An enabling framework for carbon capture and storage in Europe: what issues are relevant?

Background Note for the CEPS ECH meeting on "Delivering a CCS and CCU Agenda for Europe", CEPS 31st January 2019

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Context:

With the release of the European Commission's long-term climate strategy, the question of how to reach net-zero greenhouse gas emissions is crucial for EU climate policy development. Carbon capture technology will be indispensable to address emissions from energy-intensive industries that are otherwise hard to abate. Once captured, significant infrastructure is required to transport and store the CO_2.

The need for CCS is part of the general long-term climate policy challenge of creating a market for zero-carbon industrial products. Without the prospects of such a market, an investment case for carbon capture would be lacking as well. Therefore, any policy that supports demand for zero-carbon products can form a

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core part of an enabling framework for CCS as well[1]. Without CCS, zero-carbon products in some industries (e.g. basic materials) are not feasible. This makes CCS a transformation technology on the path towards a net zero economy.

CCS is not the only technology that can play a major role in achieving deep decarbonisation in industry. Electrification will play a major role. In trying to electrify major industrial processes, however, electricity demand could increase precipitously. The EC roadmap scenario, which maximises electrification leads to a doubling if not tripling of EU electricity demand.[2] Hydrogen can likewise play an important role as a feedstock in industry. The production of low-carbon hydrogen, however, either greatly increases electricity demand (electrolysis) or requires carbon capture as well, thereby reinforcing the case for CCS.

Much like the climate problem CCS is addressing itself, CCS infrastructure could be construed as a public good.[3] It being a public good, however, also entails that there would be underinvestment due to free-rider concerns. This creates an additional rationale for public intervention.

Carbon price:

Given that CCS would be implemented for sectors covered by the EU emissions trading system, the first question is what the contribution of a carbon price signal can be. Up to now, even following the higher carbon prices seen in the wake of the reforms completed between 2015 and 2018, the ETS price of around 25 euros is well below the price required to make the investment case for CCS. Even if the ETS price continues to rise, investment in CCS infrastructure is needed in the short-term, if emissions are to be captured at scale in the medium and long-term. A higher carbon price will rather support investment cases in CCS by making less attractive continued investment in more carbon-intensive production.

Where should funding come from?

Deploying CCS requires large investments in capture, transport and storage infrastructure. This prompts the question of financing, i.e. the relative shares of private and public finance. While the distribution between the two can be debated, it seems inevitable that the funding must come from both public and private sources.

One instrument which has been created with the express purpose of supporting, inter alia, CCS in industry is the EU ETS Innovation Fund. This fund will disburse money generated by the sale of some 450 million allowances over the 10-year trading period of the ETS starting in 2021. At current carbon prices, this amounts to just over a billion euros a year in funding. The Innovation Fund, however, has been set up to fund more than just CCS, including other industrial decarbonization and renewable energy projects. As such, funding will need to be provided from other sources as well, including national sources. This makes the development of the next Multiannual Financial Framework (MFF) of the EU budget especially pertinent. Another

[1] This can include contracts for differences, public procurement standards etc. See also this Policy Insight where the issue is further explored: http://ceps-ech.eu/publication/tools-boost-investment-low-carbon-technologies

[2] The EC roadmap scenario, which maximises electrification, leads to an increase in EU electricity demand from 22% in 2015 to 58% of final demand in 2050. See IN-DEPTH ANALYSIS IN SUPPORT OF THE COMMISSION COMMUNICATION COM(2018) 773: A Clean Planet for all. A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy", p. 72

[3] A public good is non-excludable and non-rivalrous. I.e. the use of CCS infrastructure by one part would not impede another party to do so as well. In principle, infrastructure can be excludable, but it can be set up in such a way that other parties can have equal access, as is common with public infrastructure.

European instrument is the Connecting Europe Facility (CEF), which targets infrastructure investment. While the transportation infrastructure of CCS could be funded this way, the storage of CO_2 itself is not eligible, thereby limiting the CEF's potential for CCS.

