THIRD WAY

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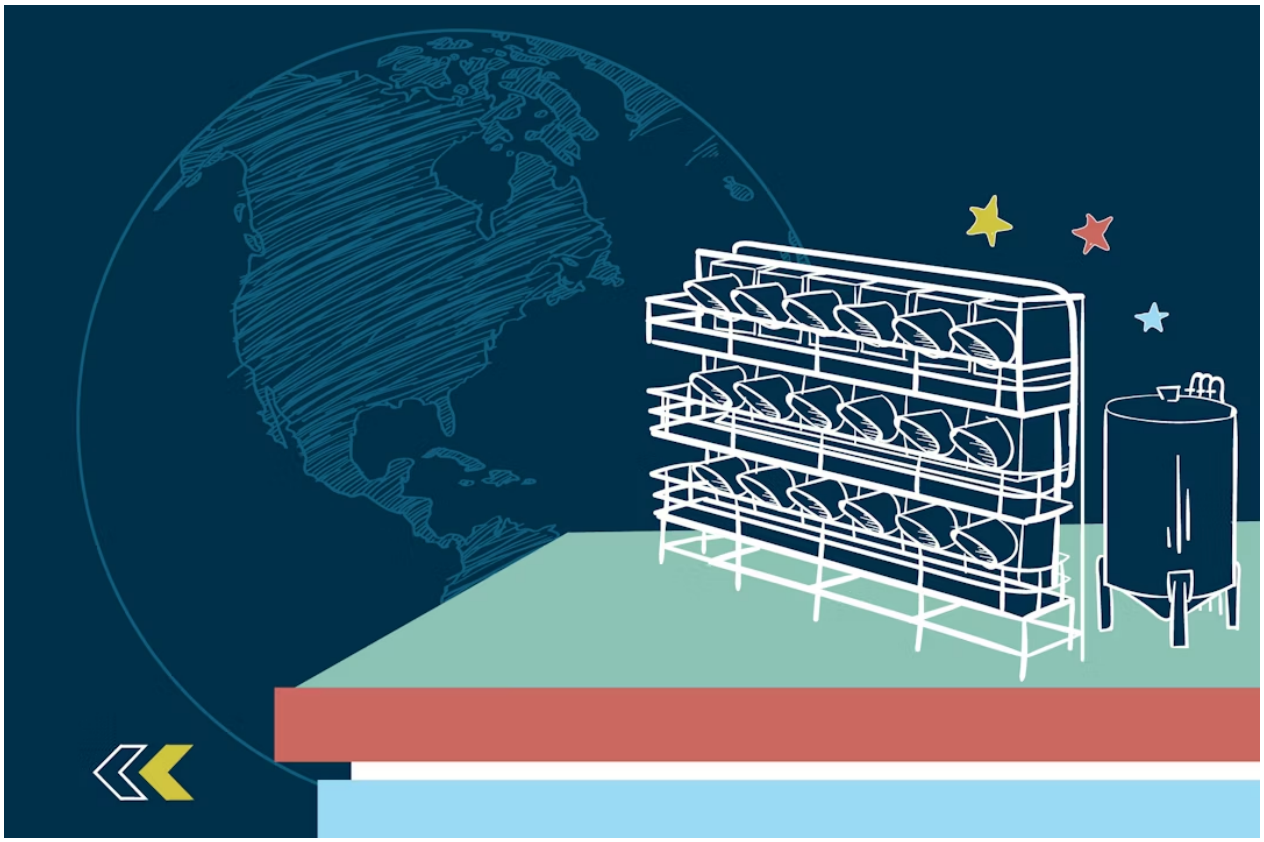
Status Report: American Competitiveness in Direct Air Capture



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Direct Air Capture (DAC) technologies are powerful tools that can eliminate carbon pollution that has been in the atmosphere for decades. DAC can also remove any residual emissions that are released from hard to abate sectors. When deployed at large scale, these technologies can significantly draw down legacy emissions, potentially removing. If the US is serious about meeting our emissions targets and decarbonizing our heaviest polluting industries, then the role of carbon management solutions like DAC is non-negotiable.

