Why CCS technologies are capturing investor attention

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There is an increasing realisation that carbon capture and storage (CCS) technologies play a crucial role in meeting net zero. Even though a number of CCS technologies have existed for some time, it hasn't been until the past year or so that there has been growing interest and appetite.

Recognition of its importance will translate into growing policy support and investment, which in turn will accelerate the development of the CCS market over the next decade. We believe this will provide investors with investment opportunities across the value chain.

What is CCS and why is it a growth area?

CCS refers to a combination of technologies that capture CO_2 from its point of source of emissions, for example directly from fuel combustion or industrial facilities. It is then transported, usually via pipeline, to a site where it can be injected into deep underground rock formations. In some cases, the CO_2 is used for a range of applications such as enhanced oil recovery (EOR) or the production of fertilisers and some beverages and food. Either way, the aim is to prevent its release into the atmosphere.

Intrinsic to the development of this market is the goal to achieve net zero emissions. Countries accounting for more than 80% of global emissions have made net zero commitments, as have around 700 of the world's largest public companies[1]. These actors are increasingly embracing CCS technologies as crucial elements to deliver their net zero plans and hit their targets.

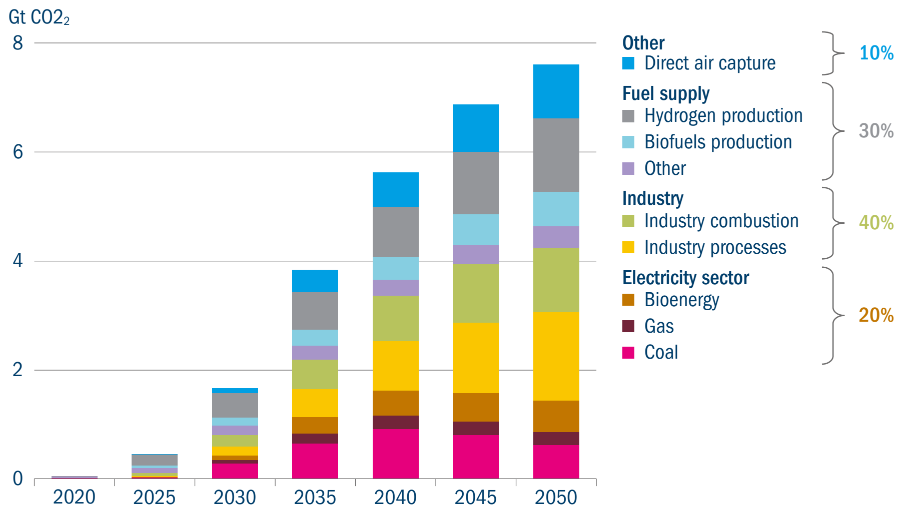
For heavy industries in particular there is no alternative to using CCS to abate emissions stemming from their processes. For example, the emissions created by the chemical processes involved in the production of cement cannot be addressed using renewables or electrification, so it must attempt to capture the CO_2 after the production process. As such, the IEA estimates that CCS can help reduce global emissions by around 15%, hence they are an important pillar of the net-zero roadmap.

In addition to CCS, there is an increasing scientific consensus – especially after the latest IPCC report[2] in April – that the use of wider carbon removal technologies is "unavoidable" to achieve net zero. The leading technology in this space is Direct Air Capture (DAC). This uses chemical reactions to pull CO_2 out of the air before it is either injected deep underground for permanent storage or used elsewhere.

In line with this, the Science Based Target Initiative (SBTi), a partnership between the Carbon Disclosure Project, the United Nations Global Compact, the World Resources Institute and the World Wide Fund for Nature, includes in its net zero standard that "any remaining emissions (up to 10% not covered by the long-term target) must be neutralised with permanent carbon removals".[3] Therefore, the increasing view is that carbon removals have a key role in climate change mitigation strategies – in addition to, not instead of, rapid decarbonisation efforts.

As per the International Energy Agency net zero scenario, most of the CO_2 captured will have been produced by heavy industries and fossil fuels, followed by the wider power sector and by DAC (Figure 1).

Figure 1: CO_2 captured in net-zero scenario



Source: IEA net zero roadmap, 2019

What drives CCS costs?

There are three main cost components in the CCS process: the cost of capture, the cost of transport and the cost of storage.

