Briefing

Is the government wasting money on CCS?

August 2025

green alliance...

Summary

Carbon capture and storage (CCS) includes a range of technologies that can capture carbon emissions, transport them and then inject them deep underground for storage.

The government has committed up to £21.7 billion over 25 years to supporting the first set of CCS projects in the UK. With such a large sum of money dedicated to this technology, despite concerns about its effectiveness, it is fair to ask: is the government wasting money on CCS?

The answer is both yes and no.

There are two parts to the question. First, is the £21.7 billion being spent strategically? Second, who is paying for it?

On the first question, the answer is that the budget is not being spent strategically. CCS will be needed for industry to decarbonise across the world, but it is expensive, unproven at commercial scale and unlikely to see cost reductions at the level of renewable technologies.

Given the tight fiscal context, the government needs to use public money for CCS more strategically by prioritising those sectors where alternative decarbonisation options are limited, such as cement. Not a single cement plant has been approved or reached a final investment decision so far.

On the second question, roughly 75 per cent of the £21.7 billion committed to CCS will come from levies on consumer and business bills, not the government. In a cost of living crisis, the burden of funding CCS should not increase the bills of poorer households. The fairer solution would be to rethink the funding and move to a polluter pays model that means the polluters pay instead, particularly oil and gas companies.

Introduction

CCS is expected to be a valuable option for reducing emissions from some parts of the economy but there are good reasons to be cautious in how and

where it is deployed. CCS is often presented as a solution to reducing industrial emissions, but its deployment raises important questions about its long term effectiveness and oversight. Though the technology used to capture and transport carbon exists, at the moment it is used mostly overseas to allow further fossil fuel production, eg including by capturing carbon and using it to pump more oil from oil wells (called Enhanced Oil Recovery) or removing carbon from fossil gas during processing.[1]

Also, understanding of how carbon behaves when injected deep underground is still developing.[2] Monitoring of early projects in Norway, for example, has shown unexpected movements of the carbon underground, although there have been no leaks.[3]

Strong regulatory oversight will be needed to ensure carbon storage is effectively monitored and companies are held to account for detecting and managing leaks. This is particularly vital for storage designed to be permanent, as the burden will fall on future generations to manage these systems in the decades to come, when individual companies may no longer exist.[4] (For more details on the technological maturity of carbon capture, transport and storage technologies see our accompanying technical paper.)

CCS is expensive and will always add significant cost to operations. It is not the same as switching from a gas power station to renewables; with the switch to renewable energy there is a direct substitution of the energy source. CCS is not a direct energy substitute; it is an additional cost to an existing fossil fuel plant. In some industries there are other, less expensive, options to decarbonise industry, such as direct electrification of heat processes, which has the added benefit of improving energy security by reducing reliance on volatile fossil fuel markets.

Therefore, it is preferable to minimise the use of CCS as much as possible and limit it to sectors that have no other easy options to decarbonise.

In this briefing, we set out to answer the question: is the government wasting money on CCS?

To answer, we look at whether current plans are justified and who will pay for them. We conclude with recommendations that will ensure public money is targeted towards the most cost effective solutions.

Is the £21.7 billion being spent strategically?

Some CCS will be needed for the economy to reach net zero carbon emissions, in line with the government's goal, but it should be minimal and focused only on those sectors where they are no other options to decarbonise.

Almost all pathways to net zero carbon emissions will rely on some CCS, including the UK Climate Change Committee's (CCC) seventh carbon budget advice to the UK government (for the period 2038 to 2042).[5] That advice, though, is very clear about the minimal role CCS will play compared to direct electrification. It projects electrification will deliver 60 per cent of emissions reductions needed by 2040 across the whole economy, compared to ten per cent from CCS and hydrogen deployment.[6]

Uses of CCS, according to the CCC, should be restricted to cement, lime and chemicals manufacturing, 'blue' hydrogen production from fossil gas and engineered removals (ie sucking carbon out of the atmosphere), including bioenergy and 'energy from waste' plants.

The CCC's advice also leaves the door open to some uses in the power system, saying either hydrogen power plants or gas plants with CCS will be needed to provide flexible power.[7] Overall, in its balanced pathway scenario, CCS is expected to reduce emissions by 13MtCO_2e by 2030. This is far lower than the previous government target to store 20-30MtCO_2e through CCS by 2030.[8]

Ultimately, some CCS will be needed for some sectors, as well as technology to pull carbon from the atmosphere, to stabilise the climate. But other sectors, like power and hydrogen production, have other technologies that could play a similar flexible role, such as 'green' hydrogen produced from renewable power. The question is how quickly they can be scaled up and at what price? The CCC anticipates large scale dedicated renewables for green hydrogen production will not come online until after 2035.[9]

The table below summarises four categories of use for CCS and our assessment of CCS as a solution in each case.