Right now, there are only 53 DAC facilities operating in the US, Canada, and Europe, capturing about 0.1 Mt of carbon annually. To stay on track with our 2050 timeline, DAC technologies, alongside other carbon management tools, the world will need to capture 85 Mt of carbon by 2030 and around

980 Mt by 2050. This is a significant increase from current levels—one the US has the opportunity to capitalize on.

By investing in and deploying DAC technology now, the US can carve out clear standards that guide the industry for the next several decades. This includes setting global benchmarks for measurement, reporting, monitoring, and verification. Establishing US leadership will allow us to tap into a $4 trillion global market and create hundreds of thousands of good-paying jobs in communities across America.

Through combined public and private sector efforts, that transition is well underway. This memo highlights key federal policies that are helping the US lead DAC development and deployment and shape the global framework for responsible and effective use of carbon removal technology.

How Federal Investments are Boosting the American DAC Industry

The US government has deployed strategic investments in DAC research and demonstrations that are catalyzing progress and reducing costs for deploying DAC technologies. Landmark provisions across the Energy Act of 2020, the Bipartisan Infrastructure Law (BIL), and the Inflation Reduction Act (IRA) are making it easier to deploy DAC technologies at scale now while making the US a more attractive location for DAC projects in the future. These incentives, which will be distributed over the course of several years, are providing clarity for long-term investment in DAC technology. Some of the most impactful federal investments include:

- Over $7 billion in grant funding to develop DAC hubs and incentivize capturing and utilizing CO2, procuring carbon-derived products, enhancing CO2 transport, and expanding geological sequestration; [1] and

- $13.22 billion in tax credits designed to promote carbon sequestration and utilization and to support manufacturing for DAC technology. [2]

These federal investments will be distributed over the next decade and will continue to pay dividends long after. And based on our analysis of Rhodium Group and MIT CEEPR's Clean Investment Monitor, it's clear that these policies are already working, with nearly in DAC manufacturing in just the past three years alone. [3] Roughly 90% of that investment occurred since the start of 2023, showing the steep upward trajectory of this opportunity.

Road to Victory: Growing US DAC Leadership

Global markets are becoming increasingly carbon-competitive, and the race for dominance is fierce. But as our research has found, if we can get ahead, the potential pay-off will be monumental. And the US is not just rising to the occasion, we're setting the pace.

Third Way's landmark analysis, in partnership with Breakthrough Energy and Boston Consulting Group, found that there are 5 segments of the DAC supply chain where the US has a distinct edge. These segments, identified for their potential market size and for American leadership, are already seeing substantial progress. Our strategic investments and the bold clean energy industrial strategy that we're putting into place are already delivering impressive wins in each of these value chain segments and strengthening our competitive advantage. Let's break that down:

Original Equipment Manufacturing (OEM)

Although the early leaders in DAC OEM were based in Canada and Switzerland, American companies are catching up quickly, and the US still maintains some distinct advantages in this value chain segment. Boasting the highest publication rate for DAC literature—25% greater than China—and leading in direct public funding for DAC, the US is well-positioned to capture a share of the $145 billion global market and create 1,000 jobs every year through 2050. With the second-highest level of private investment in OEM, the US is already making major strides here:

- **US Leads Advanced Manufacturing:** American companies are uniquely positioned to lead the global market on engineered carbon removal solutions. CarbonCapture Inc. is one such enterprise pioneering a high-volume and flexible manufacturing process in Arizona, which supplies modular DAC systems to US carbon removal projects, such as Project Bison in Wyoming. This advanced manufacturing facility will have the capability to start supplying carbon removal projects worldwide by 2025

- **Filling Technology Gaps:** The American-Made Direct Air Capture Prizes, including the Pre-Commercial Energy Program for Innovation Cluster Prize and the Pre-Commercial Technology Prize, are accelerating DAC solutions and supporting US entrepreneurship by addressing obstacles in DAC technology development.

- **Leading in DAC R&D:** The National Energy Technology Laboratory's DAC Center is leveraging an expansive network of world-class facilities and technical expertise to act as a platform for collaboration between universities, research institutions, and project developers, driving US leadership in DAC R&D.

