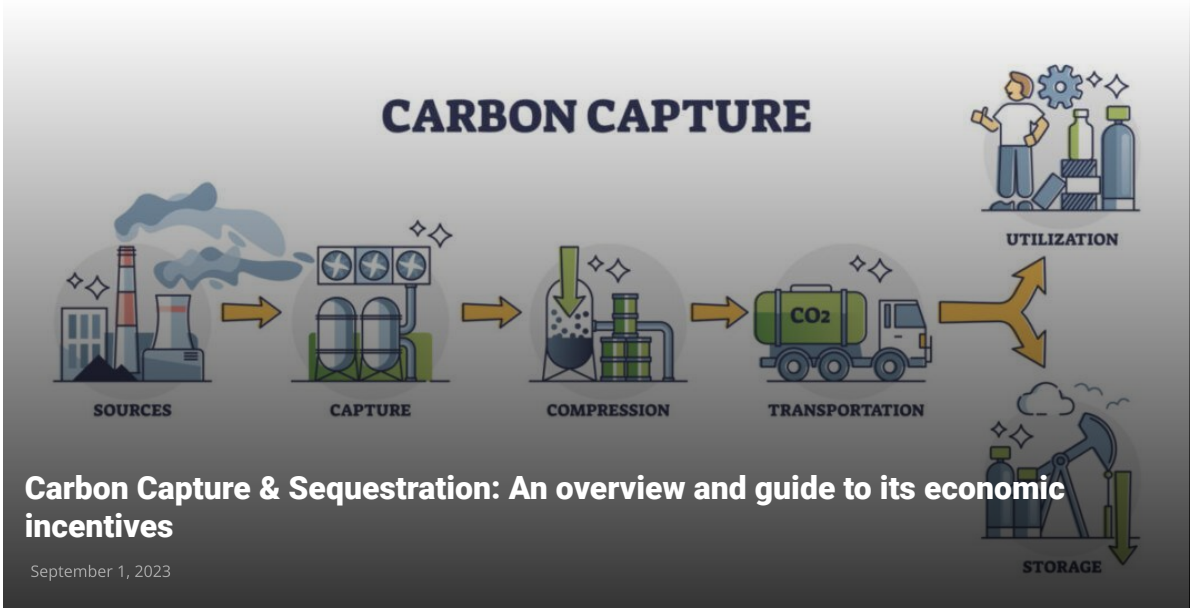

Carbon Capture & Sequestration: An overview and guide to its economic incentives

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By Dave Palmerton, SCS Engineers, Project Director

The Biden Administration Infrastructure Plan's robust commitment to carbon capture, utilization, and storage technologies has set the stage for significant strides toward environmental sustainability. President Biden has set an ambitious goal for the US: to achieve a carbon pollution-free power sector by 2035 and net zero emissions economy by no later than 2050, according to a TheWhiteHouse.gov fact sheet. In April, the administration released a new National Innovation Pathway Report, highlighting the Biden-Harris Administration's strategy for accelerating critical clean energy technologies. According to the White House, the Administration is advancing a three-pronged approach to prioritize innovation, demonstration, and deployment to scale the technologies needed to achieve its carbon pollution-free
electricity sector goals.

What is Carbon Capture, Utilization, and Storage (CCUS)?

CCUS is the capture, transport, and geological sequestration of carbon so it is removed from the biosphere. Once the CO2 is captured it can be transported by various methods and stored within underground geological formations, such as those comprising depleted oil and gas fields, or in deep ocean water. Carbon capture, utilization, and storage are one of the key technologies under development to help reduce greenhouse gas emissions and mitigate climate change.

The CCUS process generally includes five steps:

Capture: CO2 is captured from industrial sources using various methods, such as post-combustion capture, pre-combustion capture, or oxy-fuel combustion. It is then compressed for transport and sequestration. Post-combustion capture is the most prominent method of carbon capture and storage (CCS) since it is the largest source. This method is favored because it can be retrofitted onto existing power plants and industrial processes. This method has been deployed commercially at several locations around the world.

Transportation: CO2 is captured and then transported to the storage site by pipelines, trucks, or ships.

Injection: At the storage site, the CO2 is injected into a suitable geological formation at a supercritical state. Injecting the CO2 as a supercritical liquid reduces the volume by over 99 percent allowing more effective use of underground pore space.

Monitoring and Reporting: After the CO2 is injected, the storage site is monitored to ensure that the CO2 stays underground and not leaking back into the atmosphere. Monitoring can include seismic reflection surveying, groundwater monitoring, integrity testing, and other techniques which help detect potential leaks. This information is then reported to the regulatory agency that issued the permit.

Post-Injection Site Care: The specific post-injection tests required for a CO2 injection project will depend on regulatory requirements, the project design , and the specific characteristics of the reservoir.

Economic Incentives:

Various economic incentives and funding sources can be used to develop CCUS. These incentives are offered under different programs but are important to consider as funding sources when embarking upon a potential CCUS project.

Carbon pricing is one of the potential policy tools that address greenhouse gas emissions and promote CCUS technologies. Other policies, such as direct government funding for CCUS research and development, tax incentives for carbon capture projects, and regulatory mandates for emissions reductions, also promote carbon sequestration efforts. In the United States, there are several tax incentives available for carbon capture projects:

Section 45Q Tax Credit: This tax credit provides a monetary incentive for CCUS projects. The credit provides up to $85 per metric ton of CO2 captured and permanently stored, and up to $60 per metric ton of CO2 captured and used for enhanced oil recovery or other purposes. The credit amount significantly increases for direct air capture (DAC) projects to $180 per metric ton of CO2 permanently stored and $130 per metric ton for used CO2

In 2022, changes in the Section 45Q Tax Credit reduced the capacity requirements for eligible projects: 18,750 metric tons per year for power plants (provided at least 75 percent of the CO2 is captured), 12,500 metric tons per year for other facilities, and 1,000 metric tons per year for DAC facilities.