Capture generally accounts for around half of total costs and is mostly driven by big capex requirements due to the large equipment required within the process. There is also high operational expenditure due to large energy requirements and other operating costs associated with this process.

Transport costs are driven by the large investment required to build the infrastructure to transport the CO_2. Location is key, and long distances from the emissions source to the storage will obviously drive higher costs.

Storage itself requires site exploration and assessment, which are generally drawn out and costly bureaucratic processes. The limitation here is not geological, as there is ample storage capacity globally[4]. However, there are few injection-ready sites.

As per Figure 2, there is a wide range of costs of CCS technologies across different applications. Natural gas processing is the most mature, and hence the cheapest, while others are more complex and under development are above $100 per tonne of CO_2 captured. Many at-point sources of emissions such as hydrogen, cement and chemical production can realise a capture cost of around $50-$70, which is below the current EU carbon price of $80. However, when the cost of transport and storage is added most become uneconomical – unless they can tap into government funding to help cover these costs.

The difference in the cost of capture is driven by the level of CO_2 concentration within each application. The higher the concentration the lower the capture cost as it is less energy intensive and easier to capture the CO_2. This is why DAC is the most expensive technology as, per its definition, the CO_2 is very diluted in the atmosphere.

Why now for CCS?

There are important and rapid developments occurring in three key areas that will support this market:

Policy support: strengthened policies, such as the US Infrastructure Deal or the EU and UK Green deals include significant government funding to support R&D and expand demonstration projects.

Economics: higher carbon prices and tax incentives are improving the economics of these projects. For example, EU prices doubled over the past year and in the US 45Q tax credits are providing important subsidies for CCS investments.

Market dynamics: the rise of industrial hubs that share not only innovation but also the costs of transport and storage are becoming a key driver of economies of scale.

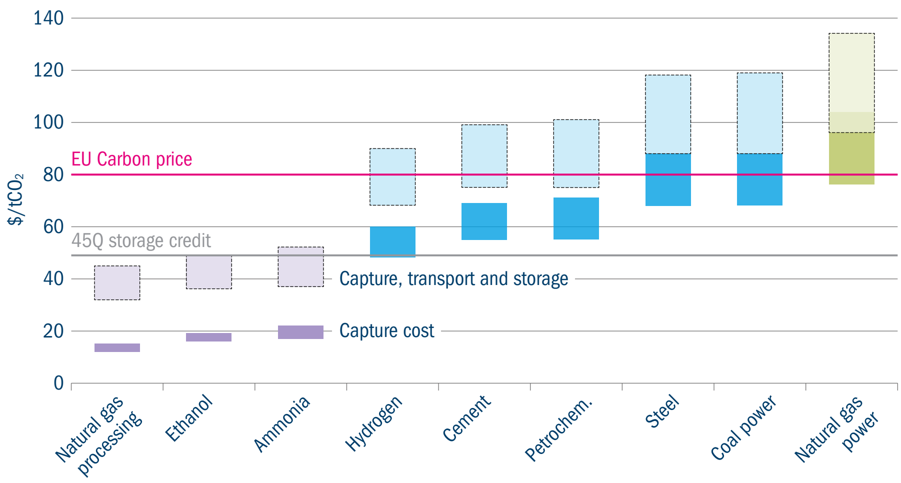
We therefore expect developments in these areas to support the adoption of CCS technologies and the growth of this market. For example, the expansion of tax incentives in the US (under the Inflation Reduction Act) and Canada, as well as higher carbon prices in EU in the range of $100, will make CCS increasingly economical. In addition, market evolution such as rising demand for low carbon products and the development of voluntary carbon markets that allow corporates to buy offsets to fund these projects will become important catalysts.

In terms of the potential size of this market, the current amount of CO_2 captured represents less than 1% of global emissions. To meet IEA net zero targets, whereby CCS would contribute reductions of around 15%, the average capture rate would need to increase 10x by 2030. The project capacity announced to date will require investment between $140 billion and $1.1 trillion – significantly more than the $3 billion spent in 2020. However, to meet the IEA's targets will require much more, with estimates ranging from $760 billion[5], $1.6 trillion[6] and $3 trillion[7].

The development of this market, however, faces challenges. Although there has been progress, global climate policies and carbon pricing is not yet supportive of DACs economics to such a level to meet the IEA net zero roadmap, so more policy support is required. In addition, a simpler and shorter permitting process is needed as the regulatory approval can be lengthy, as well as limited liability protection to finance projects.

