TAXPAYERS for COMMON SENSE

REPORT

August 2024

From Cradle to Grave: Taxpayer Subsidies Throughout a Carbon Capture and Storage Project's Lifecycle

Taxpayer Subsidies for CCS

Carbon Capture and Sequestration (CCS) encompasses technologies designed to capture carbon oxides emitted during power generation and other industrial processes, instead of releasing them into the atmosphere. These captured carbons are then sequestered underground or in specially designed facilities. For decades, the federal government has provided billions of dollars in both direct and indirect subsidies to support CCS technology and projects. These subsidies have included research, development, and demonstration (RD&D) funding, loan guarantees, and tax credits. Over the past few decades some of these subsidies have gone to projects that have been repeatedly started and stopped, only to eventually collapse due to various economic issues and controversies (e.g., FutureGen, Kemper). Additionally, the 45Q tax credit, which has grown significantly in both size and scope, has been mired in fraud and waste. To date, the federal government has spent tens of billions of taxpayer dollars on CCS through research and development funding and tax credits, yet the technology is still struggling with widescale deployment issues due to high costs. Despite these concerns, Congress appropriated $12 billion more to the technology through the infrastructure law (Infrastructure Investment and Jobs Act, P.L. 117-58) and greatly expanded the already lucrative tax credit in the Inflation Reduction Act (P.L. 117-169).

Research, Development and Demonstration

The Department of Energy (DOE) began funding clean coal technology programs as early as the 1980s. It now officially funds CCS RD&D through the Office of Fossil Energy, currently known as the Office of Fossil Energy and Carbon Management (FECM). One of the most notable programs established under FECM is the Clean Coal Power Initiative (CCPI), which funded FutureGen. FutureGen aimed to be the world's first clean coal power plant using CCS technologies. Despite substantial DOE funding, the project underwent restructuring, cancellation, relocation, and eventual restart, before its suspension in February 2015. Many other facilities, including the Petra Nova plant in Texas, also received funding through CCPI.

According to the Congressional Research Service (CRS), Congress provided roughly $9 billion (in nominal dollars) in annual appropriations for DOE's FECM from FY2010 to FY2023, with over $2.8 billion specifically directed towards CCS line items.[1]

The Infrastructure Investment and Jobs Act (IIJA), enacted in November 2021, further increased the authorization levels for CCS programs established in the Energy Act of 2020 and created new programs.

CCS Programs	FY2022-2026 Appropriations	Managing DOE Office
CCS demonstration projects	$2.537 billion	OCED
Front-End Engineering and Design (FEED) program for CCUS transport infrastructure	$100 million	FECM
Carbon Storage Validation and Testing	$2.5 billion	FECM
Carbon Dioxide Transportation Infrastructure Financing and Innovation (CIFIA)	$2.1 billion	FECM & Loan Program Office (LPO)
Large-Scale CCS Pilot Projects	$937 million	OCED
Carbon Utilization	$310 million	FECM
Regional Direct Air Capture (DAC) Hubs	$3.5 billion	OCED
Carbon Removal Prize Competition	$115 million	FECM
Total	**$12.1 billion**	

In total, the IIJA allocated $12.1 billion for CCS from FY2022 to FY2026. DOE has already announced several funding opportunities for CCS programs following the passage of the IIJA.

Debt Capital Financing

In addition to directly funding RD&D programs, the DOE supports the early commercialization of advanced technologies, including renewables, nuclear, and advanced fossil fuels, through various loan guarantee programs with hundreds of billions in lending authority. Loan guarantees mean that the federal government will repay loans to lenders if the borrowers default.

[1] Congressional Research Service, "DOE's Carbon Capture and Storage (CCS) and Carbon Removal Programs," IF11861, January 2024. https://crsreports.congress.gov/product/pdf/IF/IF11861

The Loan Programs Office (LPO) at DOE has $8.5 billion in loan guarantee authority specifically for advanced fossil energy projects like CCS under the Title XVII Innovative Loan Guarantee Program created by the Energy Policy Act of 2005.

Furthermore, the Inflation Reduction Act (IRA) provided an additional $40 billion in loan authority for Title XVII projects, available through the end of FY2026, and appropriated $3.6 billion in credit subsidy to support the cost of those loans and administrative expenses. When a loan guarantee is issued, the recipient must pay a credit subsidy cost, an estimate of the long-term cost to the federal government of guaranteeing a loan for the entire period it is outstanding. This cost includes covering interest subsidies, loan defaults, and delinquencies.[2] The amount of the credit subsidy cost correlates with the size and riskiness of the loan.

