actiam PERSPECTIVE

Capturing and storing CO_2 (CCS)

An environmentally friendly and economically sustainable solution?

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For investment professionals only

The election debates have been a bit tame so far, and the topics that are really important for the future, such as climate, don't seem to be really discussed because of the COVID pandemic. Yet, for a subject such as the climate it is important what the outcome of the election will be. The parties that will form the coalition will determine which technologies are stimulated and how subsidies and support packages are used to achieve the climate objectives.

One of the new technologies that is being embraced by more and more companies is the capture and storage of CO_2 (also called CCS). For example, Exxon recently announced that it will invest $3 billion in CCS solutions.

In this article, we consider whether this technique will indeed contribute to the realization of the Paris Climate Agreement and whether it constitutes an attractive investment category.

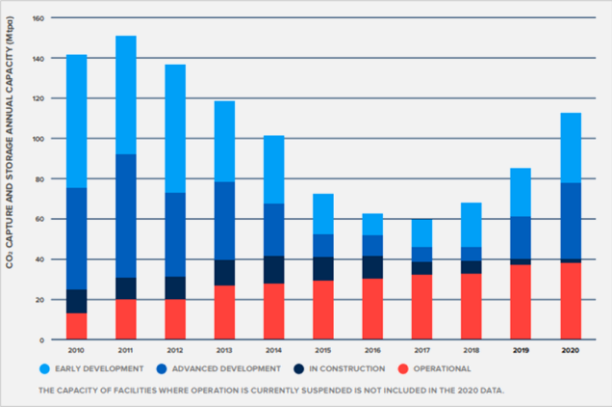
What is CCS?

Discussions on capturing and storing CO_2 are commonplace within the climate change debate. The Dutch Climate Accord introduced the capture and storage of CO_2 generated by industry as an important step in ensuring that the Dutch climate targets could be achieved cost-effectively. But this technology is still a topic of widespread debate. Its advocates view it as being the ultimate exit strategy for including heavy industry in the drive to achieve climate targets. Opponents point to the risk that CCS: (a) has a potential negative impact on the environment; (b) comes with high costs; and (c) the focus on CCS may be at the expense of the search for more structural solutions to the climate problem, including, for example, the switch to sustainable energy. This is also a thorny issue for investors, who still have to make up their minds on the whole matter.

CCS is a technology for capturing and storing CO_2 in an underground geological formation. The CO_2 is captured at places where a lot of it is produced, such as cement or steel plants. The Norwegian company Aker Carbon Capture is one of the specialists in this field. CO_2 can also be filtered directly from the atmosphere, as is done by the Korean firm ECOPRO, for instance. CCS has been gaining increased traction in recent years. The IEA estimates that, in 2020 alone, over €3.8 billion was committed to CCS projects, with the investments shared between governments and commerce. There were 65 commercial CCS facilities at different stages of development in 2020. The facilities that are already up and running have a capacity of 40 Mt of CO_2 per annum, which is around one-tenth of a percent of annual global emissions.

The application of CCS ranges across a number of sectors. Most of the existing projects are those undertaken by natural gas manufacturers. They control some of the oldest and largest projects, including ExxonMobil's Shute Creek dating from 1986, Occidental Petroleum's Century Plant from 2010 and Petrobras's Petrobras Santos from 2013. The bulk of the projects currently being developed are aimed at power generation. Other applications occur in the production of artificial fertiliser, hydrogen and ethanol, in the chemicals industry, in the steel sector and in cement manufacture. One example close to home is the Porthos project in the Port of Rotterdam. This project is designed to store CO_2 produced industrially in the port in exhausted North Sea gas fields. The companies that have shown interest in this project include the oil firms ExxonMobil and Shell, gas manufacturer Air Liquide and the chemicals company Air Products.

