CARBON CAPTURE, UTILISATION & STORAGE

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March 2022

Carbon Capture, Utilisation & Storage is the process of capturing CO2 from fuel or industrial processes, the transport of this CO2 via pipeline or ship, and its use either as a resource to create valuable products or services, or its permanent storage in deep underground geological formations[1].

Technologies

CO2 is used in a number of technologies, from refrigeration to carbonated beverages. However, by far the largest use case of captured carbon is for enhanced oil recovery. This is a process whereby CO2 captured from the combustion process in power plants is then injected back into the ground to enable further extraction of fossil fuels. This raises a number of questions around long-term sustainability and net zero goals, as although this in theory lowers the GHG emissions derived from power generation, it does so to then facilitate additional high emitting activity. In terms of the capture technology itself, there are a plethora of methods used; from physical separation using a liquid solvent such as Selexol, to membrane separation based on inorganic devices that have high CO2 selectivity.

A few interesting projects

Contrary to popular belief, CCUS has been around for a long time. For example, Enid Fertiliser Plant in Oklahoma has been capturing CO2 from its operations since 1982, and then piping that CO2 off to nearby oil wells for enhanced oil recovery[2].

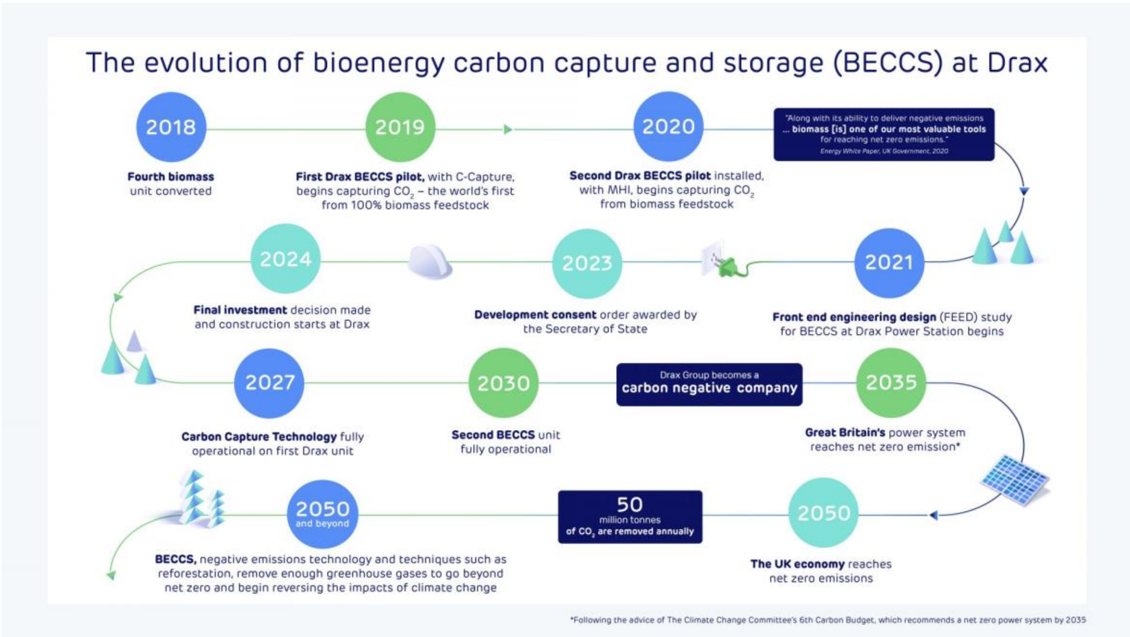
However, CCUS being used to permanently store CO2 is less common and has been met with mixed success:

Gorgon LNG, Australia

Perhaps the largest scale CCUS project currently in operation is the Gordon LNG Project in Australia. This joint venture between Chevron (47%), Shell (25%) and ExxonMobil (25%) has invested over $3 billion in the scheme that has captured 5.5Mt of CO2 since August 2019. Despite this success, it has fallen short of its overall target of capturing 80% of CO2, hitting just 68%. This has triggered the compulsory surrender of 5.3 million carbon credits to the Western Australian government[3]. Indeed, the GHG emissions from extracting, processing and use of the natural gas from Gorgon LNG, means that the CCUS project captures just 2% of the overall emissions of the project altogether.

