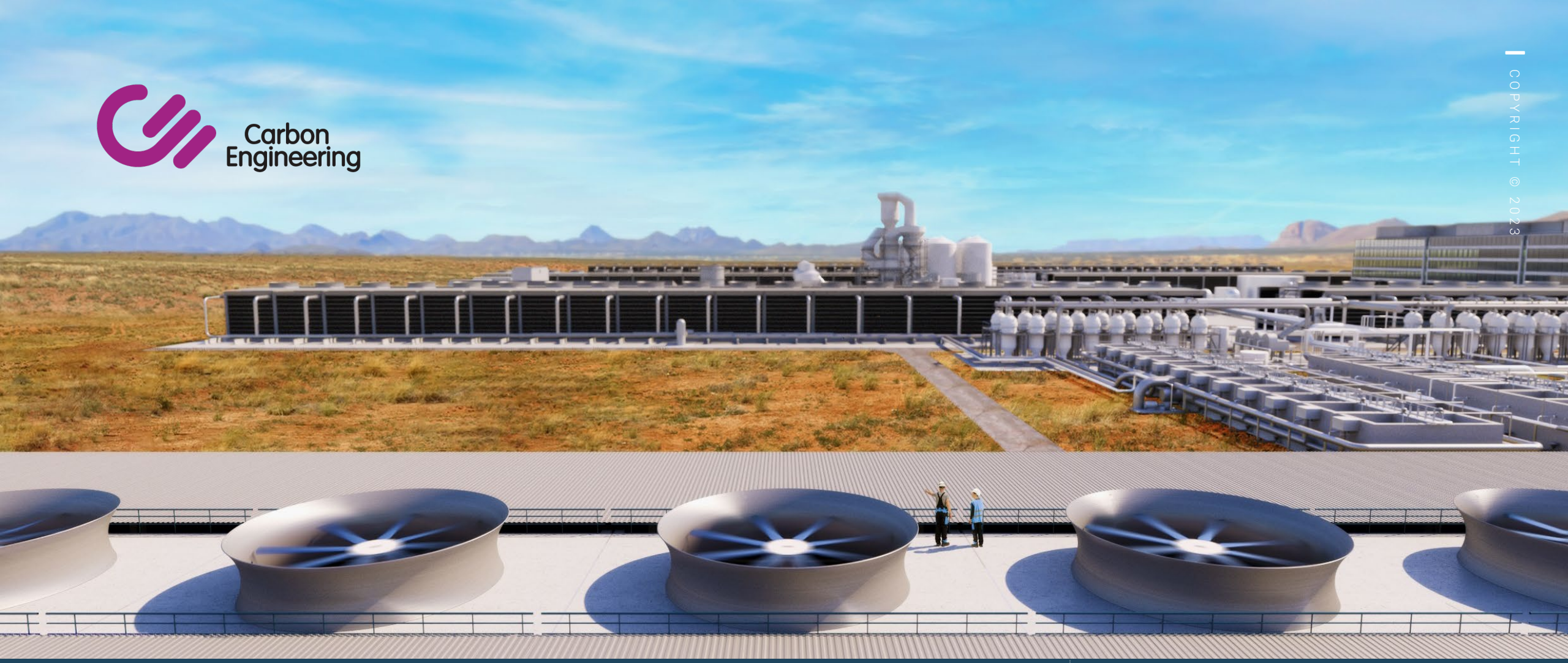


Commercial-scale Direct Air Capture

Technology, projects and policy to support cost-effective net zero

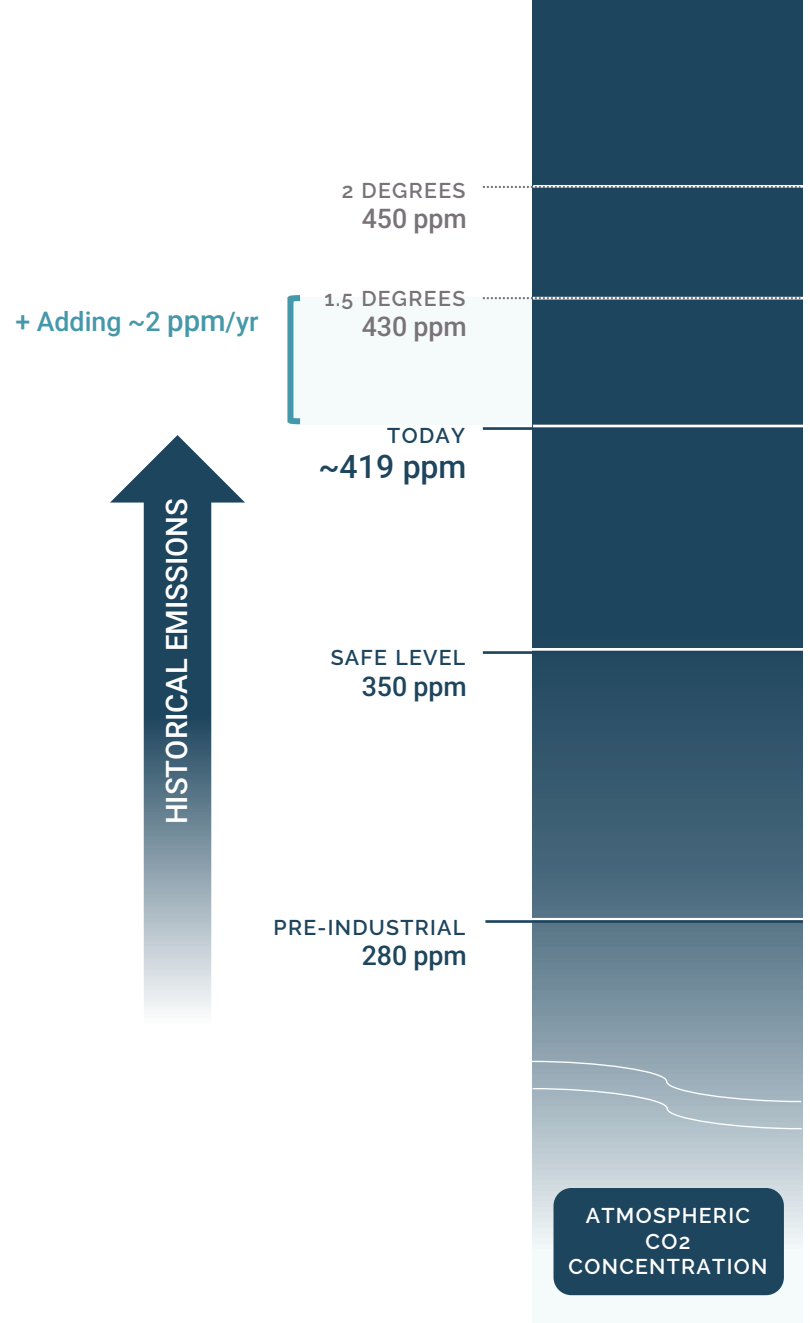
PRESENTED BY:
Adam Baylin-Stern

COMPANY:
Carbon Engineering Ltd.

