

Carbon capture technologies: A real necessity or a delaying tactic?

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Background

The EU proclaims that to reach the 2050 climate neutrality target, among other solutions, it will also need technologies that can capture CO₂ or remove it from the atmosphere, and then store or utilise it. Specifically, the EU argues that these technologies will be applied to sectors where emissions are particularly difficult or expensive to reduce, such as the cement or waste-to-energy sectors. That is why the European Commission adopted at the beginning of 2024 an [Industrial Carbon Management Communication](#), which explains the contribution of such technologies. What are the key proposals? How did stakeholders react? Who are the fierce opponents and supporters? Why is there so much critique of this technology? And most importantly, is there a real need for such a policy action in the first place?

What is industrial carbon management?

Industrial carbon management refers to the use of various technologies that can capture, store, transport and utilise CO₂ emissions from industrial processes, with the ultimate goal of reducing emissions. The EU's proposed strategy is based on the following options:

- Capturing CO₂ for storage (**CCS**), which means that CO₂ emissions of fossil, biogenic or atmospheric origin are captured and transported for permanent and safe geological storage;
- Capturing CO₂ for utilisation (**CCU**), where the industry uses captured CO₂ in industrial processes for construction products, synthetic fuels, plastics, or other applications, or permanently stored in underground geological formations;
- Removing carbon from the atmosphere, (**CDR**) which refers to human activities that intentionally remove carbon emissions from the atmosphere (such as restoring trees to the landscape through reforestation, or cultivating algae in special types of aquaculture settings).

A surprising move?

In a certain way, the publication of this strategy shall not be perceived as a surprise move. The EU provided some hints already in this sense, as in the [Net-Zero Industry Act](#) (NZIA), the Commission proposed that the EU should develop at least 50 million tonnes per year of CO₂ storage capacity by 2030. It also requires Member States to recognise CO₂ storage, as strategic net-zero projects and limit the duration of the permitting process to 18 months after the receipt of all necessary documentation. As a result, applicants for a CO₂ storage site permit will be able to communicate with only one designated point of contact and expect a final decision within the above-mentioned time frame. Moreover, NZIA also [specifies](#) that "EU oil and gas production licensees must invest and use their assets, skills, and knowledge to make CO₂ capture a reliable industrial carbon management solution." Furthermore, in 2022 a coalition of several European NGOs, including Bellona, Germanwatch, and Carbon-Free

Europe, [called](#) for an EU-wide carbon capture and storage strategy. Last but not least, based on the [impact assessment](#) of the EU recommended climate target for 2040, Europe will need to grow its storage capacity to around 280 million tonnes by 2040. Therefore, following these policy recommendations, the European Commission came up with a dedicated strategy for this matter.

What are the key provisions in the EU Industrial Carbon Management Strategy?

According to the [European Commission](#), to help scale up the market for capture and permanent storage of CO₂ emissions, it plans to:

- establish **guidance for project permitting processes** and set up an **atlas of potential storage sites**.
- develop an **aggregation tool** for matching CO₂ suppliers with transport and storage operators and CO₂ off-takers, in cooperation with the Member States.
- **investment and funding**: promote industrial carbon management projects under EU energy infrastructure programmes and consider them as Important Projects of Common European Interest (IPCEIs). The Commission will assess whether certain CO₂ capture projects can already be supported with market-based funding mechanisms such as competitive bidding auctions-as-a-service under the Innovation Fund.
- **research, innovation and public awareness**: the Commission will consider boosting funding for R&I through existing instruments, in particular [Horizon Europe](#) and the [Innovation Fund](#). It will also support the establishment of a **knowledge-sharing platform** for CCUS projects. Working closely with the Member States, the Commission also plans to raise public awareness of these technologies, including by highlighting their benefits and discussing **potential rewards for local communities**. However, further details are not provided at this stage for this point on potential rewards.
- **international cooperation**: the Commission will accelerate work with international partners, especially on the harmonisation of reporting and accounting of carbon management activities and ensure that international carbon pricing frameworks take into account removals to address emissions in hard-to-abate sectors.

Member States are following the suit

In May this year, Germany became the first national government of the EU that adopted the [draft legislative proposal and a position paper](#) on a carbon management strategy as the government recognises that certain sectors like cement, lime, and waste incineration cannot fully eliminate emissions so there is a need to apply the CCS and CCU as components of decarbonising these hard-to-abate sectors. The key proposals include: removing existing barriers to CCS/CCU, developing CO₂ transport infrastructure, updating the Carbon Storage Act, and ratifying amendments to international protocols to facilitate CO₂ exports for offshore storage. Public funding will be directed towards hard-to-abate sectors to facilitate the uptake of these technologies but will exclude fossil fuel power stations. The draft will be discussed in the parliamentary procedure and it might take several months to finally adopt it. Nevertheless, the proposal is intended to enter into force this year.