The IRA also created a new, time-limited $250 billion Title XVII loan authority—Section 1706, Energy Infrastructure Reinvestment Financing—for projects that:

(1) Retool, repower, repurpose, or replace energy infrastructure that has ceased operations; or
(2) Enable operating energy infrastructure to avoid, reduce, utilize, or sequester air pollutants or anthropogenic emissions of greenhouse gases.

Potential projects could include repurposing shuttered fossil energy facilities for clean energy production or updating operating energy infrastructure with emissions control technologies, including CCS. The IRA appropriated $5 billion in credit subsidy to support the cost of those loans and administrative expenses.

The IIJA also established a new carbon dioxide (CO_2) transportation infrastructure financing and innovation program (CIFIA) to provide federal credit instruments, such as loan guarantees, secured loans, or grants, to CCS infrastructure projects. CIFIA received $2.1 billion in funding for FY2022 through FY2026 to support the construction of infrastructure (e.g., pipeline, shipping, rail) to transport CO_2 from capture sites to storage or utilization locations. This program is jointly managed by DOE's LPO and FECM.

To date, DOE has not finalized a loan guarantee for any CCS facility. However, when a project is ready to start construction, DOE is prepared to guarantee up to tens of billions of dollars with the full faith and credit of the U.S. government.

Carbon Capture and Sequestration Tax Credit (45Q)

Lastly, there's a substantial tax credit available to CCS facilities when they begin operation. The carbon capture and sequestration credit, often referred to as 45Q, is available to qualified taxpayers for each metric ton of carbon oxide they capture and sequester. Established in 2008, the credit has been expanded and extended several times. Most recently, the IRA significantly expanded and extended the CCS tax credit again, pushing the eligibility date back to 2033. The IRA also made credits transferable and allows certain taxpayers to elect to receive 45Q credits as a direct payment instead of as a credit against their federal income tax liabilities. This change

[2] Government Accountability Office, "DOE Loan Guarantees: Further Actions Are Needed to Improve Tracking and Review of Applications," GAO-12-157, March 2021. https://www.gao.gov/assets/gao-12-157.pdf

enables companies to benefit from the credit regardless of their tax liability. As the 45Q tax credit rewards operators for every ton of carbon captured and stored, instead of the amount of carbon reduction achieved compared to a certain benchmark, it offers a perverse incentive for carbon-emitting facilities to emit more carbon to be then captured and stored.

	Equipment in Service 10/3/2008 – 2/9/18	**Equipment in Service 2/9/18 – 12/31/22**	**Equipment in Service after 12/31/22 –Construction Begins Before 1/1/33**
Claim Period	75 million cap already reached (No Longer Effective)	12 years	12 years, reduced to 5-year period if transferred.
Credit Amount			
Geologically Sequestered CO_2	$20	2018 base credit $25.70, increasing annually to $50 in 2026	$17 ($36 DAC) $85 ($180 DAC) if prevailing wage & apprenticeship (PWA) requirements are satisfied
Enhanced Oil Recovery	$10	2018 base credit $15.29, increasing annually to $35 in 2026	$12 ($26 DAC) $60 ($130 DAC) if PWA requirements are satisfied
Other Qualified Use of CO_2	$10	2018 base credit $15.29, increasing annually to $35 in 2026	$12 ($26 DAC) $60 ($130 DAC) if PWA requirements are satisfied
Annual Capture Requirements	Capture ≥ 500,000 metric tons	*Power plants that emit > 500,000 metric tons*: ≥ 500,000 metric tons. *Facilities that emit ≤ 500,000 metric tons per year:* Capture ≥ 25,000 metric tons. *DAC and other capture facilities:* Capture ≥ 100,000 metric tons.	*Power Plants*: Capture ≥ 18,750 metric tons AND ≥ 75% baseline carbon oxide production. *Other Facilities:* Capture ≥ 12,500 metric tons. *Direct Air Capture:* Capture ≥ 1,000 metric tons.

Lack of Liability Framework

CCS facilities can access various forms of support from the DOE, including funding for early research, development, and demonstration (RD&D), as well as loan guarantees for constructing facilities. Additionally, these facilities are eligible for the substantial 45Q tax credit when they commence operations. There is also the possibility of obtaining liability coverage in case the carbon stored underground leaks.

