

BRIEFING PAPER
**ACHIEVING NET ZERO:
CAPTURING AND
PERMANENTLY STORING
CARBON DIOXIDE**

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March 2020

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GEOLOGICAL STORAGE OF CARBON DIOXIDE IS NO LONGER OPTIONAL

To stop climate change and meet the goals of the Paris Agreement, we need to achieve net zero emissions by mid-century. Because fossil sources account for the overwhelming share of carbon dioxide (CO₂) emissions, there are only two ways to accomplish this:

- 1) Institute and enforce a global ban on fossil fuel extraction and use, or
- 2) Permanently store one ton of CO₂ for every ton generated by burning fossil fuels and producing steel and cement, such that it remains out of the atmosphere for thousands of years.

Banning fossil fuels would be impractical, unenforceable, and politically infeasible. Even if electricity production is completely decarbonised, applications such as shipping, aviation, steel, and cement production will continue to use these fuels well past 2050.

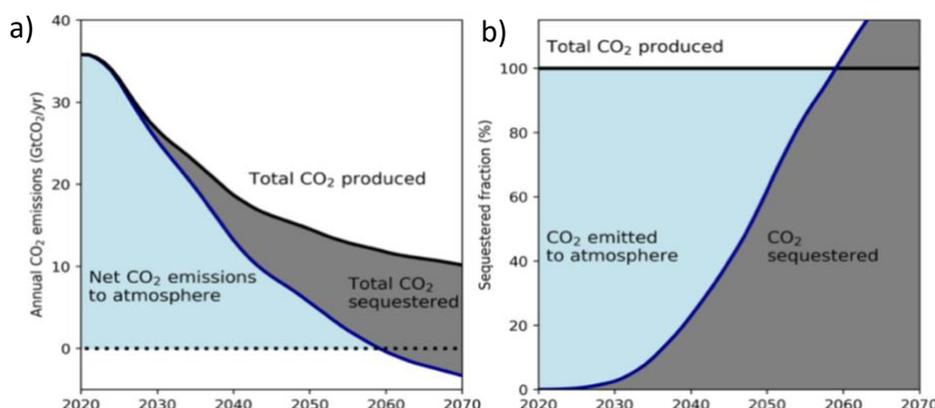
To stop global warming, we must learn to permanently store CO₂ at scale, and we must begin doing so now. At present, the only permanent storage option that is proven at scale is geological sequestration. But because there are cheaper ways to reduce emissions in the short term, geological storage has been starved of investment. Development has been made slow and expensive by relying on government subsidies. If oil and gas companies were required to dispose of CO₂ as a licensing condition of continuing to extract fossil fuels, they openly admit they would do so far more quickly and cost-effectively.

How can we get the companies whose products cause climate change to start storing enough CO₂ to stop it?

Carbon Takeback places the responsibility for safe disposal and storage CO₂ onto the companies that extract or import fossil fuels. **Here's How it Works:**

- Extractors and importers of fossil fuels are required through a progressive **Carbon Takeback Obligation (CTO)** to permanently store a percentage of the CO₂ generated by their products.
- The portion that must be stored increases gradually, reaching ~1% in 2023, 15% by 2030, and 100% by 2050. It must reach 100% to stop fossil fuels causing global warming.
- Companies can store the CO₂ themselves, or pay someone else to store it, trading certificates of storage until their obligation is fulfilled.

How much carbon dioxide do we need to store?



1.5°C-compliant trajectory

a) Note that total emissions (black line) are higher than net emissions (blue line) when net-zero is reached in the 2050s, due to sequestration (gray shaded region).

b) Same data, now shown in terms of the portion of CO₂ that is geologically stored (must reach 100% for net zero emissions). This is the fraction that must be stored under **Carbon Takeback**.

CARBON TAKEBACK IS KEY TO ACHIEVING NET ZERO IN THE UK

What makes **Carbon Takeback** appealing?

- **PREDICTABLE.** Industry discovers its own least-cost means of permanent storage to meet a predictably-escalating obligation. The regulatory burden is light.
- **NO TAX.** No direct taxpayer subsidy, price support mechanisms, or taxes.
- **AFFORDABLE.** The initially high costs of geological storage (£40-100/tCO₂ depending on source) are manageable because they are spread over the full volume of fossil fuels sold. For example, sequestering 10% of emissions adds just £0.7-1.8 to the cost of a barrel of oil. Costs decline over time as more projects are built to satisfy the CTO.
- **SAFE.** CO₂ is stored permanently underground, not in vulnerable ecosystems.

The public already intuitively holds fossil fuel companies responsible for climate change, and some (e.g. BP, Shell) are starting to accept that conclusion as well. **Carbon Takeback** simply makes that responsibility official and equitable, updating our social contract with the fossil fuel sector, and making them part of the solution, rather than the source of the problem.

Carbon Takeback is the ideal 'big idea' for the UK to showcase and lead with at COP26.

- If incorporated into the UK's Nationally Determined Contribution to the UNFCCC, **Carbon Takeback** would represent a dramatic increase in ambition as the first climate policy directly linked to achieving Net Zero.
- This would have minimal impact on UK competitiveness: obliging industry to sequester up to 15% of extracted and imported fuels would add less to the cost of carbon-based products than the current UK carbon floor price.
- The best way to discover the cost of doing something is to do it. This policy is the simplest and most efficient way of getting a fleet of initial projects built, so we can validate costs and start reducing them through learning.

Carbon Takeback bolsters existing UK plans for CO₂ storage under the North Sea.

The UK already plans to sequester ~10 MtCO₂/year by 2030 at a series of industrial hubs (e.g. Teesside). This would constitute 2.5% of fossil fuel extraction and imports, a welcome first step, but well short of the 10% required for a smooth transition to 100% storage, or net zero emissions, by 2050. Instituting **Carbon Takeback** gets us the rest of the way. Happily, we can reuse existing infrastructure – pipelines connecting Britain's North Sea coast to depleted oil and gas fields are instantly transformed from a £24 billion decommissioning liability to a valuable asset. These depleted fields contain enough storage space for at least 200 years of UK emissions. All of this enables a just transition, including thousands of new jobs, a new offshore industry, and exportable skills.

Carbon Takeback enlists the fossil fuel industry to help the UK deliver net zero by 2050.

Photos – [Front](#): Calcium carbonate and hot springs, Yellowstone Park USA. Pg 01: iStock. Pg 02: Graham Eaton, Overflight Stock