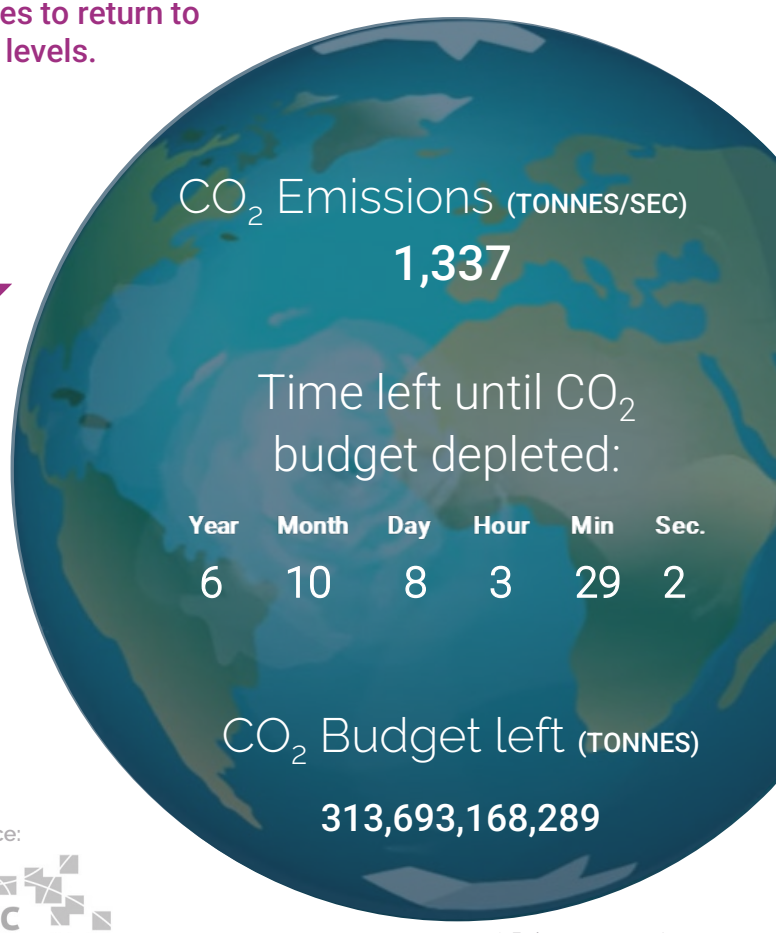
DATE & EVENT:
11 October 2023 – APEC Symposium (Kobe, Japan)

Remaining carbon budget

We have fewer than **7 years left on the carbon clock** before an expected average of 1.5 degrees of warming



Remove ~1 Trillion tonnes to return to safe levels.

