a Carbon180 fact sheet

Direct Air Capture

DEFINITION

Direct air capture (DAC) is a technology that removes carbon dioxide from the atmosphere. The captured CO_2 is permanently stored underground or used in the production of commercial products like building materials and fuels. Meeting global climate goals will require both reducing and removing emissions through carbon removal technologies like DAC.

Photo credit: Carbon Engineering

WHERE IN THE WORLD IS DAC?

DAC is not entirely new. Similar systems have been installed in submarines and space applications for decades – it would be impossible to breathe in these closed environments without them. Over the past several years, progress on the large-scale versions has moved quickly. Today, there are five leading commercial development efforts.

01 Carbon Engineering
Canada

- Runs one pilot plant
- Received investment from Bill Gates, Occidental Petroleum, and Chevron

02 Climeworks
Switzerland

- Runs first net-negative power plant in the world
- Partnered with a Coca-Cola subsidiary

03 Global Thermostat
New York

- Currently completing construction on a pilot plant in Alabama

04 Infinitree
New York

- Uses DAC to produce CO_2-enriched air for greenhouse applications

05 Skytree
The Netherlands

- Uses European Space Agency technology in a modular DAC unit

Advantages of DAC

Location: Individual DAC systems can be placed in any country and most climates, all but eliminating the costs and emissions associated with transportation of CO_2.

Scalable: The modular design of many DAC plants means these facilities can be scaled up while keeping a small physical footprint compared to other forms of carbon removal.

Storage: Depending on how it is implemented, DAC can boost companies and whole sectors from net-zero emissions into net-negative territory.

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The third largest geothermal power plant in the world, located in Hellisheidi, Iceland, which sends captured CO_2 into deep geologic storage using direct air capture. According to research, DAC facilities like this may be able to store 0.5-5 billion metric tons of CO_2 per year by the year 2050. Photo credit: Climeworks

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CURRENT POLICY SUPPORT FOR DAC

Policy support for DAC has been limited, but that's starting to change. Last year the bipartisan FUTURE Act was signed into law, updating an existing tax credit to include DAC for the first time. As a result, a DAC project can now receive a tax credit worth **$35 to $50 per ton** of captured CO_2, depending on how it is used. California also allowed DAC combined with secure geologic storage to access their low carbon fuel standard market – currently the most valuable carbon incentive globally at **$180 per ton**.

This Congress, senators introduced another bipartisan and bicameral bill known as the USE IT Act. It would authorize $25 million dollars in funding for a competitive DAC technology prize.

But there's plenty more to do to get this technology deployed at the level needed to meet climate goals. The most pressing need is a robust federal research, development, demonstration, and deployment (RDD&D) program. A recent report by the National Academies of Sciences outlined research and funding goals for this kind of program, which would need about **$60 to $180 million dollars** a year over ten years and across several agencies.

Costs & Opportunity

Cost estimates for DAC are currently between $400 and $600 per ton, though a recent study suggested the cost of future plants could drop below **$100 per ton**. Meanwhile, the market opportunity for using CO_2 already exceeds **$1 billion**. Paired with regulatory incentives, these growing markets can help drive down DAC costs further.

FURTHER READING

National Academies of Sciences, Engineering, and Medicine (2018). *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda*. Washington, DC: The National Academies Press. https://doi.org/10.17226/25259.

David W. Keith et al. (2018). A Process for Capturing CO2 from the Atmosphere. *Joule, 2*(8), 1573–94. https://doi.org/10.1016/j.joule.2018.05.006.

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