Pipeline of commercial CCS facilities



Source: Global CCS Institute (2020). Global Status of CCS 2020

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CCS IS ESSENTIAL FOR ACHIEVING CLIMATE TARGETS

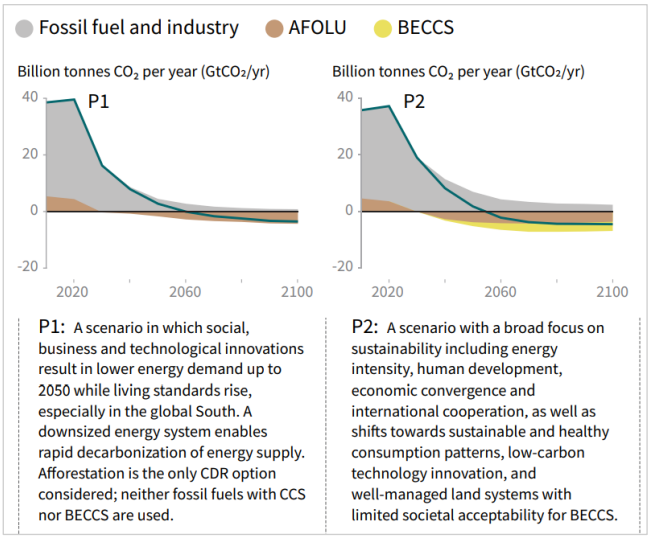
One of the most commonly cited arguments in favour of CCS is that we need it in the transition to a CO_2-neutral society. Reducing carbon emissions is a serious challenge, particularly for heavy industry. Their processes are often run at high temperatures that simply cannot be attained without fossil fuel sources unless their plants undergo major adaptation. On top of that, electrification or a shift to hydrogen power would result in a hugely increased demand for electricity. A joint working group from the electricity and industrial sectors has worked out that, for the Dutch Climate Accord, the electrification of industrial heating processes would result in an increased demand for green electricity of between 8 and 24 TWh. Chemiepark Chemelot indicates in its strategic plan that electrification means that its power consumption will be more than four times greater in 2050 than it is now. The Dutch national daily NRC has calculated that the current government's ambitions for hydrogen will raise the demand for green electricity by 30% as soon as 2030. This rise in the demand for electricity has not yet been incorporated into the current plans for developing green electricity. By 2030, twice as many wind parks would have to be built in the North Sea just to cope with the extra power requirements of hydrogen plants.

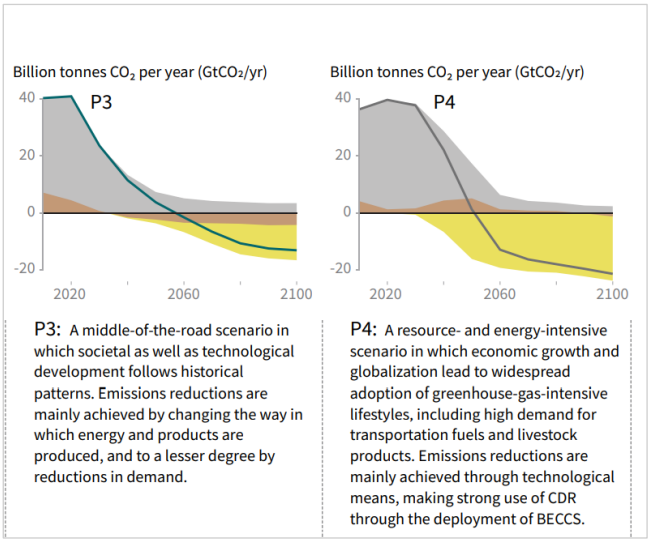
CCS plays an important part in most climate scenarios, alongside capturing CO_2 through reforestation. In 2018, the IPCC published the "Special Report on Global Warming of 1.5°C", which set out 90 scenarios each offering at least a 50% chance of limiting temperature increases to 1.5°C. Most of these scenarios assume net negative emissions, often using CCS. The IPCC's four basic scenarios are shown below. The first scenario (P1) uses natural means alone for removing CO_2 emissions from the atmosphere. However, this scenario requires a significant fall in the demand for energy (-15% in 2030 and -32% in 2050, compared to 2010) in order to achieve the Paris targets in time. The other scenarios all make greater or lesser use of CCS. In its Fifth Assessment Report (AR5), the IPCC also concludes that excluding CCS from the range of transition technologies would push up the cost of the energy transition more than any other technology.

CCS IS NOT AN IDEAL TECHNOLOGY

While people ascribe an important role to CCS in achieving climate targets, it is not free of risks to the environment. Firstly, CCS may well capture CO_2, but other emissions that exacerbate global warming, such as methane, still end up in the atmosphere. Critics also argue that underground storage of CO_2 might be susceptible to leaks. These could harm natural habitats and ground water, or else some of the escaping CO_2 could even end up back in the atmosphere. Leaks could occur either at the storage sites themselves or during transportation to them, which is often via pipes. Any leak would rapidly release a large volume of CO_2. This would be hazardous to humans and animals within close proximity to the leak, as CO_2 displaces oxygen due to its greater weight.