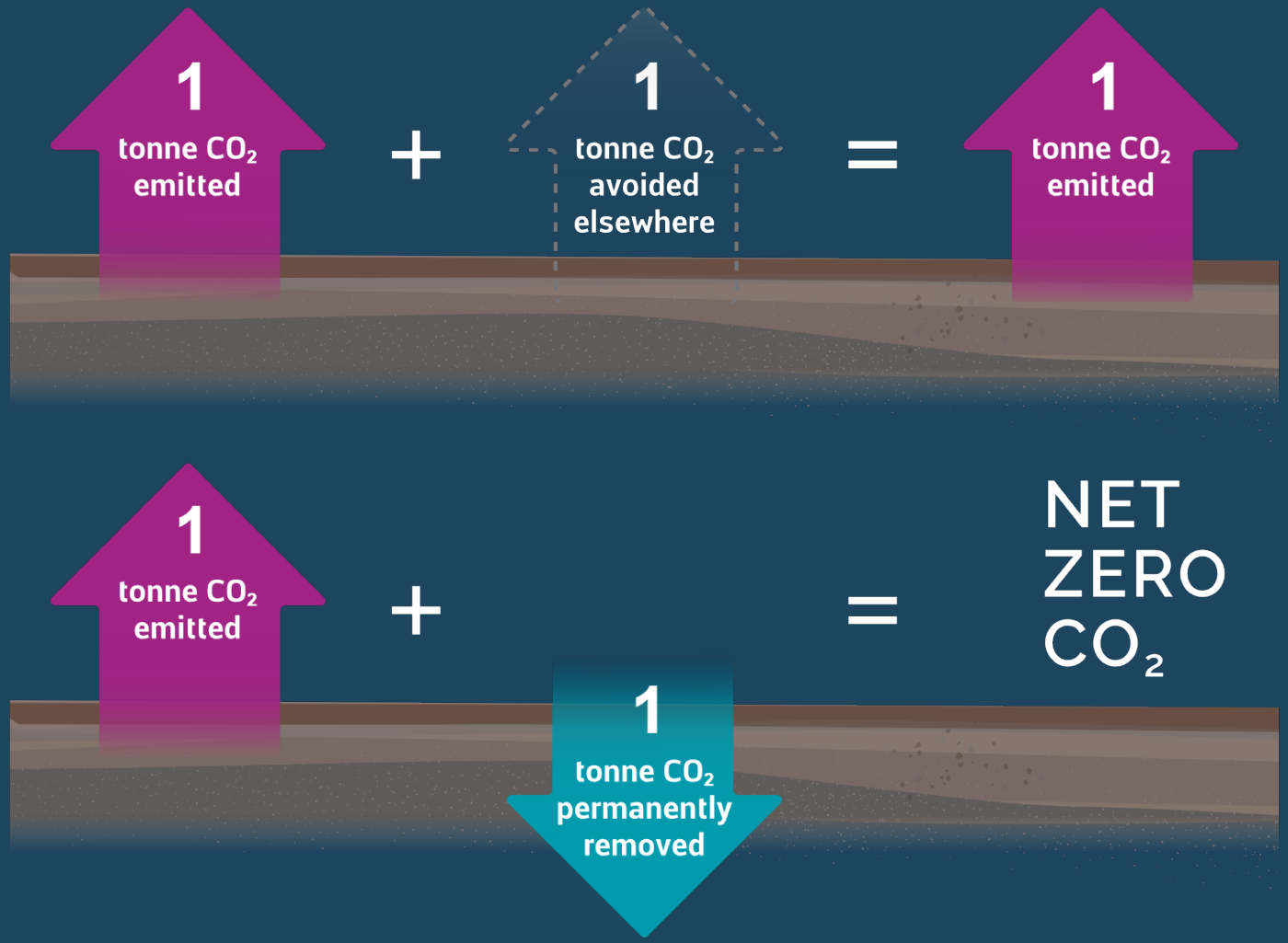


Source:
MCC
Mercator Research Institute on Global Commons and Climate Change

1.5-degree scenario
Data from 2022-09-14

THE CARBON CLOCK IS TICKING; THE CLIMATE PROBLEM IS URGENT

Permanent carbon removal & avoided carbon offsets



CO_2 REMOVAL DIFFERS FROM OFFSETS THAT PROVIDE A CREDIT FOR AVOIDED EMISSIONS

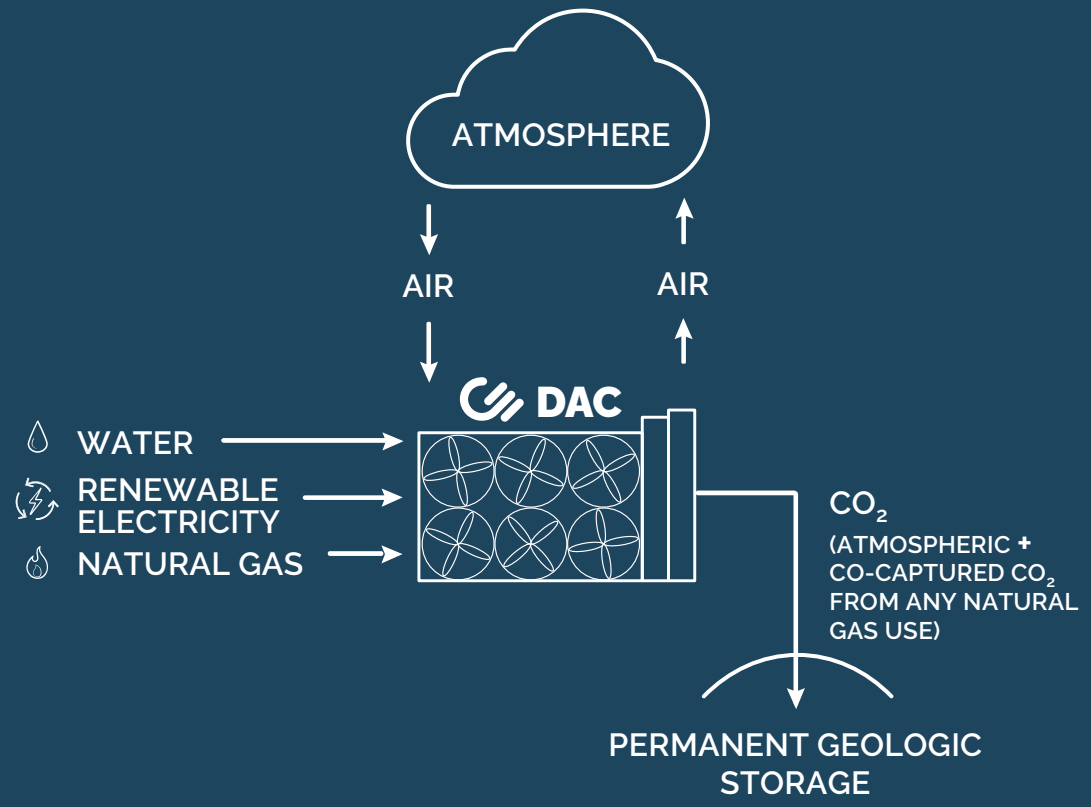
Our Vision

Our vision is to lead the world in the large-scale removal of carbon dioxide from the air and advance our shift to a sustainable, net zero society.

