With private investors being slow to support carbon capture technology, the government is hoping to kickstart the sector with a scheme that helps to pinpoint the most promising sites. **Tanya Blake** investigates

Priming the pump

A geologist and geophysicist peer, Lord Oxburgh, recently warned that the world cannot meet its carbon targets without using carbon capture and storage (CCS) technology.

However, the UK private sector has dragged its heels on investing in a potentially costly and risky industry, leaving the country in danger of falling behind in its goal of an 80% drop in greenhouse gas emissions by 2050.

To remedy this delay, a scheme has been launched to assess hundreds of potential offshore CCS sites around the UK, helping to de-risk and speed up private investment in future projects.

In late 2014, the Energy Technologies Institute (ETI) put out a call for the project – which is funded by the Department of Energy and Climate Change (DECC) – and recently announced that Pale Blue Dot Energy, Axis Wells Technology and Costain were best placed to answer it.

The appraisal project will be building on previous work that ETI funded that mapped out all the potential stores in the UK continental shelf. These stores are now detailed in the "CO_2 Stored" database managed by The Crown Estate and the British Geological Survey. The main goal of this new project is to select five 'premium' carbon dioxide stores from the hundreds already identified, says Den Gammer, ETI's CCS strategy manager. Having begun in May, the partners will have just 12 months to carry out the assessment process.

"Detailed appraisal on these five sites will be carried out, to increase confidence that the UK has secure, low-cost storage options beyond those being examined in DECC's CCS commercialisation competition. These will be used to plan options for extending the early projects, and confirm the declining cost pathway for CCS projects," he says.

The data collected by the project on the rock structures in which the CO_2 will be stored, the sealing cap rock and other features of the stores will be modelled and analysed to assess the stores' capability to securely contain CO_2. "Modelling also tells us how much CO_2 the store can contain and how fast it can be filled, and estimates the growing 'footprint' of the store as it develops," adds Gammer.

This 'de-risking' process is structured to ensure that all key issues are fully addressed before the store is progressed to commercialisation, with an invitation to the broader CCS community to comment on the progressing work at major decision points, he says.

Sharing data

Once complete, the outcomes from the work will be published and the quality, cost and availability of the stores shared with companies so they can complete appraisal, engineering and development plans for these stores. The aim is also to show any companies interested in capturing CO_2 onshore that there are "more than adequate storage options offshore to meet their needs", says Gammer. "The project is an excellent start on

'Detailed appraisal on these **five sites** will **increase confidence** that the UK has **secure, low-cost storage options** beyond those examined in DECC's CCS commercialisation competition'

Energy
Carbon capture and storage

maximising use of CCS as a way of addressing the UK's emission targets, and is aimed to put us on track to store the CO_2 output of around 10GW of power stations by 2030."

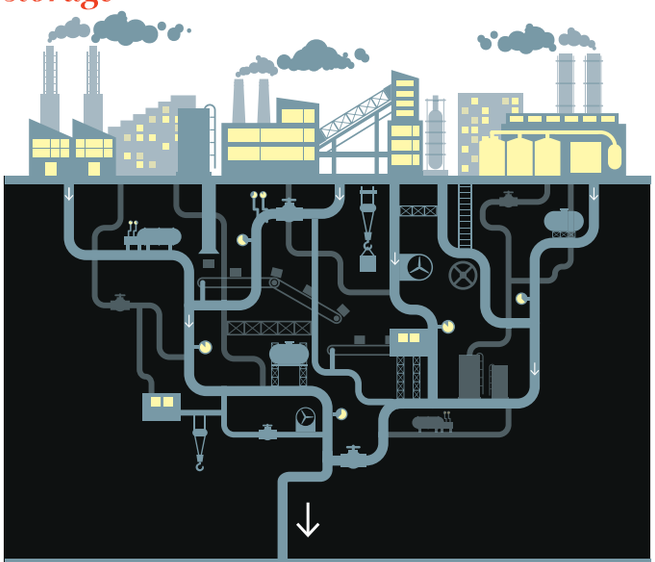
Management consultancy Pale Blue Dot, and associated company CO2DeepStore, have been brought onboard because of their seven years of CCS experience, plus a background in oil and gas subsurface and offshore operations.