As of now, there is no established legal or regulatory framework governing liabilities related to long-term carbon storage. Advocates for CCS suggest that, to encourage the development of CCS facilities and infrastructure and to attract investors, it is necessary to implement measures such as transferring ownership to states after a specified period or providing liability coverage.

This approach, however, implies that despite receiving subsidies at every stage, the responsibility and potential financial burden of any liability due to carbon leakage might fall on taxpayers. Such leakages could pose significant risks to public health, water, the environment, and climate.

Subsidy Recipients and Activities

When Congress first created the 45Q tax credit in 2008, many policymakers envisioned that carbon capture technology would be used to reduce greenhouse gas emissions from coal-fired power plants. However, to date, only one commercial CCS facility—Petra Nova—captures carbon from coal power plant. Several projects along those lines were announced, but almost all were eventually cancelled. The high-profile Kemper County plant in Mississippi, for example, cancelled the coal gasification and carbon capture component of its plans after cost estimates to complete it increased by billions of dollars.

As both the types and the amounts of CCS subsidies grew over the years, many proponents argued that carbon capture technology could be used to help reduce greenhouse gas emissions from hard-to-abate sectors like cement and fertilizer. That vision has not materialized. Of all current and proposed CCS projects, cement and fertilizer only represent 3.9% and 4.7% of total capture capacity. Of the total metric tons of carbon that would be captured at current and proposed facilities, the oil and gas industry and the ethanol industry would account for 40.4% and 17.5%, meaning that these two industries would enjoy the lion's share of 45Q payouts for simply capturing their own emissions.[3] And given that the 45Q is rewarded based on every ton of carbon captured, not the amount of carbon reduced from a certain baseline, CCS subsidies do not necessarily reduce total emissions. For example, a facility currently emitting one ton of carbon would be able to claim the credit if it installs energy-intensive CCS capture equipment that emits two tons of CO_2 equivalent to capture the initial one ton of emission, despite having the same overall emissions (two tons generated minus one ton captured equals one ton emitted).

[3] Clean Air Task Force, "US Carbon Capture Activity and Project Table," Accessed May 2024. https://www.catf.us/ccstableus/

PIPE DREAM?

The Flow of Carbon Capture Subsidies

RESEARCH, DEVELOPMENT & DEMONSTRATION
$12,100,000,000+

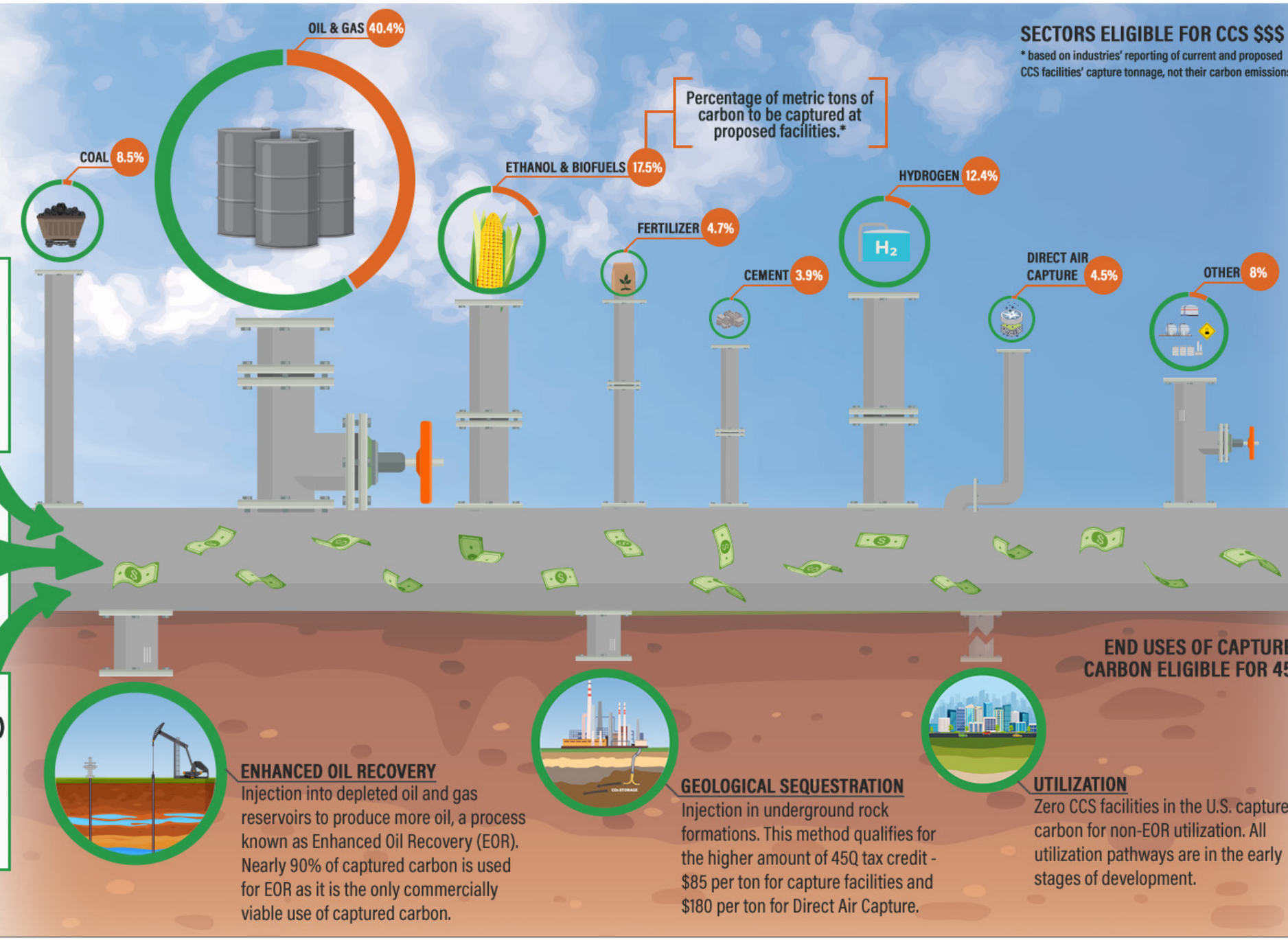
The federal government funds CCS research, development, and demonstration and recently allocated $12.1 billion from FY2022 to FY2026 through the Infrastructure Investment and Jobs Act.

