

Markets and Mandates

How best to drive pace in CCS deployment?

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This briefing introduces the key themes that the Carbon Capture and Storage Association (CCSA), Oxford Net Zero, and Carbon Balance Initiative are exploring to understand the role of markets and mandates in driving carbon capture and storage (CCS) to reach net zero by 2050. We invite stakeholders to contribute to this work at COP28. Your contributions will feed into a 2024 research project and an economic analysis of policy options for enduring CCS deployment.

Why do we need carbon capture and storage?

To prevent the worst effects of climate change, the Paris Agreement committed the world to limiting human-induced global warming to 1.5°C. But nearly a decade on, global greenhouse gas emissions (GHG) are still rising, and temperatures are still going up. Rapid, global action has never been more urgent.

To achieve the 1.5°C target, the IPCC is clear that we need to achieve net zero carbon dioxide (CO₂) emissions by 2050. This requires rapidly reducing emissions by reducing fossil fuel consumption, increasing energy and process efficiency, and shifting towards energy from renewable sources. Reaching net zero by 2050 also means we need to capture and permanently store remaining CO₂ emissions, preventing them from reaching the atmosphere. At the same time, emissions that cannot be captured at point-source must be balanced by removing CO₂ that has already been emitted to the atmosphere. This makes carbon storage, with either point-source CO₂ capture or carbon dioxide removal (CDR), a crucial part of global action to address climate change.

The Earth's capacity for geological CO₂ storage is immense, but currently only ~50 million tonnes of CO₂ are captured annually, with a smaller fraction still geologically stored[1]. IPCC models that reach 1.5°C indicate that we need to store more than 5 billion tonnes of CO₂ per year by 2050[2].

This requires a scale up of more than 10,000%. This is an immense challenge, given that the timeline for carbon storage project development is long, and most of the projects planned today are not expected to be operational before 2030. Thus, developing capacity needs to be an ongoing process of continual CO₂ storage development, at huge scales, across the world. If we do not act faster now it leaves us with a larger scale-up task in the 2040s and 50s, leading to a serious risk of failure for our net zero targets.

Exploring various policy options for scaling CCS

In response to the carbon storage challenge, many governments are now considering the best policy mix to scale their CCS facilities and produce an enduring CO₂ storage market, while preventing an over-reliance on fossil fuels in the future. Our research has identified several important themes and outcomes for the long-term deployment of CCS. The overriding goal is to scale up carbon storage facilities to the right size and in time to reach net zero. In addition, investors need certainty of returns, and the market should work efficiently and fairly. Externalities, such as the cost of dealing with climate change, should be internalised in the price of carbon-intensive products and borne across the value chain. Finally, policies will need to mitigate unintended consequences such as carbon leakage, job losses and resource insecurity.

To achieve these objectives, and drive long-term deployment of CCS, governments can use a range of policy instruments. These can be grouped into three broad categories:

- **Government project-level subsidies for carbon storage** (e.g., competitions, tax breaks, government support agreements, and direct procurement of CO₂ storage);
- **Demand-side policies for carbon storage markets** (driving up demand for CO₂ storage from emitters of CO₂, e.g., emission trading schemes (ETS), public sector low-carbon procurement obligations, private sector procurement commitments, and low carbon product regulations);
- **Supply-side policies for carbon storage** (e.g., producer responsibility frameworks, such as storage mandates).

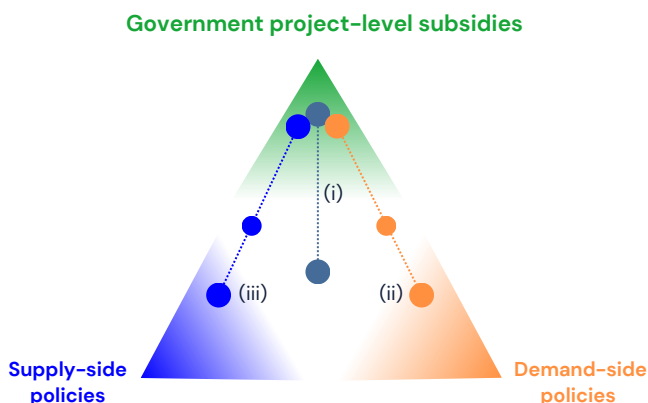
The interaction between these three policy mechanisms is illustrated in the figure below.

Over time, the policy mix is likely to move from (i) government project-level subsidies to a mix of (ii) demand and (iii) supply-side schemes.

Understanding the interplay between these policies is a key priority for future research.

Figure 1. Categories for policy mechanisms

The dotted lines and circles represent hypothetical policy mixes, migrating over time away from government procurement. This does not represent an exhaustive list of policy scenarios.



How effective are existing policy options in delivering CCS scale-up?