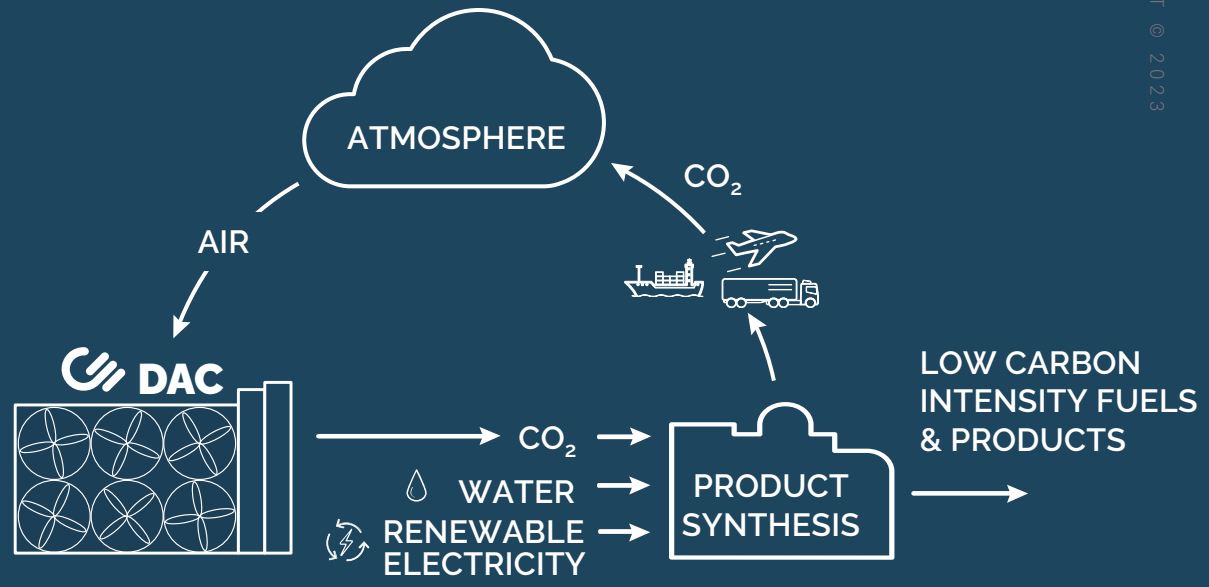
A GLOBAL SOLUTION FOR CLIMATE CHANGE

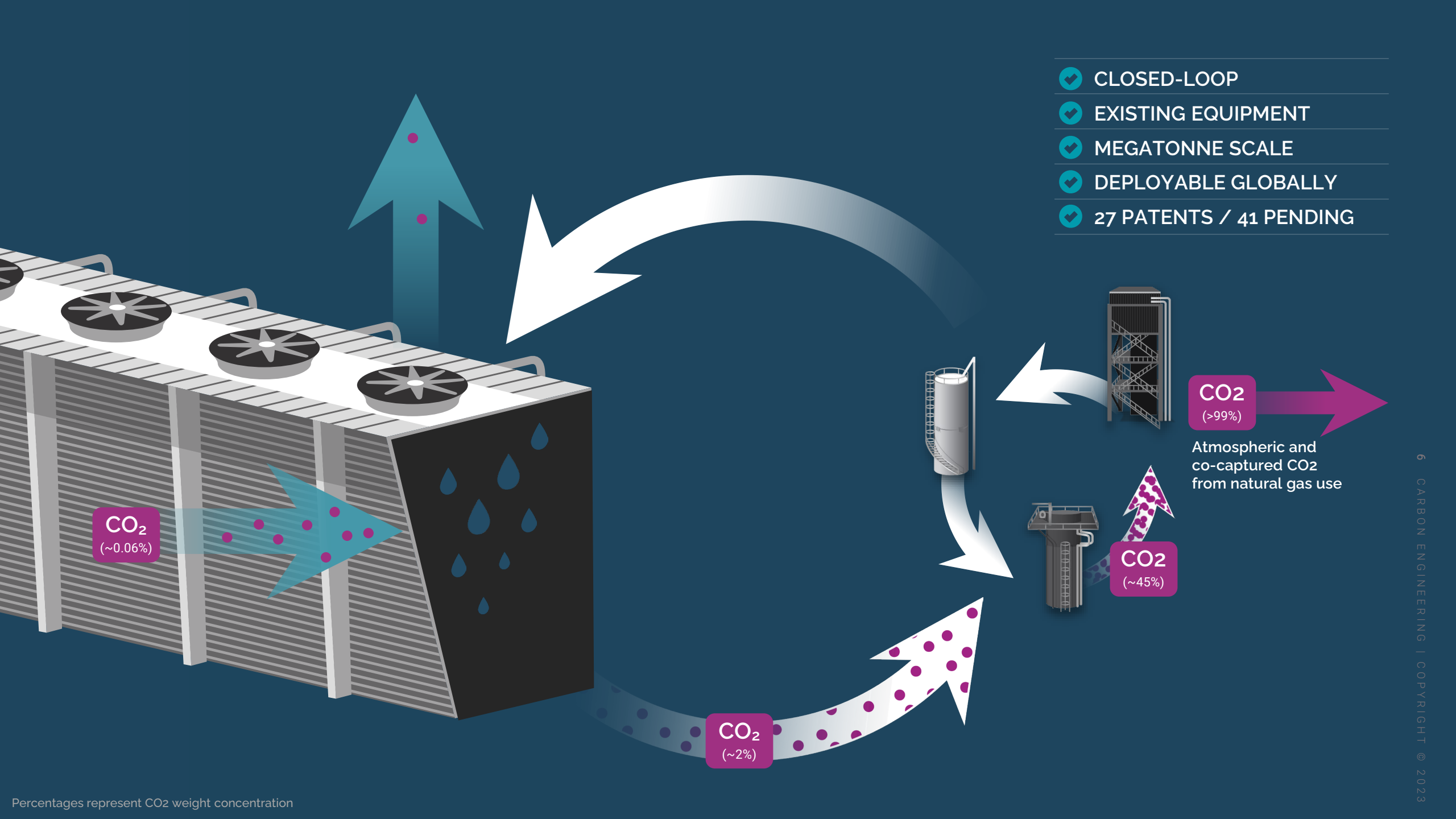
CE DAC enables complementary solutions for carbon dioxide reduction and removal from the atmosphere

CARBON DIOXIDE REMOVAL



LOW CARBON INTENSITY FUELS & PRODUCTS





Percentages represent CO2 weight concentration

Large Scale Deployment Underway

PILOT PLANT

BUILT **2015**

Piloted elements of CE's DAC technology.

INNOVATION CENTRE

BUILT **2021**

R&D platform for technological advancements to incorporate into commercial plants.

STRATOS PERMIAN SITE

CONSTRUCTION UNDERWAY

Expected to be largest in the world.

SOUTH TEXAS DAC HUB

ENGINEERING UNDERWAY

Enables potential for **30** MTPA DAC

100 Mt by 2035

1POINTFIVE DEV. SCENARIO

Advancing feasibility studies and plant designs in other locations across the globe

CE Innovation Centre

- Squamish, BC, Canada
- Built 2021
- Validation plant for pre-commercial testing of equipment (run-replace-run), ~1,000 t/y capacity
- Extensive facilities for lab and bench scale testing