DEBT CAPITAL FINANCING
$300,000,000,000

The federal government backs advanced technology commercialization with nearly $300 billion loan authority, including for CCS projects.

CARBON CAPTURE & SEQUESTRATION TAX CREDIT (45Q)
$30,000,000,000+

The 45Q tax credit was recently expanded, allowing new facilities to claim up to $180 per ton of CO_2 captured and sequestered, costing taxpayers close to $5 billion the next 5 years, and over $30 billion over the next 10 years.



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Although many proposed facilities claim that they plan to benefit from the more lucrative 45Q category for companies that directly sequester captured carbon underground, most currently operating facilities sell their carbon oxides to oil and gas producers who pump the carbon underground to free oil and gas from rock formations and increase their wells' output, a process known as enhanced oil recovery (EOR). Of the 15 commercial carbon capture projects operating in the United States, only two sequester captured carbon in an underground sandstone formation and 13 are capturing and injecting CO_2 for enhanced oil recovery. The CRS notes that in the near term, most CCS projects will continue to be for EOR because the revenue generated from the production of oil is needed to make carbon capture commercially viable.[4] It is still unknown if using captured carbon oxides for EOR results in a net reduction in emissions. Recent papers suggest that most EOR projects using captured CO_2 initially have a negative carbon footprint (net emissions reduction) because a high portion of the CO_2 pumped underground becomes trapped.[5] But as projects continue, increasingly less CO_2 is trapped underground, and the carbon footprint becomes positive (no net emission reduction).

Conclusion

Subsidies for carbon capture and storage have and will continue to be utilized by industries contributing to climate change. Federal supports for CCS must receive proper oversight and accountability to ensure taxpayers dollars are used effectively. Continuing to dedicate taxpayer resources to a costly and ineffective technology may divert important resources from other more effective and plausible climate mitigation strategies.

[4] CRS, "Carbon Capture and Sequestration (CCS) in the United States," R44902, October 2022. https://crsreports.congress.gov/product/pdf/R/R44902

[5] Núñez-López and Moskal, "Potential of CO2-EOR for Near-Term Decarbonization," Frontiers in Climate, September 2019. https://doi.org/10.3389/fclim.2019.00005; Sekera, J. & Lichtenberger, A., "Assessing Carbon Capture: Public Policy, Science, and Societal Need: A Review of the Literature on Industrial Carbon Removal," Biophysical Economics and Sustainability, October 2020 https://link.springer.com/article/10.1007/s41247-020-00080-5