- Colorado based Global Thermostat unveiled its first-ever kiloton-scale DAC unit, demonstrating breakthrough technology that can be scaled-up for carbon storage or utilization, showcasing US leadership in DAC intellectual property.

Project Development

DAC facilities require complex infrastructure and consequentially, strong, centralized project development to overcome financial and logistical barriers like permitting. As the only country with publicly funded centralized infrastructure for four DAC hubs, the US holds a distinct advantage in project development. Coupled with our access to critical resources, a mature market, and a skilled workforce, the US is well-positioned to capture a significant portion of this $65 billion market for project development and create 2,000 jobs every year through 2050. Here are a few ways we're already making progress:

- **Showcasing American Expertise:** The Department of Energy is leveraging $3.5 billion to develop four regional DAC hubs, demonstrating centralized project development and coordination across multiple stakeholders to establish fully-integrated DAC technological ecosystems in local communities.

- **Contextualizing Innovative American Projects:** The South Texas DAC Hub and Project Cypress in Louisiana were both selected for the first project phase of the Department of Energy's Regional DAC hub initiative and will effectively leverage the US's resources, market maturity, and a skilled workforce to create new economic opportunities within transitioning local economies. These projects continue to highlight American expertise in developing strategies that best integrate advanced DAC technologies into communities.

- **Building Partnerships:** Heirloom's new DAC facility is the first commercial DAC facility in the US and will permanently sequester captured carbon in concrete through a partnership with CarbonCure Technologies. This project exemplifies how thorough planning and project development enables companies with different specializations—such as concrete production and big tech—can effectively collaborate and advance DAC technology.

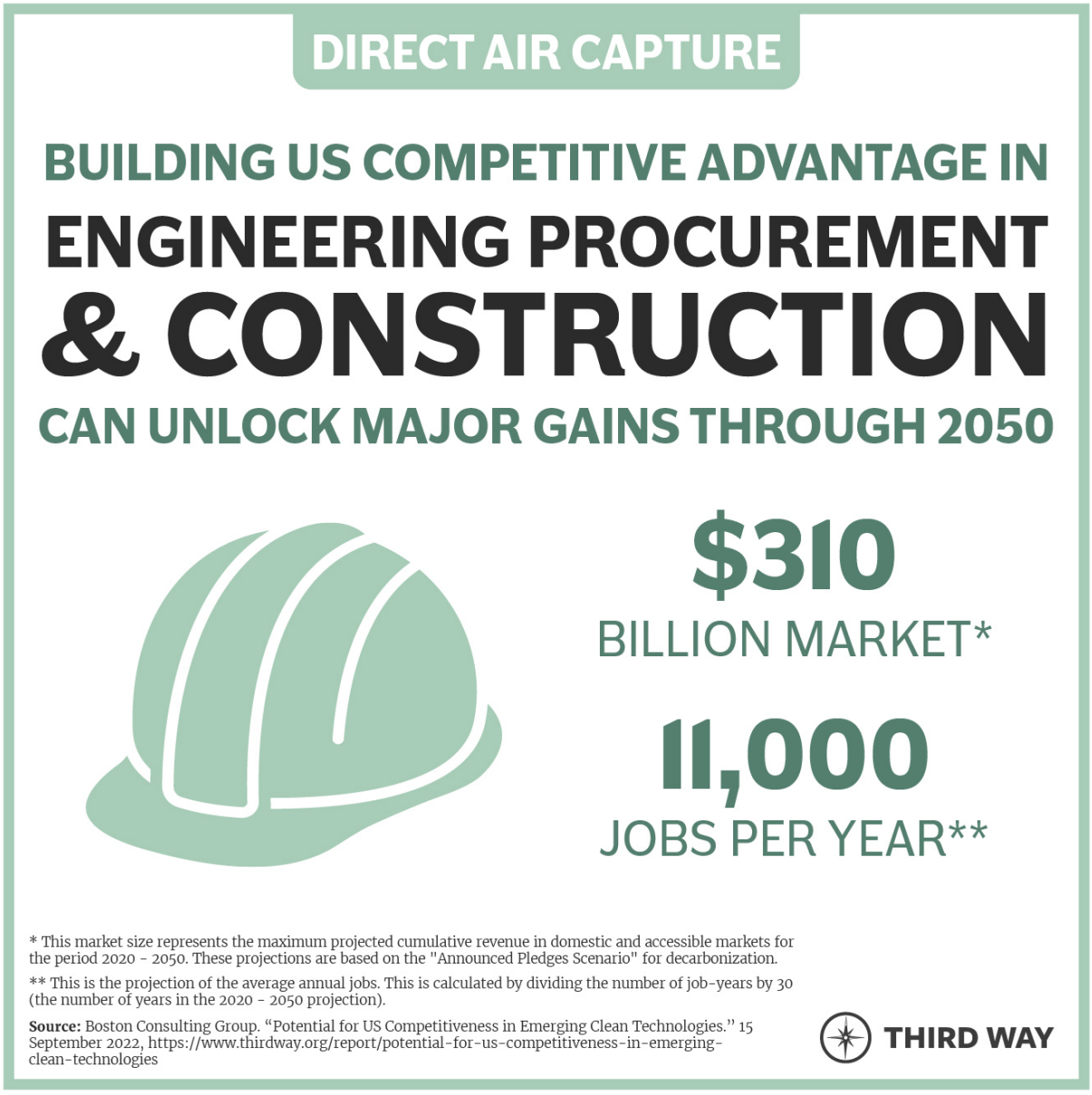
- **US Leadership in Large-Scale DAC Projects:** Standing at $80 million, CarbonCapture's Project Bison DAC Facility in Wyoming represents one of the largest private investments in DAC. Set to be the world's largest DAC facility and the first to use Class VI wells for CO_2 storage, Project Bison is a significant achievement and an example of US leadership in large-scale project development.