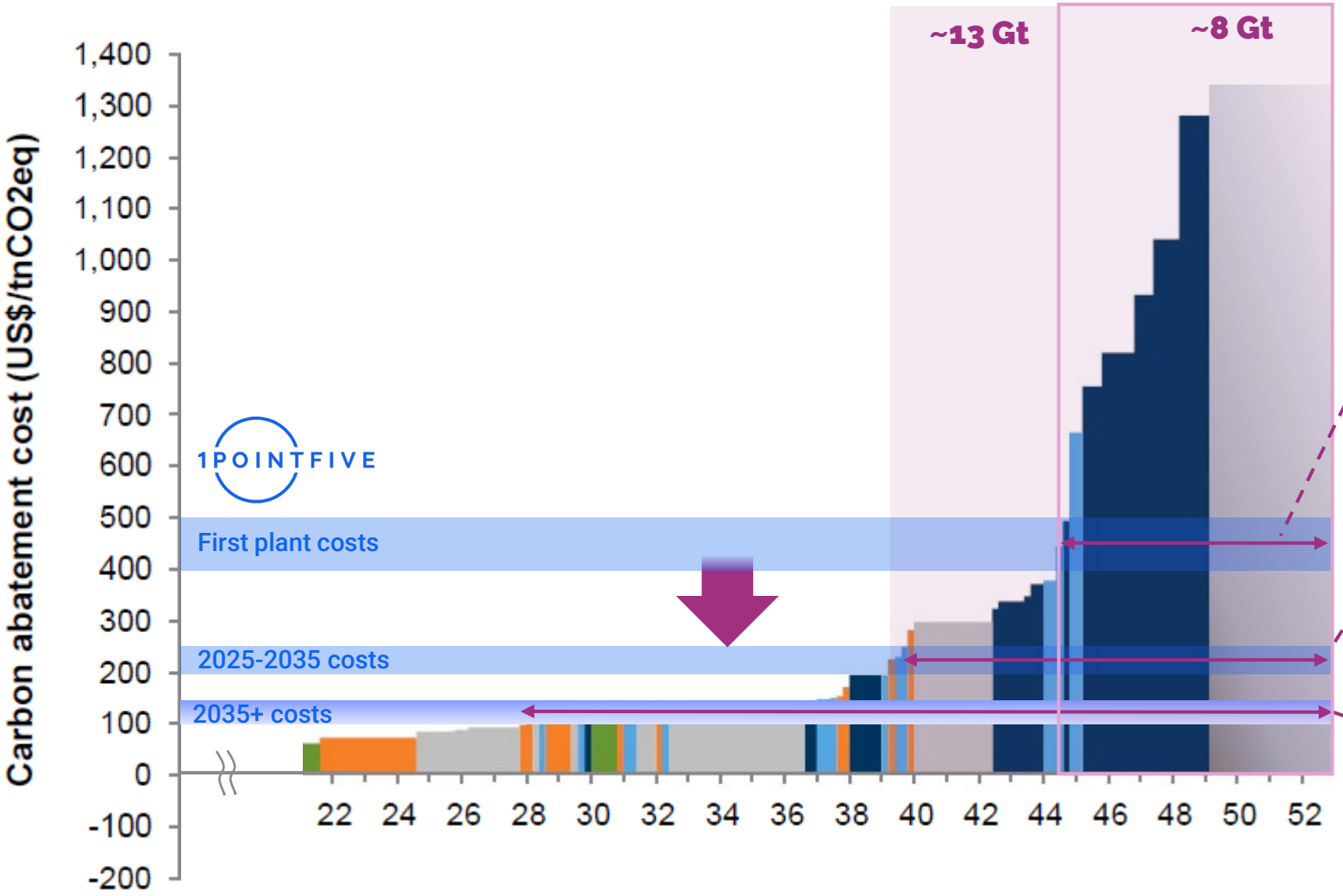
Lab, bench, and fully-integrated demonstration testing

STRATOS

- Permian Basin, Texas, US
- Expected to capture **500kt/year** once fully complete
- Site prep and early construction started Q4 2022
- Operations targeting mid-2025

STRATOS, THE FIRST COMMERCIAL SCALE DAC PLANT TO USE CE TECH, IS UNDER CONSTRUCTION BY 1POINTFIVE

DACS can offer an economic solution to c. 10+ Gt of hard to abate emissions



~8 Gt/yr

Emissions with abatement cost >$450/tonne

~13 Gt/yr

Emissions with abatement cost >$225/tonne

>20 Gt/yr

Emissions with abatement cost >$125/tonne

Sources:
Carbon abatement costs based on currently available solutions; data from Goldman Sachs, Carbonomics, November 2022
DAC + geologic sequestration cost range from Occidental Petroleum 2022 and 2023 reports