Our assessment is indicated on a colour scale from green to red, with green signifying the fewest concerns and most confidence that CCS might be a solution and red where there are significant concerns about using CCS.

Category	CCS application	Sectors	Assessment of CCS as a solution
Chemical reaction	Enabling chemical processes that produce CO_2	Cement, some chemical production	Alternative technologies to decarbonise these processes are being researched, but they are not yet commercial.[10] Therefore, CCS will be

			needed, at least in the short to medium term.
Fossil fuel	Allowing continued use of fossil fuels as an energy source	Gas power plants with CCS, industrial gas boilers, blue hydrogen production	Sustains demand for fossil fuels, leading to continued extraction and upstream emissions.
Biomass and waste	Allowing the use of biomass or waste as an energy source	Bioenergy plants with CCS (BECCS), energy from waste (EfW) with CCS	There are sustainability concerns around burning biomass at scale and increasing waste burning, due to land use impact and the increases in demand for waste as a fuel, when we should be aiming to reduce waste generation in line with government targets.[11]
Engineered removal	Direct greenhouse gas removal	Direct Air Capture CCS (DACCS). BECCS and EfW CCS also claim to be in this category	This will be needed to achieve net negative emissions in 2050. But DACCS is high cost and there are sustainability concerns about BECCS and EfW CCS.

The government is not prioritising CCS where it is needed

The previous Conservative government published a Carbon Capture, Utilisation and Storage (CCUS) Vision with a timetable for four industrial clusters deployed by 2030 and a target to store 20-30MtCO_2 per year by 2030.[12] This is equivalent to London's yearly total emissions.[13]

In 2023, the CCUS investment roadmap announced two initial clusters, 'track-1' and 'track-2', with eight capture projects between them, aiming to deliver 9MtCO_2 of storage.[14]

In October 2024, Ed Miliband, the secretary of state for the Department of Energy Security and Net Zero (DESNZ) announced that the government had

approved three capture projects out of the original eight in track-1.[15] These include:

- two capture projects in Merseyside, in the HyNet industrial cluster: one energy from waste (EfW) plant and one blue hydrogen production plant;
- one capture project in Teesside, in the East Coast industrial cluster: a gas power CCS plant.

In addition, two transport and storage networks have been approved, one in Teesside called the Northern Endurance Partnership and one in Merseyside called HyNet North West, with a combined potential storage capacity of 8.5MtCO_2 per year, down from the 9MtCO_2 previously planned.

At the spending review in June 2025, £9.4 billion was allocated to CCS capital funding over the next three years, aimed at filling the 8.5MtCO_2 capacity at the Teesside and Merseyside storage networks. While the precise allocation of costs to different projects is still unclear, the scale of investment promised suggests further capture projects from 'track-1' or the 'track-1 expansion' group could soon be approved. The government has announced five priority projects for connection to the HyNet cluster including a gas power CCS plant, a blue hydrogen production plant, a cement plant, an energy from waste plant and a BECCS plant.[16] Development funding has also been promised for two further transport and storage networks: Acorn in Scotland and Viking in the Humber.[17]

The inclusion of a cement and lime plant in the priority list is welcome, as cement is one of the few sectors with no other current options to decarbonise. However, this project is yet to be approved and is still only a single plant. Overall, announcements demonstrate the prioritisation of blue hydrogen, gas power and EfW plants for funding. This reflects a missed opportunity to focus on sectors where there are currently no other options to decarbonise.

Who is paying for CCS?

The government has committed to invest up to £21.7 billion in CCS over 25 years, aiming to leverage £8 billion private investment.[18] That is a poor investment multiplier, with every £1 of government support attracting just 37p from the private sector. However, not all of the £21.7 billion promised is government money. Roughly 75 per cent of it is due to come from levies on businesses and consumers.[19]

The government has created five CCS business models (shown below) to help make the technology financially viable. These are designed to cover the

additional costs of CCS so companies using it can remain competitive with those that do not.

Business Model	Sector	Funding Source	Features
Industrial carbon capture	Industry	Public funding via contracts for difference (CfD)	If the UK carbon price was high enough, it would incentivise CCS on its own. Currently it is too low, so government plans to use public money to top up the difference between the carbon price and the cost of CCS, so that plants with CCS can compete on cost with those without CCS.[20]
Waste carbon capture	Energy from waste (EfW)	Public funding via CfD	Same as above.
Power carbon capture	Power generation	Levy on electricity bills	Designed to enable gas CCS power plants to compete on cost with gas power plants.[21] Already enacted through legislation in November 2024.[22]
Hydrogen production	Blue and green hydrogen[23]	Proposed levy on gas shippers	Designed to enable hydrogen to compete with fossil gas on price in the market. Government has consulted on how to fund this business model. In the consultation they assume that 100 per cent of the cost will be passed onto gas bills.[24]
Transport and storage	Infrastructure	Public funding,	As transport and storage is a monopoly, with no market competitors, an independent regulator sets

		regulated returns	the price they can charge for their services. Capture sites pay for T&S services and public money is used to top up this payment, to achieve agreed rates of return on investment.[25]

Two further business models are in development, one to support greenhouse gas removals and one for power BECCS. (A detailed explanation of how the five published business models work and the differences between them is in our accompanying technical paper.)