Finally, the 2022 changes include a seven-year extension to qualify for the tax credit, meaning that projects have until January 2033 to begin construction. Companies who seek eligibility for the tax credit must also propose a facility which will capture at least 100,000 metric tons of CO2 per year. The tax credit is limited to twenty-five million metric tons of CO2 per year.

To qualify for the Section 45Q tax credit, a project must also meet other criteria:

Eligible facilities: The tax credit applies to specific types of facilities that capture CO2, such as power plants, industrial facilities, or direct air capture facilities.

Minimum capture thresholds: Facilities must capture a minimum amount of CO2 per year to be eligible for the credit. This threshold varies depending on the type of facility and its purpose (e.g., electric power generation, industrial manufacturing, or direct air capture).

Secure storage or utilization: Captured CO2 must either be securely stored in geological formations, used as a tertiary injectant in enhanced oil recovery, or used in certain commercial applications, such as producing chemicals, plastics, or carbon-based building materials.

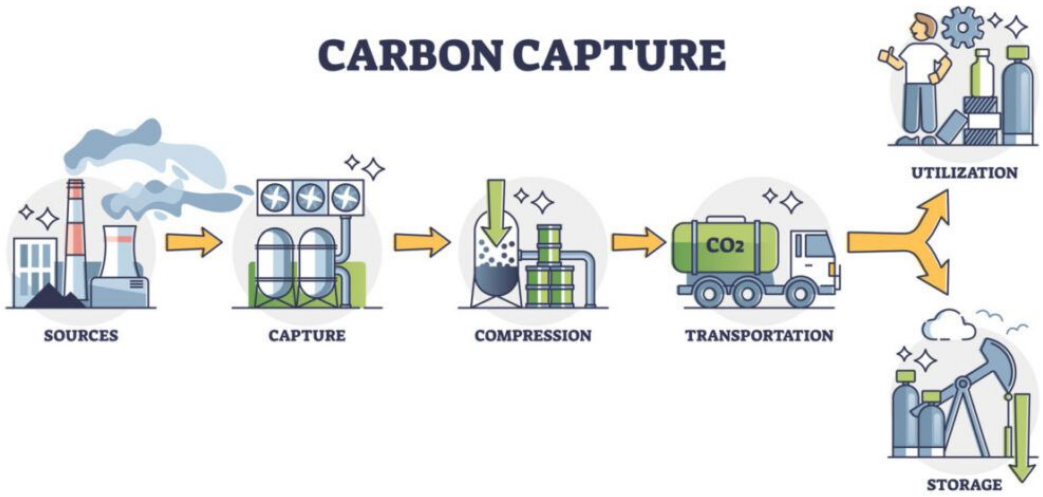
Reporting and monitoring: Companies claiming the credit must also adhere to reporting and monitoring requirements set by the Environmental Protection Agency to ensure the proper storage or utilization of CO2.

Modified Accelerated Cost Recovery System (MACRS) Depreciation:

This depreciation allows businesses to quickly recover the costs of their capital investments in CCUS equipment and reduce their tax burden.

Industrial Source Carbon Capture Project Credit:

This credit provides up to 30 percent of the cost of qualifying carbon capture equipment, up to a maximum of $3,000 per metric ton of CO2 captured and stored.



New Markets Tax Credit:

This credit provides financing for qualifying community development projects, including CCUS projects in designated low-income areas.

The availability and terms of these tax incentives depend on the specific project and the current regulatory environment. Additionally, other forms of government support, like grants and loans, may also be available to support carbon capture projects. Several states have also implemented other types of carbon pricing policies, but require state-specific research to understand the available programs.

By meeting these criteria and following the necessary guidelines, businesses can take advantage of the tax credits available for CO2 capture, thus offsetting the costs associated with implementing CCUS technologies.

SCS Engineers offers technical consulting services to help businesses and governments assess the feasibility of implementing these technologies, evaluate potential sites for storage or utilization, and navigate the permitting process. The company offers holistic teams to oversee system designs,

provide guidance throughout the licensing and permitting process, and remain involved as collaborators throughout the construction phase.

Choosing an appropriate partner for such initiatives ensures access to the necessary expertise, resources, and professional networks to enhance successful implementation. As various stakeholders unite around shared goals to advance carbon capture, they lay the groundwork for a more sustainable future for all.

Dave Palmerton, PG, is professional geologist and Project Director at SCS Engineers' Environmental Services Practice. He has handled numerous strategic and technical environmental issues for Fortune 100 companies across the United States. Dave's extensive knowledge of federal and state regulatory requirements has enabled him to successfully negotiate with agencies on his client's behalf. His recent publications include "Funding Accelerates Efforts to Plug Abandoned Wells" in The American Oil and Gas Reporter and "The Science, Funding, and Treatment of Acid Mine Drainage" in Coal Age. SCS Engineers solve environmental management, solid waste, hazardous waste, and Superfund problems. SCS has a long history of assisting industrial, commercial, and institutional organizations, military facilities, federal-to-local governments, and tribes, in identifying and implementing appropriate environmental management practices.