A solution for hard to abate transportation sectors

DAC enables complementary solutions for reduction and removal

1 Durable Carbon Dioxide Removal (CDR)

1POINTFIVE

2 Sustainable Aviation Fuel (SAF)

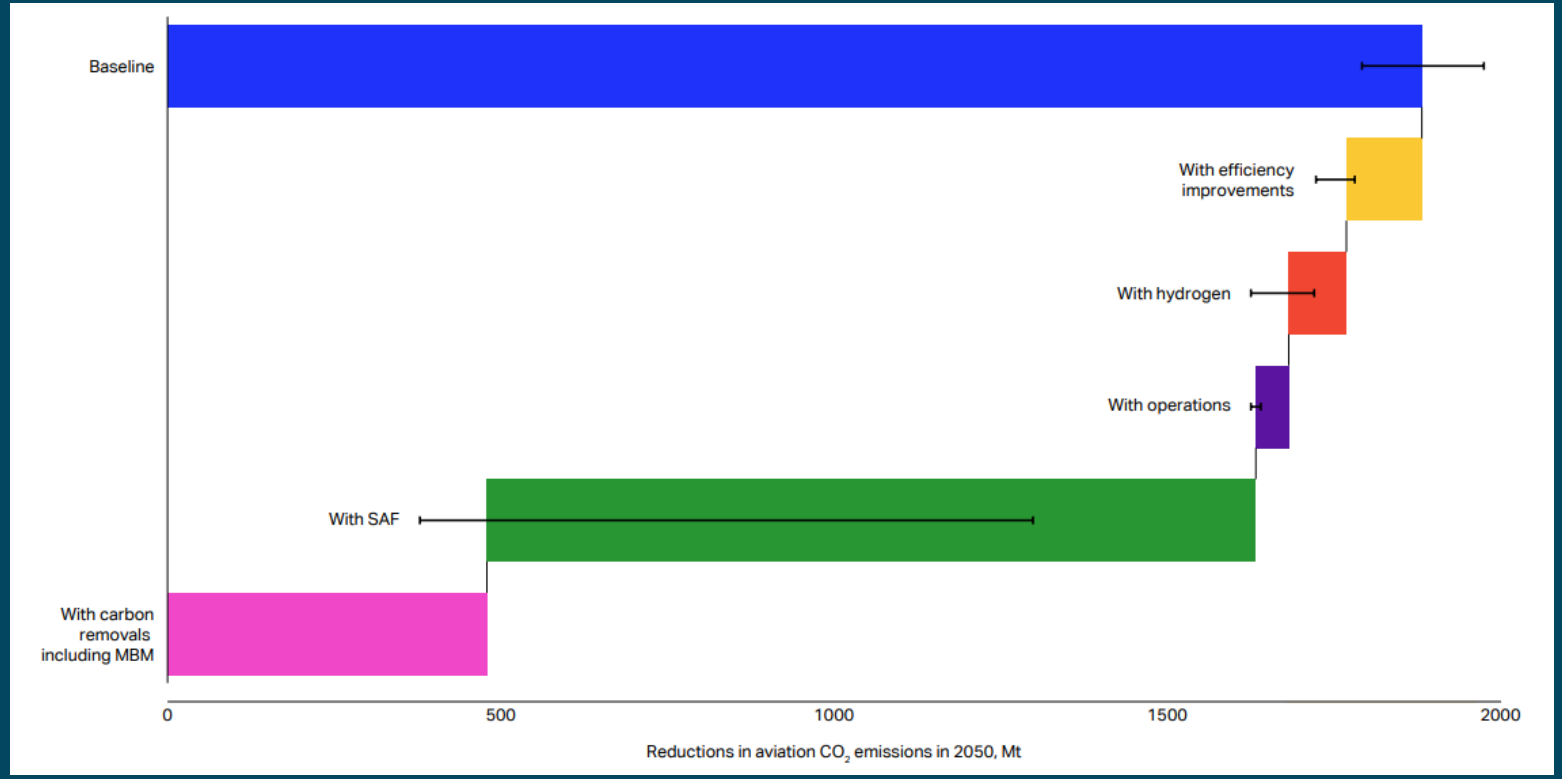
Produced through CE's AIR TO FUELS™ process.

CE's fuel (right) compared to conventional diesel (left)

BOTH options are considered equal in existing and emerging high-integrity transportation decarbonization compliance markets like the pioneering California LCFS (and WA/BC LCFS policies)

IATA 2050 Net Zero Roadmap (Published June 4, 2023)

The International Air Transport Association (IATA) is the trade association for the world's airlines, representing some 300 airlines or 83% of total air traffic. We support many areas of aviation activity and help formulate industry policy on critical aviation issues.



"IATA's targeted scenario is shown in the colored bars, while the black lines illustrate the potential range of outcomes, depending notably on the extent and pacing of financing and policy support. In all the scenarios modeled, even that where SAF fully replaces traditional jet fuel, there will be residual emissions which will need to be removed using carbon capture."

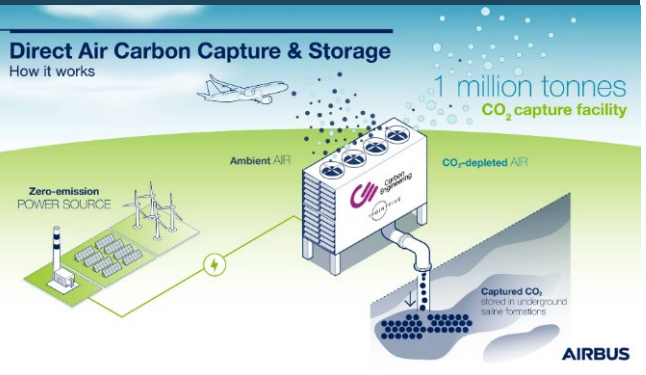
Source: https://www.iata.org/contentassets/8d19e716636a47c184e7221c77563c93/executive-summary---net-zero-roadmaps.pdf

Over the last 18 months, aviation partners have joined CE/1P5 to accelerate DAC

1 **March 2022**
Airbus pre-purchased **400,000 tonnes** of CDR from 1PointFive

AIRBUS

1POINTFIVE



2 **July 2022**
Airbus announced a CDR collaboration with seven other airlines (and airline groups) at the Farnborough airshow

AIR CANADA

AIRFRANCE KLM

Lufthansa

easyJet

LATAM

virgin atlantic

IAG INTERNATIONAL AIRLINES GROUP

3 **November 2022**
Carbon Engineering announced significant R&D investments by Airbus and Air Canada

AIRBUS

AIR CANADA

4 **August 2023**
All Nippon Airways announced the pre-purchase of **30,000 tonnes** of CDR from 1PointFive, becoming the first airline to directly purchase CDR.

