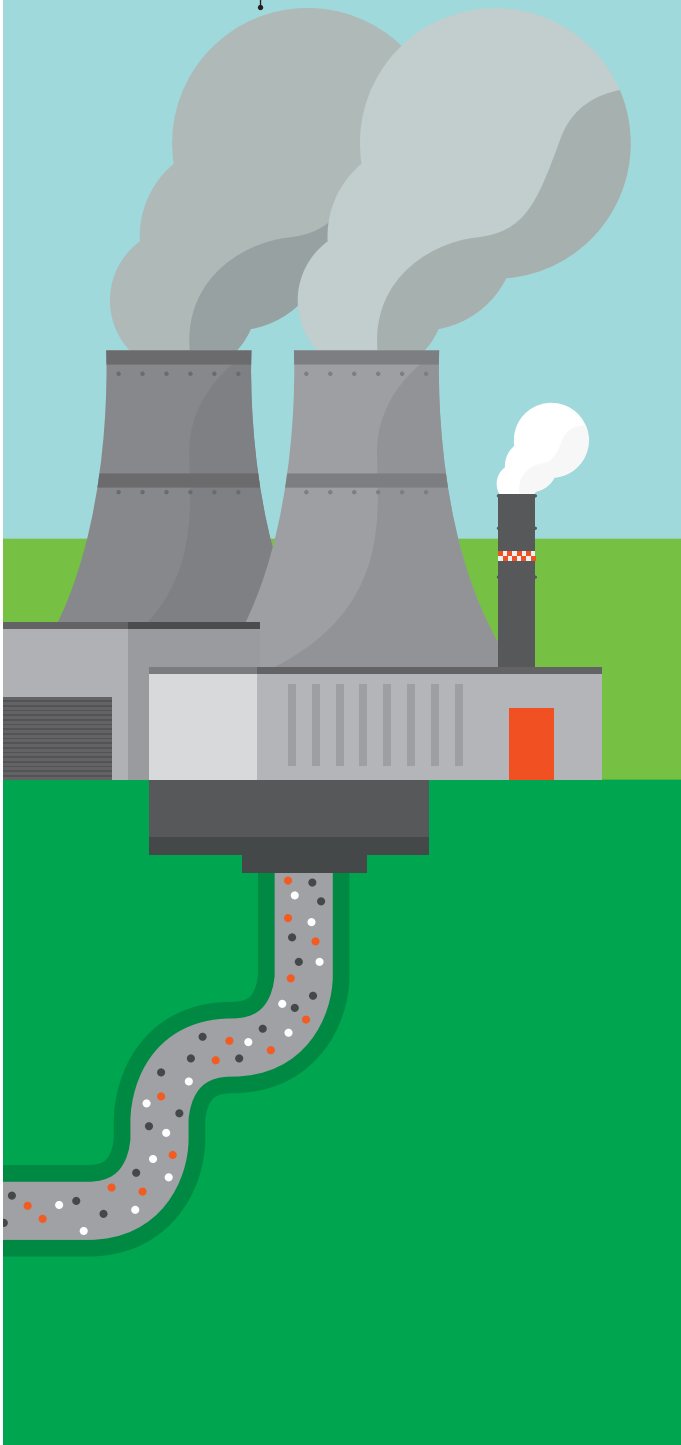
"There is a lot of concern with people considering carbon-capture plants on how to get their money back," says Sharma. "We say it can take around eight years for the investors to get the money back. However, anyone who is interested in investing to make industry clean and green can certainly look at our capture and reuse project as one of the ways of doing this."

CCSL agrees that one of the biggest issues facing the industry is finding money for CCS projects. "There are no private equity investors, as it is too risky for them at this time. The UK government CCS competition funding stream has gone as well," says Sharma.

"For people creating the



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policies, it would be great to see how a fund structure could be created that gives sustainable financing for these plants that promise to return the money. We don't want grants; we want cheap loans. Today, even if you show a 15% return on investment, no one will invest – they say it is too risky.

“For customers running these industries, for them to invest in such projects on their own balance sheet is horrific. Infrastructure works by bringing some equity and leveraging it against some kind of debt, but there is no leverage.”

However, in Norway, there is government backing. CCSL's pilot programme at TCM has received 75% of its funding from government through Gassnova and 20% from Statoil, with 2.5% each coming from Shell and Saso. Because CCS is not yet a commercial industry, it is dependent on a “large degree of government support”, says Vegar Stokset, spokesperson for TCM. Norway has been an early mover in this field. More than 20 years ago it introduced a carbon tax for CO₂ emissions, which triggered a stream of research projects. Around \$200 million has been spent on CCS

research in Norway, along with investment in the TCM test centre. There are plans for three full-scale CCS projects, with a decision on investment due to be made by the Norwegian government this month.

“Both the International Energy Agency and the Intergovernmental Panel on Climate Change have said

that you cannot reach 2020 CO₂ reduction goals without CCS,” says Stokset. “We believe the best route towards commercialisation is for the politicians to increase the price of CO₂ emissions, and for vendors to make CO₂ capture more efficient and cost-effective. TCM is providing an arena for vendors to do that.”

Mixed signals

Sadly, for the UK, the promise of a clear CCS funding strategy from the government is lacking since its abrupt cancellation of the £1 billion CCS competition in December 2015, which ended two big commercial projects. Since then, the government has claimed that it still supports CCS and that it hasn't “closed the door”, yet many in the industry have reacted to these claims with scepticism. While the government agreed in February to implement a national strategy for CCS by June 2017, industry and investors are

waiting for action with bated breath.