Sam Gomersall, commercial director at Pale Blue Dot, has spent the past eight years working on the delivery of early-stage CCS projects in the UK, and sees this project as essential to building confidence in the potential of CCS for the UK, particularly for power and industrial project developers that are unused to CO_2 storage.

"At the moment, beyond the two government CCS commercialisation projects [the Peterhead Project in Aberdeenshire and the White Rose Project in Yorkshire], there is no commercial basis for appraising CO_2 storage sites and therefore few players and little activity," he says.

The current project will help by progressing the appraisal of the potential CO_2 storage sites around the UK and initially whittling them down to 20, he says. Then, after consideration of both individual site attributes, such as distance from coastline, size and depth, and portfolio aspects, this list will be narrowed down to five.

When assessing the subsurface elements of a site, "CO_2 storage capacity, integrity and injectivity are paramount", says Gomersall. For example, the store itself may be sizeable, with a potential to store 100 million tonnes of CO_2, but the porosity of the bearing rock layer that determines the injectivity of the site may be at only 10% or less, depending on the rock mechanics, chemistry, water volume and solubility.



100m t

There could be potential to store this **amount of CO_2**, but the **porosity** of the bearing rock layer that determines the **injectivity** of the site might be **only 10% or less**

Beyond these aspects, factors such as distance from CO_2 source, cost and interaction with other 'users' will be considered. Finally, portfolio factors will be addressed, to ensure the five sites are suitably varied in location and reservoir type.

Defining criteria

Costain has been brought onto the project to appraise the infrastructure requirements of the potential offshore storage sites. Even at this early stage, when the company's partners Pale Blue Dot and Axis Wells will be analysing subsurface conditions, the firm will help rule out sites by analysing existing infrastructure such as pipelines, subsea wells, and platforms, says Angus Reid, engineering manager at Costain. However, the exact criteria to help search for the ideal CCS locations are still being defined.

So what would make the ideal offshore CCS site? There are a lot of factors, says Reid. Some criteria are clear-cut: the reservoir or aquifer will need a depth of 800m – any less and the ambient pressure isn't sufficient to keep the CO_2 in its liquid form.

The lifetime of a site would ideally be 30-40 years, and ideal capacity would be in excess of 100 million tonnes.

Other criteria are more fluid, and can open up further considerations on whether a site will be commercially viable. For example, if a site has high injectivity, it can achieve higher flow rates and it won't need as many wells, and these could be more closely spaced.

"If the wells are closer together, it would change our surface architecture," he says. "You could possibly inject from a single platform or hub instead of a widely dispersed field with extensive flowlines."

In terms of location, proximity to existing infrastructure needs to be assessed – being close to pipelines is a plus, says Reid, as sites could be around 500-600km from the sources of CO_2 and adding high-pressure pipelines could push up prices.

The reuse of existing facilities such as decommissioned oil platforms seems ideal, but feasibility must be assessed. Costain will have to question how much life is left in the platform and how much extra infrastructure – such as trees, in-field pipelines and manifolds – is needed.

Other factors include the sources of power and control, adds Reid. "These sites don't operate in isolation, so you need to think about where that power and control will come from? Do you have an umbilical from the beach, or some kind of remote control system from a small jacket structure?"

Clearly, the project team must ask many questions, and collate and model a great deal of information in a limited timeframe: the pressure is on. However, those involved are being driven by the need to realise the UK's potential and develop a CCS track record, as is already being done onshore in countries such as Canada and the US.

"Let's start by showing it can be done here," says Reid. "With the right infrastructure in place, we could even begin importing CO_2 from elsewhere by ship or pipelines from Europe. It is a tremendous opportunity for the UK." ■