



Pathway to Commercial Liftoff

To meet its net zero commitments by 2050, the U.S. will likely need to capture and permanently store ~400-1,800 million tonnes of CO₂ annually (MTPA) via both point-source carbon capture, utilization, and storage (CCUS) and carbon dioxide removal (CDR). Today, the U.S. has over 20 MTPA of carbon capture capacity, or 1-5% of the target capacity.

Achieving both commercial liftoff and net zero goals represents a \$100 billion investment opportunity in CCUS by 2030. The extension of and increase in the value of the 45Q tax credit, via the Inflation Reduction Act, has provided more certainty to developers and investors and is likely to yield attractive returns for several types of projects, particularly in industries with high-purity CO₂ streams like ethanol, natural gas processing, and steam methane reforming to produce hydrogen or ammonia. Many of these project types are in active development and some are already in operation but will require the emergence and support of additional large-scale transportation and storage infrastructure.

The next milestone is achieving a project pipeline representing ~100 MTPA of CCUS or CDR capture capacity by 2025. These projects should reach operational status by 2030 and be complemented by a cumulative 2 billion tonnes of domestic commercial storage potential and the requisite large-scale transportation infrastructure. As the projects in industries with high-purity CO₂ streams mature, it will be crucial to also advance successful demonstration projects in sectors with lower concentration CO₂ streams and higher costs, such as steel and cement. The costs of both CO₂ capture and high-quality CO₂ removals should continue to fall with further commercial deployment and innovation.

There is at least 2,000 billion tonnes of domestic carbon storage potential in the form of deep saline formations. However, the permitting process for Class VI wells is frequently cited as a potential bottleneck by investors and developers. Class VI wells are permitted by EPA or directly by states, territories, or tribes with “primacy” (i.e., approved by EPA to implement Class VI permitting). EPA has publicly announced that, moving forward, it will strive to permit wells in 2 years, and it has developed a series of tools to help streamline the process. Permitting time reductions will also depend on industry players improving their capacity to effectively manage the application process.

CO₂ pipeline project development speeds vary across the U.S. due to regional differences in effective community engagement, safety, routing and siting, and permitting. The Department of Transportation, Pipelines and Hazardous Materials Safety Administration (PHMSA) and the Department of Interior, Bureau of Safety and Environmental Enforcement are anticipated to take actions to increase consistency and clarity of CO₂ pipeline regulation.

Market Status

Metric	Value	2030 Target	2050 Target
CCUS Total Installed Capture Capacity ¹ Source: BNEF 2024 Q2	~23 MTPA	100 MTPA	800 MTPA ²
Expected Capacity of CCUS Projects ^{1,3} Source: BNEF 2024 Q2	~63 MTPA	100 MTPA ⁴	-
Class VI Well Permits Issued Source: Congressional Research Service April 2024	19 ⁵	-	-
Miles of Domestic CO ₂ Pipelines Source: PHMSA 2024, DOE 2024	5,514	-	30,000 - 96,000 ²

1. Includes Direct Air Capture (DAC) capacity 2. Targets from 2023 Carbon Management Liftoff report 3. Includes projects at an advanced stage of development, under construction, completed, and operational 4. Target from 2023 Carbon Management Liftoff report 5. Includes 8 permits issued by EPA, 8 issued by the state of North Dakota, and 3 issued by the state of Wyoming

Possible Near-term Actions

1. Expand EPA, state, and industry technical and regulatory capacity further to increase the efficiency and effectiveness of the Class VI permitting program
2. Provide project CapEx funding and demand-side or other revenue/operations to help bridge voluntary and compliance markets for CDR developers and investors
3. Promote advance market commitments for carbon removal purchases and commitments for low-carbon products to spur development of bankable revenue streams
4. Create archetypal, field-tested business models and terms to enable the development and execution of multi-party agreements that simplify CCUS and CDR project development
5. Promote the development of and consensus around robust measurement, monitoring, reporting, and verification (MMRV) methods for CDR