The hydrogen production and power carbon capture business models are both paid for through levies on consumer bills. As the government revealed that 75% of the £21.7 billion over 25 years would be paid for through levies, this suggests that roughly 75 per cent of the projected costs over that period will be for hydrogen and power projects. The remaining 25 per cent of the budget, funded by government money, will be split between industrial, waste and transport and storage projects. This suggests prioritisation of large, costly blue hydrogen and gas power CCS projects, potentially at the expense of the more strategic industrial projects such as cement and chemicals.

Most of the cost of CCS will be paid by consumers

CCS is expensive. It will always represent an additional cost to business operations, as it requires new infrastructure to be built and energy to run, compared to a plant without CCS. No cost reductions in carbon capture technology have been reported over decades of past use in gas processing, and some costs have increased.[26]

For many cases, there are cheaper alternative options, with the potential for cost reductions over time, for instance in heavy industry. The CCC's seventh carbon budget advice (for 2038-42) is that direct electrification of industrial processes will be cheaper than CCS, wherever it is possible.[27] Running costs of electrified processes have the potential to fall in future, as energy costs in a renewable dominated power system come down.

With renewable energy, there is direct substitution of fossil fuel energy for renewables. CCS, on the other hand, is an additional cost to an existing plant. Where this supports continued fossil fuel use, this means continued reliance on fossil fuel imports and volatile fossil fuel prices.

While it is possible that some aspects of CCS cost could fall over time as the technology is increasingly deployed and as risks are better understood by the financial sector, the fundamental point that it is an additional cost will not change.[28]

At a time when fuel poverty is rising, households struggling to pay their energy bills should not be forced to cover the cost of CCS. There are two risks to the current approach.

Firstly, under the hydrogen production business model, where the cost looks likely to be passed onto household gas bills, there are fairness concerns. As higher income households switch from gas boilers to heat pumps, the customer base paying the levy will shrink, placing the burden on those unable to afford the upfront cost of switching to electric heating. Secondly, adding charges to already high electricity bills under the power carbon capture business model will both impact fuel poor households and is likely to be a disincentive to the electrification of heating, transport and industry.

Levies on energy bills and decisions about who pays for which costs need to be reviewed with these risks in mind. Introducing a social tariff on energy bills would be one way to protect poorer households, but it shouldn't be done in a way that disincentivises electrification by raising bills for other groups.

Demonstrating that the transition to a low carbon economy can help to cut energy bills, particularly for the poorest and deliver tangible benefits to people's lives is essential to maintaining public support for climate action.

Recommendations

The government is not being strategic at present with how it raises or spends CCS funding. In a tight fiscal context, funding should be targeted at applications where there are no other current options available to decarbonise, such as the cement industry. This is particularly critical when roughly 75 per cent of the cost of supporting initial CCS projects will be paid by consumers through their energy bills.

This should motivate government action in four key areas:

1. **Apply the polluter pays principle.** Set out a clear timeline to move rapidly to a polluter pays model for CCS funding, that places the cost on the polluters, particularly oil and gas companies, instead of household energy bills. This could include a levy on fossil fuel producers, or an obligation on them to store an increasing fraction of the emissions they are responsible for, known as a 'carbon takeback obligation'.

2. **Protect households.** As part of a wider review of levies on energy bills, look to move the cost of CCS off poorer households while also creating an electricity to gas price ratio that incentivises electrification across the customer base. Options could include a social tariff – ie a discounted energy rate for low income and vulnerable households – to protect those least able to pay from high energy bills and moving a portion of policy costs to general taxation.

3. **Rebalance policy support towards other decarbonisation options.** Review whether track-1 CCS projects are good value for money, compared to other decarbonisation options and prioritise future government funding towards the best value options. This should include policy and funding support for industrial electrification, at least equivalent to the support offered for CCS and hydrogen.

4. **Prioritise CCS funding.** Direct further support for CCS towards applications in industries with long term prospects and no better alternatives to decarbonise, such as the cement and chemicals industries, rather than prioritising projects that prolong fossil fuel use, such as power CCS and blue hydrogen production. This should include a review of the previous government storage target of 20-30MtCO_2e by 2030, reflecting that the CCC's seventh carbon budget advice (for 2038-42) recommends less than 13MtCO_2e will be needed by that date.