Breakdown of contribution to global net CO_2 emissions in four illustrative model pathways





Source: IPCC (2018). IPCC Special Report on Global Warming of 1.5°

The risk of this happening led to planned trials of CO_2 storage being scrapped in an area of Barendrecht back in 2009, under pressure from the local population. There is a mitigating factor in that many countries only allow the storage of CO_2 once there is research and proof that the chance of leaks is minimal. European legislation prescribes that adverse consequences for and risks to the environment and public health must be avoided before the permanent storage of CO_2 can be allowed. Also, monitoring is often required by law during the storage period, so that any leaks can be detected. However, because the technology is relatively new, there is little understanding as yet of the potential impacts in the longer term.

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THE FINANCIAL APPEAL OF CCS IS STILL UNCERTAIN

The financial appeal and technology of CCS are still uncertain and depend heavily on government subsidies to get going. The level of costs depends on a wide range of factors. Technology, location and the source of the emissions all play their part. The purity of the emissions plays an important part if the emissions are captured immediately adjacent to the source. Certain emissions, such as those from ethanol plants, are purer than those from other sources, including steel and cement production. Relatively clean emissions can be captured for between €20and €25 per tonne, though the price rises to between €50 and €125 per tonne for dirtier emissions (McKinsey).

The cost of capturing emissions via Direct Air Capture (DAC), where the emissions are filtered directly from the atmosphere, are substantially higher still (averaging between €400 and €500 per tonne).

These high costs mean that CCS projects are significantly less attractive if they do not receive government subsidy. For instance, ExxonMobil cut its support for a CCS project in the USA in 2020, although it continued investing in the Dutch Porthos project during the same period. The difference? Whereas the US project had to be financed out of the company's own coffers, the Dutch project incurred fairly low costs for the participating firms because of high government subsidies.

CO_2 emissions certainly do have a price tag in Europe. The higher the price, the more attractive it becomes for companies to pump their CO_2 underground. The price is currently fluctuating between €25 and €30 per tonne of CO_2. In recent presentations, Aker Carbon Capture showed that the break-even point will only be reached once the effective CO_2 price rises still further and the costs of CCS technology fall. In 2018, the Netherlands Environmental Assessment Agency (PBL) calculated that the national costs incurred for CCS in industrial processes were between €40 and €100 per tonne of CO_2. This PBL estimate means there is a gap of between €14 and €74 per tonne compared to the current European CO_2 price.

CONCLUSION

For investors, this raises the question of whether it is worth investing in a technology that is not yet profitable without government subsidy, knowing that there are alternatives available for generating green energy at lower cost prices.

And there lies the rub. Because prices of solar, wind and other forms of green energy have fallen so markedly in recent years, those prices are, in certain areas, comparable with or sometimes even lower than the price of coal-fired and particularly gas-fired power stations equipped with CCS.

While ACTIAM regards innovations in CCS as a positive development, the question is whether the technology has been overtaken by reality before it has had the chance to mature. In theory, CCS can provide a valuable contribution towards achieving climate targets. However, the question that investors have to ask themselves, is whether it is logical to invest in an as yet fledgling technology (which is no more than an interim solution and that is tied into major environmental risks), given that there are greener options available.

Also, CCS should not be used to camouflage dependence on fossil fuels. Although it can indeed contribute towards achieving climate targets, oil and gas companies will have to intensify the energy transition to avoid being saddled with stranded assets. Investors should therefore approach these two topics separately and CO_2 capture should not be used to mask the risks of the energy transition.

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For equity investments, our objective is an optimal financial and sustainable return via passive and active solutions. Our equity team has a long-standing history in sustainable investments and realizes a solid performance, both financially and socially. All our equity funds receive no less than four stars in the Morningstar rating (source: Morningstar, September 2020). The ACTIAM Global Equity Impact product also receives four Morningstar globes in the field of sustainability! It is not without reason that we were awarded Winner Lipper Group Awards "Equity Large" in 2019.

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