ANA

Economic Benefits of DAC Deployment

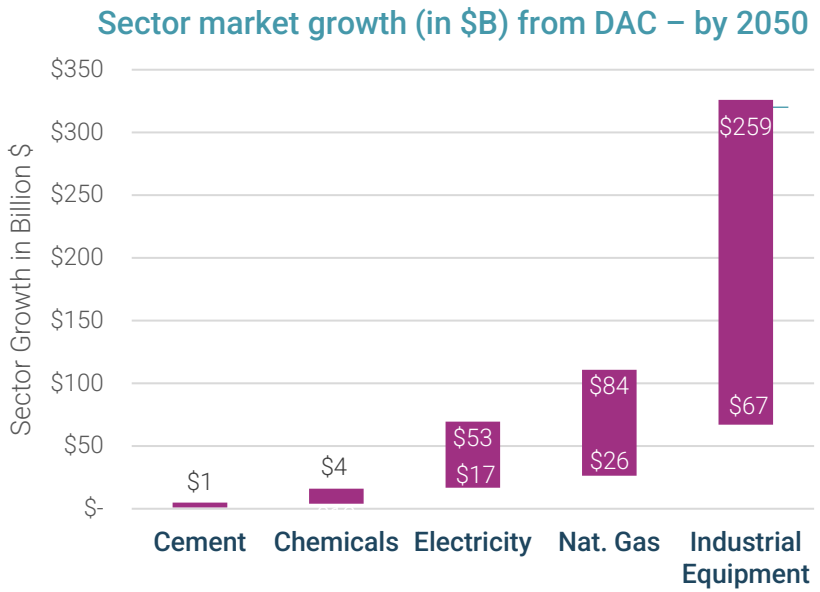
Rhodium Group research shows promising job creation and business opportunities accompanying DAC

Major sectors receive an economic boost, including:

- Industrial Equipment Manufacturing
- Construction
- Engineering
- Steel Manufacturing
- Cement Manufacturing
- Electricity Generation
- Natural Gas
- Chemical Manufacturing

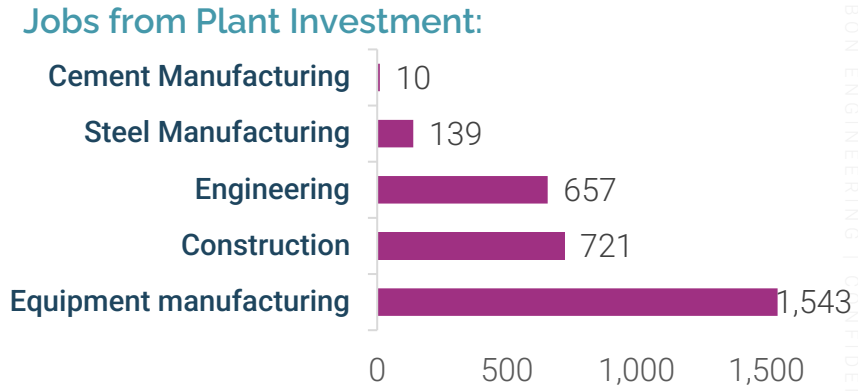
Business Opportunities Across Sectors

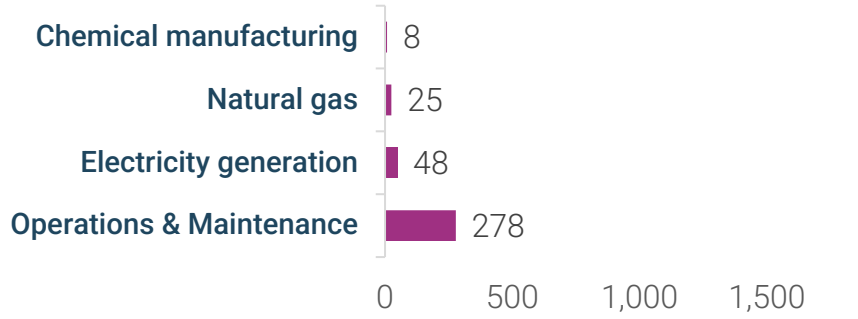
- Based on a net zero by 2050 scenario, DAC-related sectors realize at minimum 11% market growth, with potential for 40% to 189%



Direct Job Creation

- Potential to create significant job growth across a variety of sectors with wide-scale deployment





STRONG ECONOMIC BENEFITS ACCOMPANY DAC

Data via Rhodium Group

Government support is necessary to build at scale through market creation and facilitation, plus accelerators for early projects

Supportive policies for DAC are needed to:

- Value the measurable, immediate, and long duration carbon removal that DAC provides
- Create climate investment and viable long-term markets
- Create jobs and transition opportunities

Examples include:

- Market creation policies (e.g. low carbon fuel standards; direct procurement; CORSIA)
- Financial support policies (e.g. output-based subsidies; tax credits; project-based support)
- Market facilitation policies (e.g. CO_2 storage protocols; capacity objectives, market linkage)

Jurisdictions with supportive policy environments are catalyzing project investment

MORE INFORMATION CAN BE FOUND AT:

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