Taken together, these four actions would support two core government objectives.

First, in shifting costs away from consumers and towards polluters and prioritising the most cost effective and unavoidable decarbonisation options, the government can ensure better value for public money, helping to address the UK's weak fiscal position.

Second, at a time when the political consensus on achieving net zero carbon emissions to reduce climate impacts is under threat and households are facing high bills, reducing consumer costs, particularly for the lowest income groups, would help maintain support for climate action.

For more information, contact:
Heather Plumpton, head of research, Green Alliance
hplumpton@green-alliance.org.uk

Endnotes

[1] International Energy Agency, 2020, *Energy technology perspectives 2020: special report on carbon capture utilisation and storage*
[2] J Alcade et al, June 2018, 'Estimating geological CO2 storage security to deliver on climate mitigation', *Nature Communications*, 9, 2,201
[3] Institute for Energy Economics and Financial Analysis (IEEFA), June 2023, *Norway's Sleipner and Snøvit CCS: industry models or cautionary tales?;* A K Furre et al, July 2017, '20 years of monitoring CO2-injection at Sleipner', *Energy Procedia*, 114 pp 3916-3926
[4] The EU CCS Directive 2009 requires 20 years of monitoring post-closure, and financial contributions for 30 years after that. These regulations have been implemented in the UK through the Energy Act 2008. See: Department for Business, Energy and Industrial Strategy (now DESNZ), 2021, 'Measurement monitoring and verification (mmv) plan for endurance'; Eni Hynethub, 'Carbon capture and storage factsheet', hynethub.co.uk/files/Eni-CCS%20factsheet.pdf
[5] Climate Change Committee (CCC), 2025, *Seventh carbon budget advice*
[6] Ibid
[7] Ibid
[8] UK Government, December 2023, *Carbon capture, usage and storage: a vision to stablish a competitive market*
[9] UK Climate Change Committee (CCC), March 2023, *Delivering a reliable decarbonised power system*
[10] Green Alliance, March 2025, briefing, 'Decarbonising the cement industry'; Green Alliance, March 2023, *A new formula: cutting the UK chemical industry's climate impact*
[11] Green Alliance, February 2024, briefing, 'Does the UK need BECCS to reach net zero?'*;* Green Alliance, November 2019, *Building a circular economy: how a new approach to infrastructure can put an end to waste*
[12] UK Government, December 2023, op cit
[13] According to the London Energy and Greenhouse Gas Inventory, the total territorial emissions produced by London in 2022, the latest year they have published data for, were 28.4 $MtCO_2e$.
[14] UK Government, April 2023, *CCUS net zero investment roadmap: capturing carbon and a global opportunity*
[15] *Hansard*, volume 754, debated on Monday 7 October 2024, 'Carbon capture, usage and storage'
[16] UK Government, 5 August 2025, '2,800 skilled jobs in Wales and North West as CCUS industry grows'
[17] HM Treasury, 11 June 2025, 'Spending review 2025'
[18] UK Government, 4 October 2024, 'Government reignites industrial heartlands 10 days out from the International Investment Summit'
[19] Public Accounts Committee, February 2025, 'Carbon capture: high degree of uncertainty whether risky investment by Govt will pay off'
[20] UK government, December 2022, *Carbon capture, usage and storage: industrial carbon capture business models summary*
[21] UK government, November 2022, *Carbon capture, usage and storage: dispatchable power agreement business model summary*

[22] UK government, Statutory Instruments 2024 No. 1159, The Contracts for Difference (Electricity Supplier Obligations) (Amendment) Regulations 2024
[23] UK government, February 2025, 'Hydrogen production business model'
[24] UK government, April 2025, *Funding mechanisms for the hydrogen production business model: consultation on the proposed Gas Shipper Obligation*
[25] UK government, January 2022, *Carbon capture, usage and storage: an update on the business model for transport and storage*
The government is planning to build transport and storage networks capable of handling not just carbon captured in the UK, but also imports of carbon from overseas, to be transported and stored in the UK. This could help with economic viability of the networks, and reduce reliance on government subsidy, as overseas companies pay for their captured carbon to the stored in the UK. See: Vivid Economics, October 2019, *Energy innovation needs assessment, sub-theme report: carbon capture utilisation, and storage*
[26] A Bacilieri, R Black and R Way, 4 December 2023, 'Assessing the relative costs of high-CCS and low-CCS pathways to 1.5 degrees', *Oxford Smith School of Enterprise and the Environment Working Paper No. 23-08*
[27] CCC, 2025, op cit
[28] Carbon Capture and Storage Association (CCSA), March 2025, *Driving cost reductions and value for money in CCUS*