In June, Austria's Federal government officially approved its national [carbon management strategy](#), which focuses on:

- the creation of the necessary legal framework for geological CO₂ storage on Austrian territory;
- the evaluation and adjustment of the legal requirements regarding pipeline-bound CO₂ transport;
- the set-up of a legal framework for minimum capture, transport, and storage targets for CO₂;
- the incentivising of research, feasibility studies, as well as pilot and demonstration projects for carbon management technologies.

France released its [national strategy](#) for the capture, storage or utilisation of CO₂ in July, which outlines the roadmap of capturing 4-8 million tonnes of CO₂ per year by 2030 across four “CCS valleys” to be constructed in the industrial ports of Dunkirk, Fos-sur-Mer and the Rhône axis, Le Havre and Saint-Nazaire. At least two of these four valleys could go into operation by 2030 and the first possibly as early as 2028, according to the ministry. The CO₂ would be deposited at sea (offshore). The first chains would have to be established by 2030 to reduce industrial emissions by around 45 percent by then. To achieve this goal, the French government plans to provide financial support for the first major projects from this year through the so-called carbon contracts for difference - CCfDs, which essentially is a policy instrument that provides a fixed carbon price to companies over a given period with the objective to reduce their investment risk in low-carbon technologies. These CCfDs would be signed for a period of 15 years.

Enthusiasm, criticism, and the debate on the maturity scale

Short overview of the pros and cons: the debate on CCS/CCU technologies has been ongoing for quite some time already and there are two contrasting positions in this regard. The first one represents the supporters group that mainly consists of the industry and trade associations, such as [Cefic](#) (the European Chemical Industry Council) or [Fuels Europe](#) (which represents the conventional and renewable fuels manufacturing industry) that have lobbied for the rollout of carbon management technologies and called for the recognition of CCU as a strategic net-zero technology in the EU Net Zero Industry Act (NZIA). Moreover, the industry supporters go even further and **ask for greater visibility at the political level**. Specifically, the industry groups and big oil heads of companies recently supported the [call](#) to appoint a dedicated carbon capture and storage (CCS) EU representative in the new mandate. The European representation of the International Association of Oil & Gas Producers (IOGP) believes that having such a dedicated portfolio in the new Commission would be very useful to liaise with Member States at the political level. Ensuring political support for such technology is important for the industry, as the rollout of carbon management technologies unlocks a new revenue stream for oil and gas companies. For example, [ExxonMobil](#) estimates a potential of \$4 trillion CCS market by 2050. However, the materialisation of such demand seems to be unlikely as the current political discussions around the distribution of portfolios and policy areas between the Member States after the EU elections do not include the establishment of a special representative for the CCS/CCU technologies.

The second one represents the opponents, which includes organisations such as [CAN Europe](#), which highlighted stated that CCS cannot deliver meaningful mitigation at the scale that is needed to limit global warming to 1.5 degrees and that “there is no evidence that this technology could ever work at the scale promised”. [Corporate Europe Observatory](#), [Friends of the Earth Europe](#), and other organisations underline in their [FossilFreePolitics](#) campaign that

oil companies use CCS as a way to unlock hundreds of millions of barrels of additional oil through enhanced oil recovery (EOR) techniques using captured CO₂ which essentially extends the life of their existing oil assets and therefore, allowing their current business model to continue as it is. Moreover, attempts have been made in the past when it comes to the commercial deployment of carbon capture via EU-funded projects. Nevertheless, the European Court of Auditors [concluded](#) in 2018 that 424 million of EU taxpayers money had been sunk into half a dozen large-scale carbon management projects, all of which failed due to the lack of coordination and long-term strategies that scared away the private investors.

When it comes to the perception of the proposed Industrial Carbon Management Communication, the polarisation of opinions, which is shortly described above, is kept in this case as well. Stakeholders such as Bellona, a Norwegian think tank, or the [Zero Emissions Platform](#), a European Technology and Innovation Platform, reacted positively by supporting this communication while also highlighting the needs that were still missing in the final text. For example, Bellona [underlined](#) that “the strategy does not elaborate on how to limit the need for CCS in a wider energy system where other scalable options for timely decarbonisation are available.” They also mention the overreliance on CCU and CDR, without clarifying how exactly the climate impact is going to be assessed and how the climate benefit is going to be ensured for CCU. The [Zero Emissions Platform](#) also highlights that “this roadmap clearly shows that CCS is unavoidable for Europe to reach climate neutrality”, while pointing out at the same time that large-scale projects will require large resources. Yet, critics emphasize the loopholes in the final communication. For example, [E3G](#) highlights that the Commission seems to have avoided “the tough political decisions on the first part of the value chain, namely where CO₂ will be captured.” In their view, the strategy does not specify what the high-value carbon capture applications are and where public support should be targeted. Without more details, specific argumentation, and policy transparency, this strategy risks, in their view, giving the impression that carbon capture could be a catch-all solution. Other problematic areas have also been highlighted. Luciana Miu, Head of Clean Economy at the Energy Policy Group (EPG) think tank, [finds](#) it disappointing the fact there is no clear mandate for project developers to conduct transparent public engagement. This can lead to a fragmented approach in aligning CCUS project deployment with social needs and concerns.