Engineering, Procurement, and Construction (EPC)

Experienced EPC providers with the ability to save cost and time in construction are well-positioned to capture a significant portion of the $310 billion global market through 2050. With a skilled workforce and the necessary technology from related industries like oil and gas, the US holds a strategic advantage here. By capitalizing on these strengths, the US has the potential to become a leading provider of DAC EPC services, creating 11,000 jobs every year through 2050. We're already making headway with initiatives like:

- **Leading Workforce Transition:** Funding for the Department of Energy's $3.5 billion regional DAC hubs is contingent on workforce development and training programs that provide pathways for good-quality jobs in historically disenfranchised communities affected by the phase-out of fossil fuels. This initiative not only leverages our skilled workforce expand an emerging industry but showcases how the US can lead in workforce transition and community revitalization.

- **Enhancing Inter-State Coordination:** A bipartisan inter-state agreement between Wyoming and Colorado is helping both states expand and complement each other's DAC efforts, including potential collaborations for grants, identifying necessary infrastructure, and defining standards. This MOU represents a pioneering partnership that will leverage Wyoming's carbon capture and sequestration expertise with Colorado's innovative work in DAC and help create a regional workforce across both states.



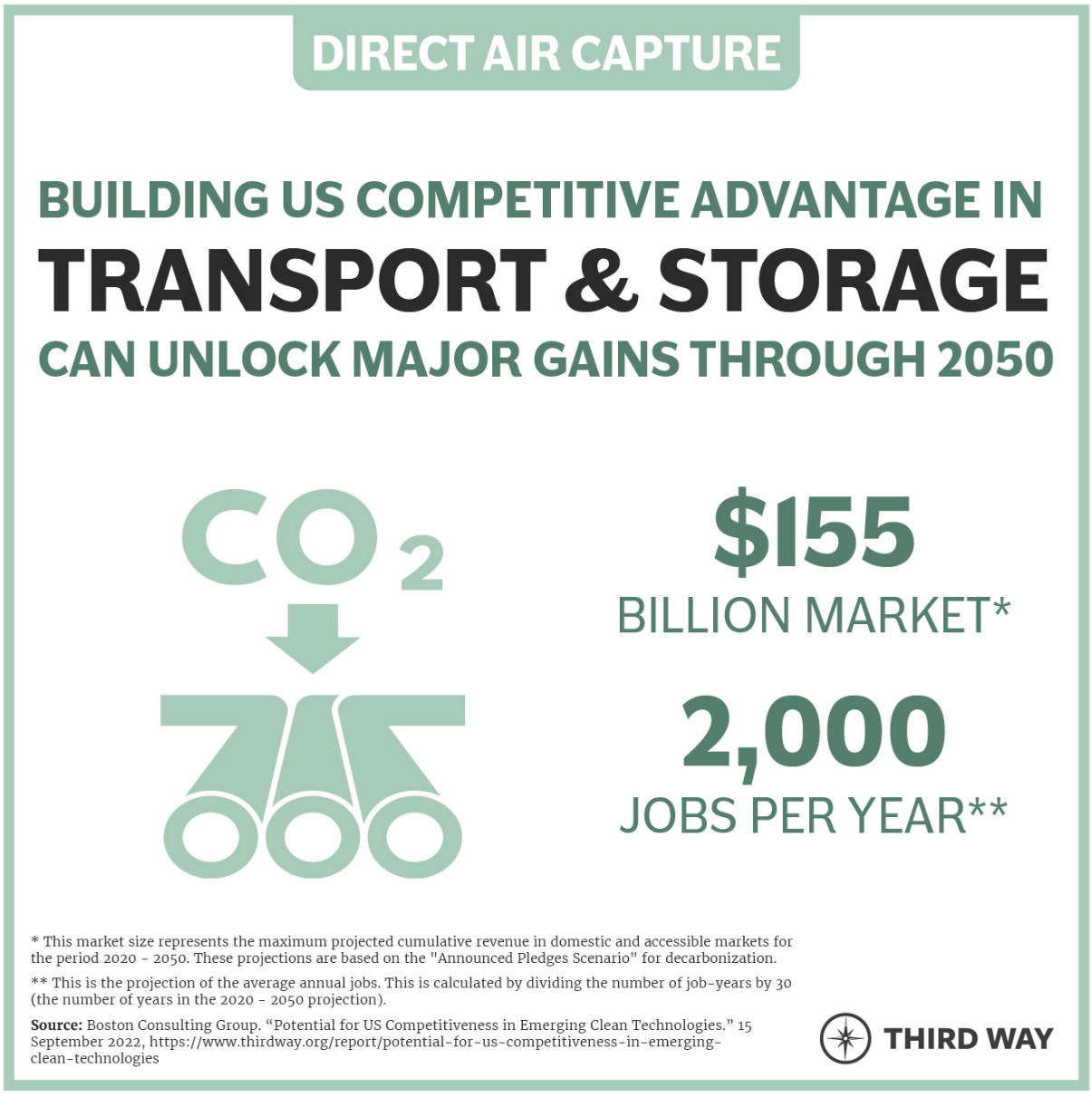
Transport and Storage

The US has immense potential for long-term carbon sequestration via geological storage, with the capacity to store approximately 3,000 metric gigatons. That's more than 500 times our annual energy-related emissions. With a skilled workforce from related fields like oil and gas, the US is well-positioned to compete in transport and storage for DAC. Doing so will give us the opportunity to tap into a $155 billion global market and generate 2,000 jobs every year through 2050. Here are some key developments we're already seeing:

- **Expanding American Carbon Management Infrastructure:** As part of a larger $251 million initiative to expand carbon transport and storage, the Department of Energy dedicated $40 million in funding to expand CO2 transport and storage facilities in Wyoming.

- **Pioneering American Technology:** Frontier Carbon Solutions secured the first three Class VI Underground Injection Control permits ever issued by Wyoming—accelerating North America's first open-source, multipurpose carbon storage hub forward and paving the way for future carbon storage projects in the state.

- **Establishing Financial Mechanisms:** The Department of Energy announced $500 million to support their Carbon Dioxide Transportation Infrastructure Finance and Innovation (CIFIA) program, providing financial assistance for designing, developing, and building CO2 transport capacity.