Work by Oxford Net Zero suggests the currently implemented policy approaches are unlikely to be enough on their own to deliver the necessary CO₂ storage capacity in an enduring market. So far, governments have mostly focused on demand-side policies and direct intervention, with policy instruments including the UK and EU ETS markets, the UK's government support agreements through its Cluster Sequencing programme, and the US's 45Q tax breaks on carbon storage. These have been crucial in securing commitments to deliver the first CO₂ storage sites, but cannot continue indefinitely due to the scale of government investment required. In addition, these mechanisms may be considered unfair and politically uncertain, given that all taxpayers are paying – rather than applying the polluter-pays principle where the product price would reflect the cost of addressing the impacts of climate change.

Carbon pricing mechanisms, such as the ETS, provide an important investment signal but also incentivise investment in the cheapest abatement efforts first. To meet the net zero target, CO₂ storage will need to be scaled up to offset all ongoing CO₂ production by 2050. CCS and CO₂ removal projects are high-cost, capital-intensive projects with long lead times of a decade or more, so to incentivise investment in these technologies the ETS price would need to be sufficiently high over an extended period of time, which cannot be guaranteed. Given the imperative of rapid progress towards net zero, additional policy instruments are likely to be needed to complement existing frameworks and guarantee delivery of sufficient levels of geological CO₂ storage to match or exceed ongoing production of CO₂.

We need to store more than 5 billion tonnes of CO₂ per year by 2050 (IPCC, 2022)

The role of mandates alongside a market approach to CCS

This study will consider one such approach and builds on the UK CCUS Council* study (2023) looking at the role of storage mandates – the Carbon Takeback/Storage Obligation (CTBO/CSO) – as a way to drive CCS investment in the UK. A CTBO is conceived as a supply-side regulation on fossil fuel producers and suppliers to capture and permanently store CO₂. A storage mandate could be phased in over time by requiring producers and suppliers to permanently store an amount of CO₂, equivalent to a specified and rising proportion of the CO₂ associated with their activities and the products they sell, to reach a minimum of 100% by 2050. Analysis by Oxford Net Zero shows a CTBO could complement existing climate policies, by acting as a “backstop”, guaranteeing that net zero will be reached under any energy scenario[3]. Advocates argue it offers a predictable market for investors with a clear pathway and end goal; the creation of a level playing field where fossil fuel extraction and use reflect the cost of generated emissions; a system where costs are borne by producers, users and consumers across the value chain; and a route out of subsidies with relatively low administrative burden.

However, the detail of how a CTBO would be implemented in a particular jurisdiction is a crucial determinant of whether it would be a successful policy. Two broad examples of differing approaches to implementation of a CO₂ storage obligation are the storage mandate in the EU’s Net Zero Industry Act Article 18 [5] and the 10% domestic storage obligation recommended in the UK’s Net Zero Review[6] – but many policy choices are available, each with different implications.

References

1. [Global CCS Institute \(2023\)](#)
2. [IPCC AR6 WIII \(2022\)](#)
3. [Jenkins et al., \(2021\)](#)
4. [Jenkins et al., \(2023\)](#)
5. [European Commission \(2023\)](#)
6. [Skidmore \(2023\)](#)

*The CCUS Council is the UK Government’s primary forum for Ministerial engagement with representatives from the CCUS sector. The purpose of the CCUS Council is to review progress and support the UK’s Government’s ambition to deploy CCUS from the mid-2020s and at scale during the 2030s

Authors: Stuart Jenkins^[a], Mirte Boot^[a,b], Rebecca Bell^[c], Ingrid Udd Sundvor^[a,b], Olivia Powis^[c], Ruth Herbert^[c] and Myles Allen^[a]. The views expressed are those of the authors and do not necessarily reflect those of Oxford Net Zero [a], Carbon Balance Initiative [b] and Carbon Capture and Storage Association (CCSA) [c].

Image: National Carbon Capture Centre.

Key questions in our research that stakeholders are invited to contribute to include:

- What would be the impact of a storage mandate on the competitiveness of domestic industries, and how could this be mitigated? For example, should a mandate apply to all suppliers of fossil fuels, including importers? What impact would this have on international markets?
- How could we avoid a CTBO resulting in continued reliance on fossil fuels and fossil fuel infrastructure? What design choices, and other complementary policies, would be needed to prevent mitigation deterrence?
- How could we navigate the legal intricacies of a mandate, such as responsibility over storage, structures for monitoring, reporting and verification (MRV), regulation and administrative questions around claiming reduction credits, and penalties for non-compliance?
- Could a CTBO be applied flexibly, for example with low-carbon product standards on specific sectors/products?

Join our COP28 activities!

The work planned by the CCSA, Oxford Net Zero and the Carbon Balance Initiative will look at key principles, implementation questions, and policy interactions between market & mandate policies – and we want to hear from you!

To join the conversation with your thoughts, comments, questions and concerns, please sign up to join **our roundtable at COP on Friday 8th December, 17.00-18.00** by scanning the **QR code below** or [clicking on this link](#).

Scan the QR code to register for the roundtable