Nevertheless, if we look at the state of play, it seems that industrial players and the Commission are aligned on the **debate whether the carbon capture technologies are already mature or not**. Concretely, commercial actors like Maria João Duarte from Mitsubishi Heavy Industries (MHI), responsible for about two-thirds of the world’s carbon capture market, [stated](#) in February 2024 that infrastructure is the key obstacle that must be tackled. The technology supporters argue that CCS/CCU is entering a phase of maturity where attracting financing for the projects might not be that difficult anymore. But if the accompanying infrastructure will not be developed in time, this could create serious risks for projects development. In a related manner, the Commission representative is convinced that there is no debate anymore. Ruud Kempener, Team Leader for Industrial Decarbonisation at the European Commission Directorate General for Energy, highlighted that the Commission disagrees that the technology is unproven: “With [the 90% target] comes the essentially the conclusion that the capture of CO₂ will be needed to achieve any of the scenarios that we looked at – there’s no doubt about it anymore”. Furthermore, [according](#) to him, the CCS strategy is not a replacement for renewables or energy efficiency, but rather compliments it.

What are still the limitations?

According to the Clean Energy Wire [analysis](#), several economic and technical factors indicate the limits of such technologies:

- **High costs and lack of a business case:** CCS is still an expensive technology and high costs are a major barrier to widespread deployment. The World Economic Forum [estimates](#) that for the technology to be widely adopted, “the cost will need to fall from \$600-\$1,000 per ton of CO₂ to below \$200 per ton and ideally closer to \$100 per ton.” Moreover, without a strong price on carbon emissions, there is limited incentive for companies to invest in expensive CCS projects. Current carbon prices under the EU ETS are seen as too low to drive CCS deployment.
- **Energy use:** The capture process requires significant amounts of energy, which would reduce the overall efficiency of power plants or industrial facilities using CCS and subsequently would lead to increased operating costs.
- **Limited storage capacity:** There are concerns about the long-term availability and safety of geological storage sites for captured CO₂. Moreover, suitable storage sites may be limited in some regions. According to the Clean Air Task Force [research](#), some areas may have more favorable geological formations for safe and permanent CO₂ storage (like the North Sea countries), while others may lack suitable storage options (like Estonia, Finland, or Luxembourg).
- **Security of geological storage:** the long-term behavior of CO₂ in the subsurface remains a key uncertainty for several [reasons](#), including: a) the subsurface environment is highly complex and includes processes like fluid flow, geochemistry, and geomechanics which makes it challenging to come up with an accurate modeling and predicting the long-term scenario of CO₂ storage; b) most projects are relatively new, with limited long-term monitoring data available; c) predictions of CO₂ behavior are sensitive to the choice of modeling approaches and assumptions used to represent subsurface processes; d) lack of consensus among experts: expert elicitations suggest some difference of opinion exists regarding the likelihood of CO₂ leakage, especially for minor leakage over long time scales.

Next steps

The new Commission potentially would start preparatory work on a possible future CO₂ transport and storage regulatory package, which would consider further issues such as market and cost structure, third-party access, CO₂ quality standards, or investment incentives for new infrastructure. However, this is not confirmed yet, and remains to be seen whether this is going to be reflected in the Commission’s Work Programme 2025, which will be released after the establishment of the new leadership structure of the European Commission.

Conclusion

The topic of carbon capture and removal technologies remains heavily disputed. Nevertheless, the Commission seems to be convinced in its analysis that technologies like CCS, CCU and CDR will be part of the toolbox of solutions that need to be deployed to reach climate neutrality by 2050, as there are not so many options available when it comes to the decarbonisation of hard-to-abate industrial sectors (such as steel, cement, and chemical production). With the release of its industrial carbon management communication, the Commission sent a clear signal to Member States, industry and stakeholders that these technologies will have a role to

play. The challenge now is to ensure that this vision can be implemented rapidly with a sufficient allocation of funding, clear regulatory guidance when it comes to the development of the necessary CO2 transport pipelines and storage sites, as well as ensuring public acceptance for geological storage. It will be up to the new Commission to provide a more precise framework in this direction.

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