More economic than regulatory barriers?

Up until now, CCS has received little dedicated regulatory focus. Within the EU, the CCS Directive is without a provision for continued review, with little experience yet at scale.[4] Currently, the definition of a transport network only allows for CO_2 transported through pipelines to be discounted, while that which is transported by ship may not be. Seeing as the role of carbon capture ranges from 52 $MtCO_2$ to 606 $MtCO_2$ within the different scenarios in the EU's long-term strategy, it may be worth considering if a more enabling regulatory environment could spur the investments needed for its deployment.[5]

Instead, other pieces of legislation have the potential to affect the deployment at scale of CCS. Particularly the London Protocol limits the possibility to trade in CO_2 across borders. An amendment to this protocol would be required for large-scale trade of CO_2 between countries to develop, and would facilitate the creation of a European market for CCS. Nevertheless, even without such an amendment, willing states would not necessarily be limited from engaging in bilateral agreements bypassing the limitations set out in the London Protocol.

More generally, while there may be some specific instances[6] where mainly national regulations hinder the deployment of CCS and infrastructure, the more important barriers are economic. With the main barriers being of an economic kind, and the sectors for which CCS would be an option being trade-intensive, the issue of international competitiveness is equally relevant. Therefore, climate measures that interact with the trade system are likely to have an impact on the broader investment case for CCS.

Need for partnerships: cover capital and operational expenditure

Both companies wanting to capture CO_2 emissions as well as those wanting to invest in transportation and storage of CO_2 need each other in equal terms. Without the necessary infrastructure being available, a company cannot go ahead with capture. At the same time, those providing transportation and storage infrastructure likewise need to be ensured that there is enough supply of captured CO_2 to process. This point to a need for partnerships that can bring ensure stability for investments.

Policy support may also need to be differentiated between CapEx and OpEx funding. At every stage of the CCS value chain, whether in capture, transport or storage, significant capital expenditure will be required. To ensure that the private sector also invests, it may be necessary in some cases to also provide public support for operational expenditures. This could have implications from a state aid perspective, as operational state aid is subject to more stringent conditions to be compatible with the internal market. On the side of capture, investments will be highly capital-intensive to adapt industrial processes in such a way as to enable the capture of CO_2 that is sufficiently clean and concentrated.

[4] One review was done in 2015, but the Directive does not contain a provision for continued reviews.

[5] See European Commission (2018), "In-Depth Analysis In Support Of The Commission Communication COM(2018) 773", p. 198

[6] It is the objective of the seminar on "delivering a CCS and CCU Agenda for Europe" to identify possible barriers.

If operational financing is provided this could take the form of a given amount of funding per tonne of CO_2 stored. The EU ETS price will be an important point of reference here, as any CO_2 mitigated through CCS processes obviates the need to surrender allowances for these emissions. It also raises the question of what happens with any potential upside, if the subsidy provided exceeds the carbon price.

Transportation:

Initial CCS projects are ideally focused on industrial clusters where the supply of CO_2 to be captured is sufficiently high. In these cases, an infrastructure of pipelines would be the most efficient way of transporting CO_2 in large quantities. Given the fact that many CCS projects will initially be publicly supported, such pipelines will most likely be open to all operators wishing to store captured CO_2. Such open-access infrastructure can help with scaling-up use of CCS, thereby boosting scale effects and lowering costs.

In other cases, installations wanting to capture CO_2 will not have pipelines at their disposal. Transportation via inland waterways or trucks is then an alternative. This may increase operational costs, but on the other hand may be less risky as well, as there are no lock-in effects with the infrastructure.

Liability:

The case for CCS can only be made if the storage of CO_2 is reliable and permanent. This raises the issue of which party is liable to guarantee the long-term safe storage of CO_2, which may exceed the lifetimes of individual projects and even companies.