Offtake

While no country with existing DAC facilities has a clear advantage in the global market, demand policies can provide crucial support for long-term offtake agreements. In the US, policies like California's Low Carbon Fuel Standard (LCFS) are already creating a market for low-carbon fuels and incentivizing the use of technologies like DAC. By further increasing demand, the US can unlock offtake potential and capture a significant share of a projected $1.8 trillion global market through 2050. Some notable examples of our progress include:

- **Jumpstarting the American Carbon Market:** Through the Carbon Dioxide Purchase Pilot Prize, the Department of Energy is acting as a customer for high-quality, certified carbon removal credits, awarding up to $30 million to 10 private entities delivering third-party verified carbon removal. This move helps jumpstart a market for carbon removal credits through DAC and establishes a reliable demand for DAC technology.

- **Setting Long-Term Commitments:** Microsoft signed a 10-year contract with Heirloom to purchase up to 315,000 tons of CO2 removal—representing one of the largest, long-term offtake agreements for DAC to date. Microsoft's deal is setting a precedent for future long-term deals, demonstrating both viability and commitment to DAC's use in carbon removal.

- **Showcasing American Corporate Leadership:** Amazon signed an agreement with 1PointFive to purchase 250,000 tons of carbon removal credits over 10 years, showcasing how DAC-based carbon removal solutions can be a viable pathway for large corporations to address their emissions.

Other Value Chain Segments

- **Leveraging Data-Driven Strategy:** Rhodium Group visualized the potential scale-up of DAC technology in each state and quantified the economic benefits and job creation potential. This granular data is helping identify states where federal DAC deployment policy can be most impactful and highlighting regions that can benefit significantly from DAC technologies.

- **Mapping American Potential:** Carbon Solutions and the Great Plains Institute developed a first-of-its-kind atlas, identifying seven distinct regions in the US that would host a DAC hub based on environmental, geological, and social research. This atlas not only spotlights American research expertise but also provides a strategic advantage for private and public sector firms navigating the challenges and considerations involved in developing and deploying DAC facilities.

- **Setting the Foundation for American Leadership**: The Department of Energy's $3.5 billion initiative to build four Regional DAC hubs across the US will establish fully-integrated DAC ecosystems that can capture and sequester at least one million metric tons of carbon dioxide annually from the atmosphere, building the foundation for a national network of commercially-viable DAC systems.

So, What's Next?

The global market for DAC technology is nascent—but competition is ramping up aggressively. The US has already begun to shape global markets and laid the groundwork to lead the world in DAC development and deployment. To cement US leadership, we must continue to expand our competitive edge through sustained and consistent investment in DAC.

The road ahead will be challenging, but with the right policy mix, the US can secure a substantial portion of a trillion-dollar market and create countless economic opportunities across the country.

TOPICS

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ENDNOTES

1. This includes $3.5 billion authorized for Direct Air Capture Hubs in the Infrastructure Investment and Jobs Act, $115 million for the Department of Energy's Direct Air Capture technology prize competitions authorized by the Energy Act of 2020 and fully funded through the Infrastructure, Investment, and Jobs Act, $310 million in grant funding authorized by Section 40302 of the Infrastructure Investment and Jobs Act for state and local governments and public utilities to procure or use products utilizing capture carbon, $100 million for carbon capture transport research programs as authorized by the Energy Act of 2020 and amended by Section 40303 of the Infrastructure Investment and Jobs Act, $2.5 billion in grant funding to expand the Department of Energy's carbon storage validation and testing program authorized by Section 40305 of the Infrastructure Investment and Jobs Act, and $75 million in grant funding to support permits in pursuant to geological sequestration authorized by Section 40306 of the Infrastructure Investment and Jobs Act.

2. This includes $10 billion for the Advanced Energy Manufacturing Project Tax Credit as established by the American Recovery and Reinvestment Act and extended by Section 13501 of the Inflation Reduction Act and $3.229 billion in production tax credits for carbon capture and sequestration, extended and modified by Section 13104 of the Inflation Reduction Act.

3. Sourced from Rhodium Group/MIT-CEEPR Clean Investment Monitor data spanning from Q1 2021 to Q1 2024.