

Carbon Capture and Storage – The Next Big Thing ?



*As governments worldwide race to contain the climate emergency, new and old technologies alike are being financed and tested to achieve their use at scale. One of those technologies is carbon capture and storage. In our latest article, **Patrick Twist** describes the process behind the technology and how UK Government intends to promote it as a key contributor to our net zero target.*

What is it?

Carbon Capture and Storage ("CCS") is the principal route for engineered sequestration of carbon dioxide emissions from large industrial processes. The classic form of CCS involves three elements:

- first, capturing CO₂ at the point of emission (this can be either post-combustion, which method allows retrofitting of existing facilities, or, pre-

combustion which is more complex and suitable for incorporation only into new power facilities)

- Secondly, the CO₂ is transported, by pipeline or by tanker, to the storage location, and
- finally, the CO₂ is buried deep underground.

Power stations, oil refineries, cement manufacturers and other major chemical and industrial facilities are substantial emitters of CO₂. They will never be able to fully decarbonise and so are all ideal participants in CCS operations.

CCS – A Pressing Need

Across the world, the need to keep global temperature rises below, or certainly not much beyond, 1.5 degrees above C19 levels is now widely accepted. That was the target agreed to at the Paris Climate Change Conference, although many now think that two degrees may be the best that can hoped for. The principal driver must be reducing carbon emissions. But that alone will not be enough to reach carbon neutrality, net zero emissions, by the planned date of 2050. The International Energy Agency sees CCS as an essential contributing technology to the task, saying that achieving net zero will be “virtually impossible” without it. Closer to home the UK’s Committee on Climate Change has said “CCS is a necessity not an option.”

CCS is not new, there have been CCS facilities since the 1970s, but it has not been operated successfully at scale as yet. There is currently a worldwide installed base estimated at between 20Mt and 40Mt per annum. There needs to be a huge expansion. For CCS to make the necessary contribution to achieving net zero the International Energy Agency believes that there will need to be annual captured volumes of 5.6 billion tonnes per annum, or 140 times the upper estimate of current tonnage. Consequently, CCS has moved steadily up the political agenda and it is an important element of the UK government’s plans to meet net zero by 2050. With the Met Office reporting that 2022 was the hottest year since records began, pressure to take action is only likely to increase.

Government’s ambitious plans involve a considerable ramping of development in order for the UK to meet its aims. The UK plans to achieve 20-30Mt p.a., in this country

alone, within 10 years. Government believes the UK to be well placed both to install CCS facilities and to develop a CCS industry. It cites the UK's geological advantage of CO2 storage availability, claimed to exceed 78 billion tonnes principally in the North Sea and Liverpool Bay, and a strong professional services, engineering consultancy and industrial base in the UK. This storage capacity would support UK CCS requirements for 200 years, so there is plenty of scope for taking in third party carbon.

The UK Government is promoting CCS

There is an important role for the Government in getting CCS off the ground. This will involve both structuring contractual arrangements and pump priming financial support. Then, once the industry is of a sufficient size and stability that operating costs come down, at the same time as carbon taxes and carbon offset prices are expected to be rising, the expectation is that the industry will no longer need subsidy support. The example of the renewables sector gives confidence that this is a realistic objective. To this end in October 2021 the Government announced that it had selected two consortia or "clusters" to proceed to negotiations to establish transport and storage infrastructure and with it the opportunity to access capital support through the £1billion CCS Infrastructure Fund. The East Coast cluster, based on the Humber and Teesside, is led by BP and the Hynet cluster in the northwest is led by Eni. CCS benefits from economies of scale and Government identified 41 CO2 industrial projects, capable of feeding into the infrastructure of these clusters, as eligible for support. In August 2022 Government selected 20 projects from those 41 to go forward as potential recipients of contractual support to connect up to the infrastructure and to cover the cost of operating with carbon capture and storage. It is intended that these clusters will be deployed by "the mid-2020s " and a further two clusters (not yet identified) by 2030.

