

# Direct Air Capture

RESEARCH AND DEVELOPMENT OF DAC



## A NEW FRONTIER FOR NORTH DAKOTA ENERGY

Direct air capture (DAC) is a carbon capture technology that utilizes air-contacting modules to remove carbon dioxide ( $\text{CO}_2$ ) from the atmosphere with chemical or physical reactions that trap  $\text{CO}_2$ . DAC involves two main steps. First,  $\text{CO}_2$  is captured and separated from ambient air via DAC technology. Second, the captured  $\text{CO}_2$  is then permanently stored underground using geologic sequestration. DAC modules use fans to draw high volumes of air into the system, then filters capture some of the  $\text{CO}_2$  in the air moving across them. Over time, this process results in a significant volume of  $\text{CO}_2$  being removed from the atmosphere and permanently stored.



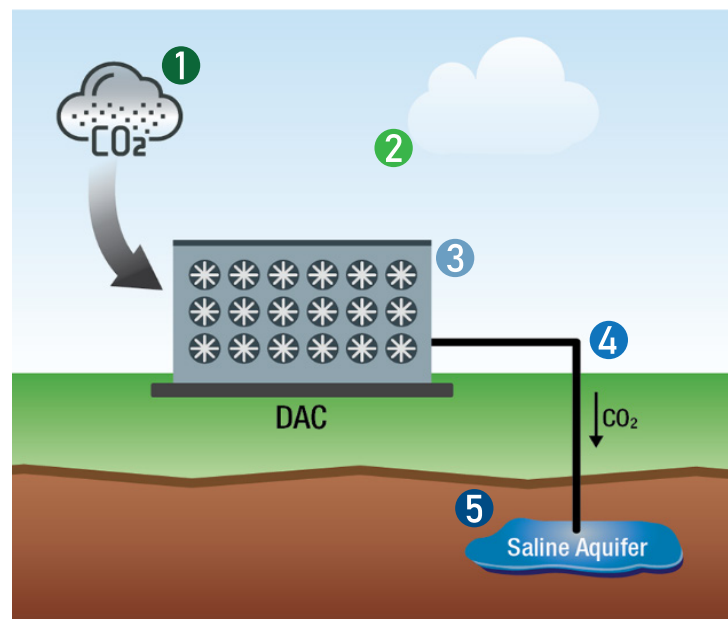
Image Courtesy of the Department of Energy

## HOW DOES IT WORK?

In one method of DAC, modules capture atmospheric  $\text{CO}_2$  by adsorption on a solid sorbent and apply a temperature/vacuum swing process to desorb concentrated  $\text{CO}_2$ :

- 1 Air is drawn into the module using fans, and the  $\text{CO}_2$  within the air is chemically bound to the sorbent material, henceforth referred to as the filter.
- 2 Air with reduced  $\text{CO}_2$  concentration is released back into the atmosphere.
- 3 Once the filter is saturated with  $\text{CO}_2$ , it is heated using low-grade heat for regeneration.
- 4 The heated  $\text{CO}_2$  is then released from the filter and collected as concentrated  $\text{CO}_2$ , and the cycle is ready to begin again.
- 5 The captured  $\text{CO}_2$  is then compressed and permanently and safely stored in the subsurface in deep geologic formations.

Typical filter material lasts for several thousand cycles. It is arranged in a structure optimized for low-pressure drop, and that allows a variety of filter materials to be used as technology improvements are made.



The DAC process allows a means of reducing the carbon intensity of distributed or otherwise hard-to-abate emission sources and  $\text{CO}_2$  that has already been emitted to the atmosphere.

## WHY NORTH DAKOTA

North Dakota has long-standing experience with safely leveraging the phenomenal subsurface resources in the state along with established and experienced service industries with the trained workforce necessary to support DAC projects.

- North Dakota has massive geologic storage resources capable of supporting carbon capture and storage from DAC in addition to in-state industries.
- North Dakota leads the nation with the regulatory framework needed to support CO<sub>2</sub> storage.
- DAC is one part of an all-of-the-above approach to a safe, resilient, reliable, economic, environmentally sustainable, and diversified energy industry.
- DAC will help meet Governor Burgum's goal of carbon neutrality through innovation by 2030.

## BENEFITS FROM OUR OWN BACKYARD

DAC projects can generate billions of dollars of investment, generating new revenue in the state.

- DAC can foster multiple cobenefits locally by fueling new permanent jobs, engaging a highly skilled workforce, and creating a supply chain for deployment of future projects.
- DAC will provide economic benefits, including customers for utilities, revenue for landowners and storage site developers, and additional tax revenue.
- Business case is supported by emerging commercial markets for carbon credits for companies seeking to reduce or offset the carbon intensity of their businesses.
- DAC can provide industry with local ties, greater resilience to potential future carbon regulations, and advantages for competing in a global economy.



***DAC will provide an opportunity  
for North Dakota to lead in  
carbon-negative efforts.***

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