Luke Warren, chief executive of the Carbon Capture and Storage Association, says:

“There are a number of projects still going on in the UK, including the CCS coal-gasification power station in

Grangemouth, Scotland, and the Sargas Don Valley project in Yorkshire. Given the lack of signals coming from government, people are not investing a great deal and progressing those projects.”

Warren concedes that the government has been helpful in reiterating that CCS for the power

‘You cannot reach 2020 carbon dioxide reduction goals without CCS technology’

DID YOU KNOW?

Delaying the development of carbon capture and storage in the UK **will add an estimated £1-2 billion a year** throughout the 2020s to the otherwise best-achievable cost for reducing carbon emissions, according to

THE COST OF DELAY



research by the **Energy Technologies Institute**. Delay is also likely to increase longer-term costs, adding **£4-5 billion a year** to the otherwise best-achievable cost of reducing emissions in 2040 – **even after deploying CCS in the 2030s**.

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Act now, urges MPs' committee

The Energy and Climate Change Committee's report, **Future of Carbon Capture and Storage in the UK**, recommends that the Department of Energy and Climate Change tackle the challenges of CCS infrastructure early on.

It says the department should assess the financial and other benefits of using our existing North Sea infrastructure. It



also advises engaging with the **National Infrastructure Commission** to explore options for the development of CO₂ transport and storage. Government has since invited **Lord Oxburgh, who wrote a report in 2009**, The Arrangements Needed to Develop the Infrastructure for CCS in the UK, to form a CCS advisory group.

sector is still an eligible technology in Contracts for Difference, the renewable energy scheme for the electricity market, giving at least some projects a route to market. Still, he wants to see a clearer, all-encompassing strategy from government.

Many of the strategies he would like to be implemented are echoed in the Commons Energy and Climate Change Committee's report to parliament, the *Future of Carbon Capture and Storage in the UK*. In the report, which was written in response to the government's cancellation of its CCS competition, committee chair Angus MacNeil warns that, if we don't invest in the infrastructure needed for CCS now, it will be much more expensive in the future to meet our climate-change targets.

Questions over gas plants

The government's push for cleaner gas-fired power stations, while phasing out coal, has also been called into question in the report. "Gas-fired power stations pump out less CO₂ than ones burning coal, but they are still too polluting," says MacNeil. "If the government is committed to its climate change pledges, it cannot simply wait and see if CCS will be deployed when it is needed. Getting the infrastructure in place takes time, and the government needs to ensure that we can start fitting gas-fired power stations with CCS technology in the 2020s."

The government has said that all new gas-fired power stations must ensure that CCS plant can be retrofitted. However, Warren says there is a feeling in the industry that the carbon-capture readiness requirement is not effective. "I think that there will be lots of gas plants built with no expectation that they will be able to be retrofitted with CCS," he says.

He is also concerned with how government will support CCS for energy-intensive industries and for low-carbon heat, in the same way that renewable heat is supported by the Renewable Heat Incentive.

MacNeil is of the same opinion, stating that government "must let investors know when CCS projects will be able to apply for guaranteed-price contracts alongside other low-carbon energy schemes".

The committee stresses that the Department of Energy and Climate Change must urgently devise a new strategy for CCS, with a new gas strategy, that tackles issues of transport and infrastructure storage and boosts investor confidence. The risk of not

acting quickly, it warns, will result in the loss of knowledge, investment, assets and expertise in the UK.

Warren adds that what is key for CCS and energy-intensive industries is whether, for heat or power, projects can share infrastructure to drive down costs. This approach is being taken by the Teesside Collective business group, which is forming a cluster of energy-intensive industries working together to build one of Europe's first clean industrial zones.

Neil Kenley, director of business investment at Tees Valley Unlimited, one of the members of Teesside Collective, says: "Our work is a collective endeavour with support within Teesside, financial backing from the government, collaboration with other industrial clusters on the east coast, and support from environmental and business groups alike."

The collective is undertaking scoping work on the opportunities offered by carbon usage, hydrogen and other options for decarbonising industries. The collective has received government support for this work.

"Our objectives are aligned with government's, focusing on decarbonisation and economic growth, so we are confident that we can push forward with the project despite recent policy uncertainty," says Kenley. "For example, Teesside Collective could play a significant role in the Northern Powerhouse initiative."

Following dealings with the All-Party Parliamentary Group on Carbon Capture and Storage, he believes there is an understanding in government that industrial decarbonisation is crucial to meeting emissions targets while providing a stimulus for economic growth.

"CCS has supporters in academia, business and government who understand the issues, and Teesside Collective is well positioned to lead the way in solving them."

The organisation will continue working to influence the formation of the government's policy on CCS and industrial decarbonisation more generally, to retain storage infrastructure and to rebuild investor confidence. "If nothing is done in 2016, valuable infrastructure related to the cancelled CCS Commercialisation Programme, which could reduce the cost of large-scale decarbonisation, may be lost," says Kenley. "This loss would delay by several years the decarbonisation agenda for power and industry, rendering cost-effective carbon reduction in the 2020s unachievable. By delaying decommissioning of the Goldeneye North Sea reservoir and the National Grid's Feeder 10 pipeline, vital infrastructure could be preserved for the nation."

There are many voices warning of the risks of not investing in CCS now, but it remains to be seen how hard the government will listen. ■

\$200m

Norway introduced a carbon tax for CO₂ emissions more than 20 years ago, which triggered a stream of research projects. Around \$200 million has been spent on CCS research there to date