The Department for Business, Energy and Industrial Strategy ("BEIS") has, after extensive consultation, drafted very detailed contractual frameworks and business models of how the sector should operate and how Government support can be funnelled in. The underlying aim of BEIS is to incentivise the deployment of carbon capture technology by those business users who have no viable alternative to achieve deep decarbonisation. In December 2022 BEIS published an update of the business models and the details of the contractual arrangements which will apply to the participants in the clusters. The principal contracts for carbon emitters will be the

Grant Funding Agreement (GFA) for capex and the Industrial Carbon Capture Agreement (ICC) dealing with operations. There are some energy-from-waste projects included in the clusters and there is a separate Waste ICC Agreement for these. The parties to the GFA will be BEIS and the developer of the capture plant. The parties to the ICC or Waste ICC will be the industrial emitter and the Government-owned Low Carbon Contracts Company Limited (LCCC). BEIS states that the contracts are now substantially in final form and will not be negotiable except in relation to a limited number of identified project specific items such as the size of the capital grant and the strike price in the ICC. Many provisions of the ICC contract will be familiar to those involved in UK infrastructure projects.

BEIS will provide support for power generation plants through a 'Dispatchable Power Agreement' between the generator and LCCC. The aim is that that a CCS-enabled plant should be incentivised to come onstream into the generation mix behind nuclear and renewables but ahead of the most modern non-CCS enabled fossil fuel facilities. The arrangement follows the contract for differences model used in the renewables sector, with the addition of an availability payment. The generator will receive a variable payment designed at a level which will compensate the generator for the additional costs of CCS. In this way the generator can compete with the most efficient fossil fuel plants. The availability payment will be paid irrespective of whether the plant is dispatching power to the grid. The intention is to compensate the generator whilst discouraging it from seeking to compete against renewable or nuclear generators.

The transport and storage elements of CCS will be under the aegis of the private sector transport and storage company ("T & S Co"). T & S Co will be responsible for the development, construction, ownership, operation, maintenance and decommissioning of the transport and storage network, both onshore and offshore. £15 billion of private sector investment will be required to establish the early phases of the transport and storage programme so it is essential that there is a robust contractual and economic model which will give confidence to investors. The proposed arrangements are based on a user pays model founded on a regulated asset base (RAB) structure. The RAB model is well established and understood for regulated utilities and was used most recently on the Thames Tideway Tunnel. T & S Co will have a licence from the regulator which will set the parameters of its operation. There is provision for a Government Support Package to cover certain high impact but low probability risks which cannot be taken by the private sector on a

value for money basis. An example is the risk of carbon leakage from storage. Government is now minded to act as insurer of last resort. That is to say it will provide cover where commercial insurance is not available on reasonable terms and T & S Co has taken all reasonable steps to mitigate the risk. The risk that the T & S facility becomes a "stranded asset" because demand from the emitters is late coming onstream or less than predicted is mitigated by a degree of revenue support but with the option for Government to terminate support and pay compensation if it considers the support arrangements are no longer viable.

Although CCS has been around for a long time it is still in its infancy as a major industry. So there remain issues that need to be addressed. It is essential that claimed carbon offsetting can be reliably substantiated and reporting by the emitters and T & S Co can be trusted by the public. Perceived greenwashing has given rise to public scepticism of some carbon offsetting arrangements. It is important that CCS is not tarred with this brush. There needs to be confidence in the monitoring, reporting and accreditation of CCS operations so that when a corporate pays for a tonne of carbon removed it knows that a tonne was removed and the investors in the project and the public have that confidence also. The contractual matrix set up by BEIS is designed to address this issue. Practitioners state that the technology is well understood, but there will be a residual hesitancy amongst investors, particularly of construction cost overrun, until there is a greater track record establishing clearly the costs and risks involved. There are a number of major corporates involved in the first two clusters and this may well lead to on balance sheet funding, rather than any project finance, for the T & S Cos, as happened when the waste to energy sector was new in the UK.

What Next ?

There is undoubtedly a propitious environment in policy and commercial terms for CCS in the UK at the moment. Government has established the two CCS clusters and developed very detailed business models and contracts to get large scale CCS projects under way. The models have been carefully worked through with likely participants and investors so that risks are allocated where they can best be managed. There is more detail to be completed but a structure is clear. It is designed to kick start CCS and be flexible so as to allow for the inclusion of different technologies as these develop. Government still has lots of caveats: the need for ministerial and parliamentary approval, further review, value for money and subsidy control. So there is still scope for Government to can the whole project as it has done before. But CCS

is both important to the UK 's climate change obligations and an opportunity, like offshore wind, for the UK build a market leading industry. So, there is good reason to believe that CCS might just be the Next Big Thing.

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