The market also needs to counteract public opposition to CCS that presents as local resistance to projects on the grounds that CCS might prolong dependence on fossil fuels as well as require significant amounts of energy and water, for example.

Figure 2: CCS costs per tonne of CO_2 across different applications



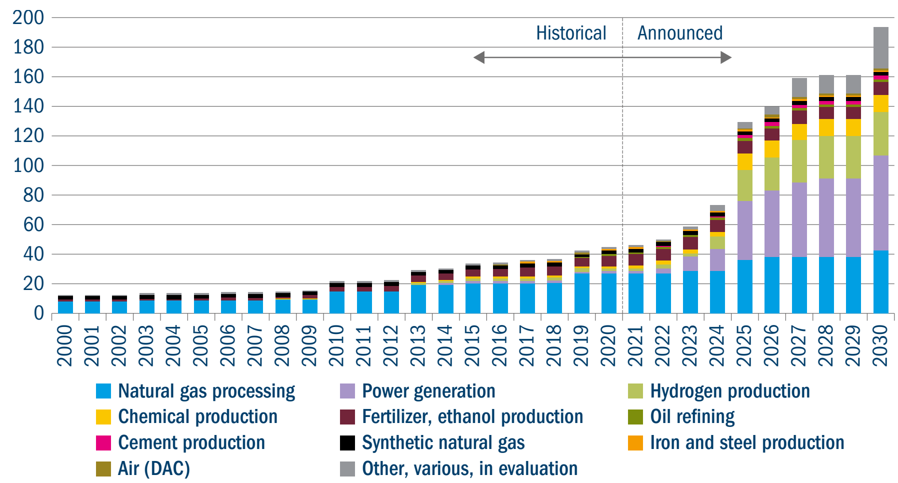
Source: BloombergNEF, CCS Market outlook, 2021

How can investors play this theme?

Corporate exposure to this market comes in a variety of forms. Companies that own and operate CCS assets, for example, are pure players that are mostly private as it stands but increasingly attract external funding. Companies that sell CCS equipment and services, such as oil and gas majors as well as energy services that are important enablers of this market, and companies that will be users of CCS to reduce their emissions and/or as an input to industrial processes, such as industrial gas companies as well as key industry groups in which CCS strategies will play an increasingly important role, will help drive demand for this market.

With the need to reduce global emissions becoming ever-more urgent, and the policy support and economics increasingly improving, the adoption of CCS technologies is poised to be a huge growth area over the next decade.

Figure 3: Global capacity installed by point source, historical and announced



Source: BloombergNEF, CCS Market Outlook, 2021

Climate transition engagement: CCS technologies

Company

OXY

Sector and country

Energy, US

Why we engaged

As part of our thematic engagement on the back of our research into carbon capture and storage (CCS), we engaged with OXY to better understand the technologies and associated economics that will drive its net zero strategy.

How we engaged

The engagement was led by Fixed Income and Equity analysts, in addition to an RI analyst, and took the form of a video conference call with OXY's Deputy Counsel, an executive from the Environmental and Sustainability Group, and a representative from investor relations.

What we learnt

OXY considers the achievement of net zero a strategic priority. The economics of its plan will require further and ongoing consideration, but could prove to be attractive under reasonable carbon price/incentive scenarios. Furthermore, OXY appears uniquely positioned in terms of its ability to employ direct air capture (DAC) and carbon capture, utilisation and storage (CCUS) strategies, which will form a key component in helping to decarbonise several hard-to-abate sectors.

Outcome

The meeting gave us a better insight and understanding of the economics of DAC projects and the role of this technology for OXY's net zero plans. The meeting also enabled us to emphasise the increasing importance of environmental, social and governance (ESG) disclosure, encourage the adoption of more granular targets and highlight the growing scrutiny that carbon-intensive sectors will face going forward.

1 Net Zero Tracker, 2022
2 IPCC Sixth Assessment, April 2022
3 Science based targets, The Net-Zero Standard, as at August 2022
4 IEA, Energy Technology Perspectives - the worlds guidebook on clean energy technologies, as at August 2022
5 IEA, Net zero by 2050, 2021
6 Morgan Stanley, Carbon Capture: a hidden opportunity, 2021
7 Goldman Sachs, Green Capex, 2021