Drax Bio Energy Carbon Capture and Storage (BECCS)

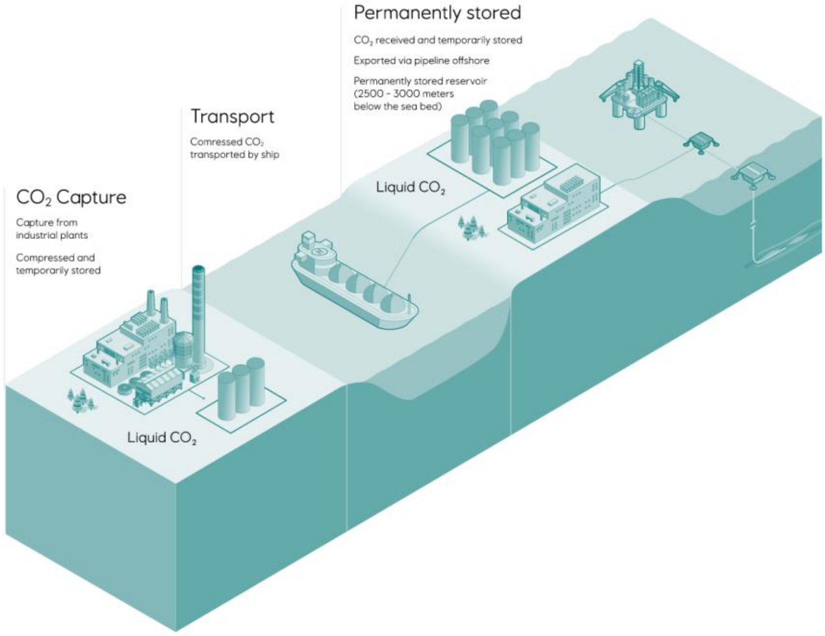
Drax has a different approach when it comes to lowering emissions. Instead of retrofitting existing coal plants with CCUS technology, they have converted old coal plants into fully functioning bioenergy power plants. These are then fitted with CCUS technology in order to capture emissions from burning biomass. Drax aims to capture 8 million metric tons of carbon dioxide from the atmosphere annually. Due to the success of the first pilot, a second one has been launched in partnership with Mitsubishi Heavy Industries. The second BECCS unit will be fully operational by 2030, as shown in the following roadmap:



Source: Drax, 'BECCS and Negative Emissions,' Accessed at: https://www.drax.com/about-us/our- projects/bioenergy-carbon-capture-use-and-storage-beccs/

Both of these pilots contribute to the wider vision of a 'Zero Carbon Humber' – a reference to the industrial cluster in the Northeast of England – which can serve as a beacon for an industrial net zero future in the region.

Equinor & the Northern Lights Project



Source: Equinor, 'Northern Lights CCS,' Accessed at: https://www.equinor.com/ en/what-we-do/northern-lights.html

The Northern Lights project in Norway is an attempt to develop the world's first open-source CO2 transport and storage infrastructure. The project is being spearheaded by Equinor, Shell and Total and will have the capacity to store 1.5 million tonnes of CO2 per year. Once the CO2 is captured, it is transported in liquid form by ships, and then injected into the rock at about 1,000-2,000 meters below the seabed. The joint venture has plans to expand capacity by an additional 3.5 million tonnes for a total of 5 million tonnes capacity.

All of these projects demonstrate a high degree of ambition but have delivered mixed results so far. This acts as a pertinent reminder of the importance of decarbonising each industry as quickly as possible, whilst also further developing CCUS technology efficacy to ensure we meet net zero, in line with the IEA 2DS.

1. Source: IEA, 'About CCS', Accessed at: https://www.iea.org/reports/about-ccus
2. Bellona, 'Why Deeply Decarbonising Fertiliser Manufacture Needs CCS,' 30th September 2016. Accessed at: https:// bellona.org/news/ccs/2016-09-why-deep-decarbonisation-of-fertiliser-manufacture-needs-ccs
3. Source: Citi Investment Research

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