

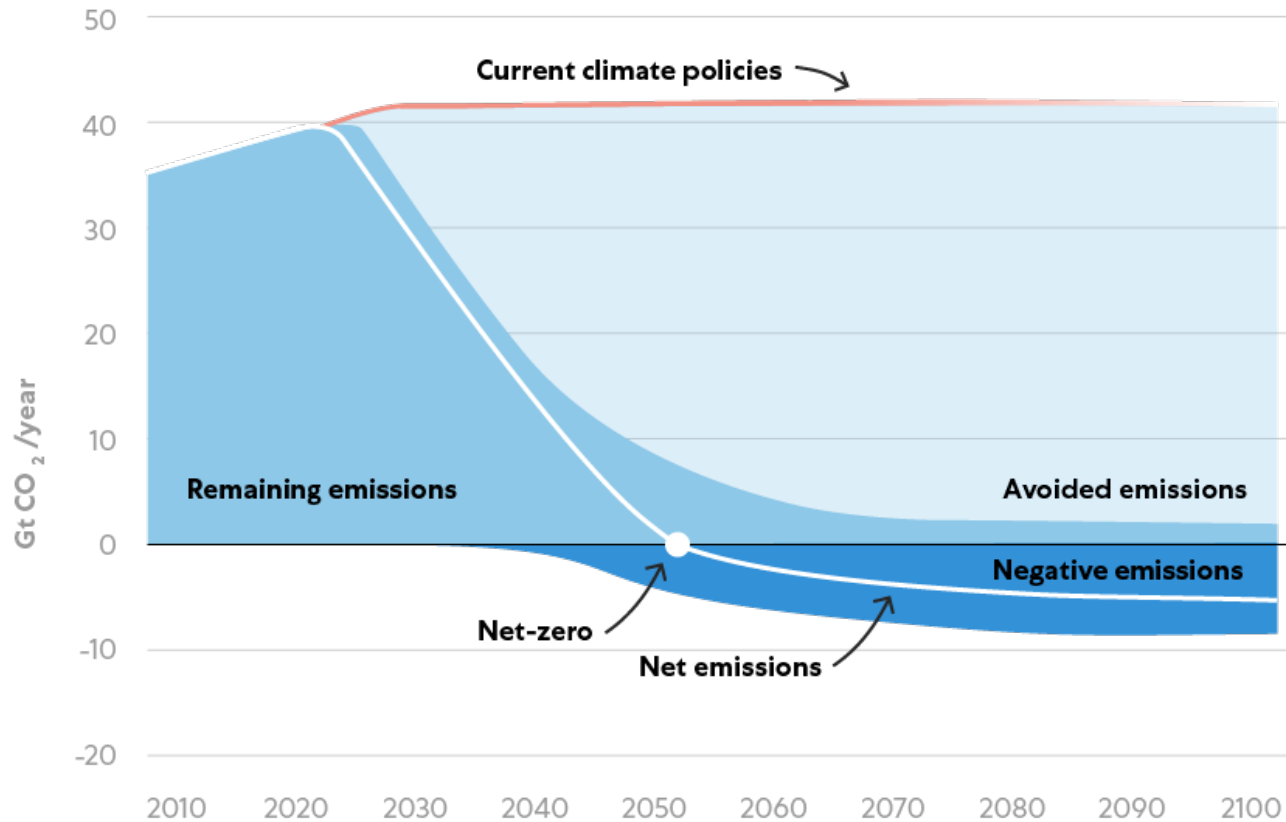


Climeworks Carbon removal via DAC+S



31 October 2023 Prepared for the Annual Bilateral meeting on
CCUS cooperation between the United States and Norway

Carbon Dioxide Removal: science-proven need



Source: Adapted from IPCC (2022) & United Nations Environment Programme (2021)

Reduce as much as possible

Conventional mitigation technologies



Remove unavoidable emissions

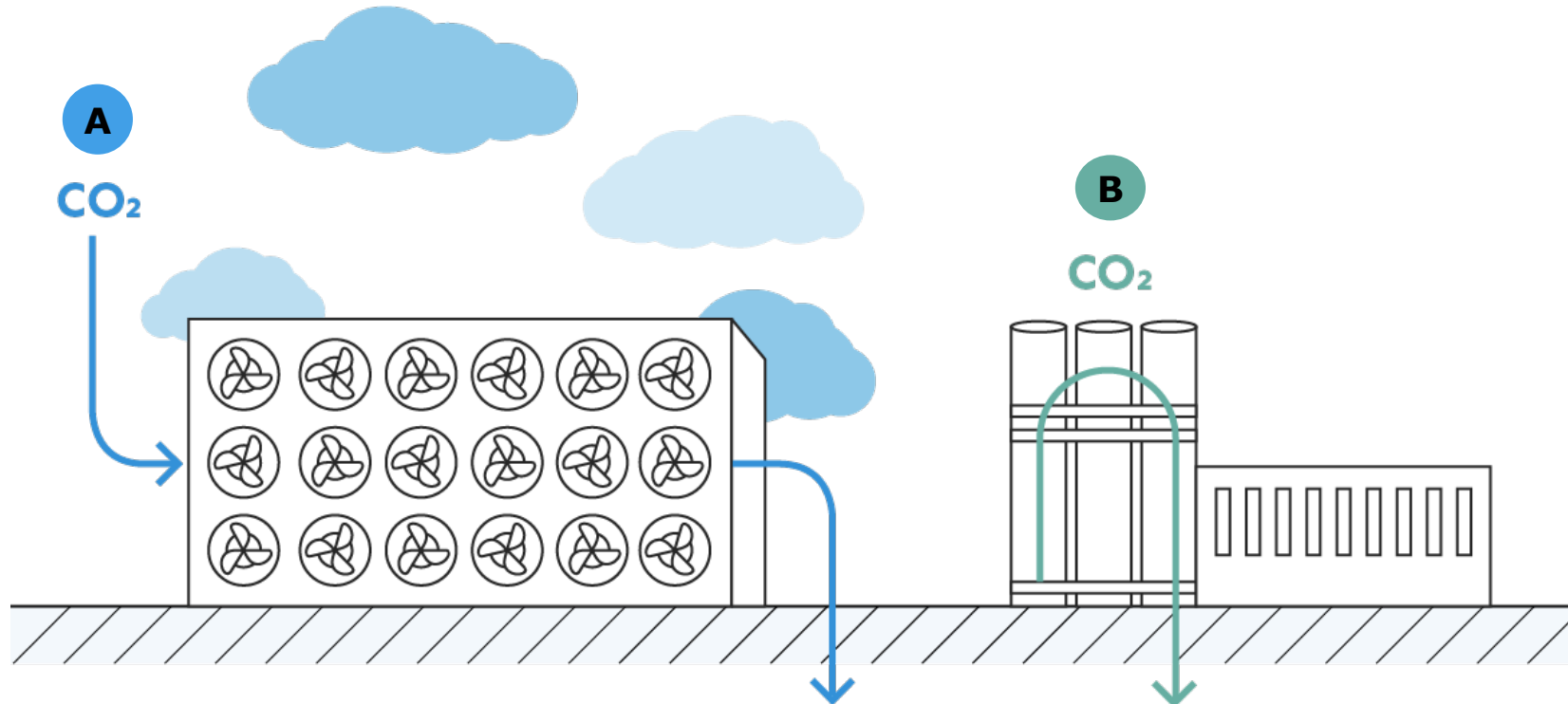
Carbon removal solutions



Climeworks provides **Carbon Dioxide Removal (CDR)** services to address:

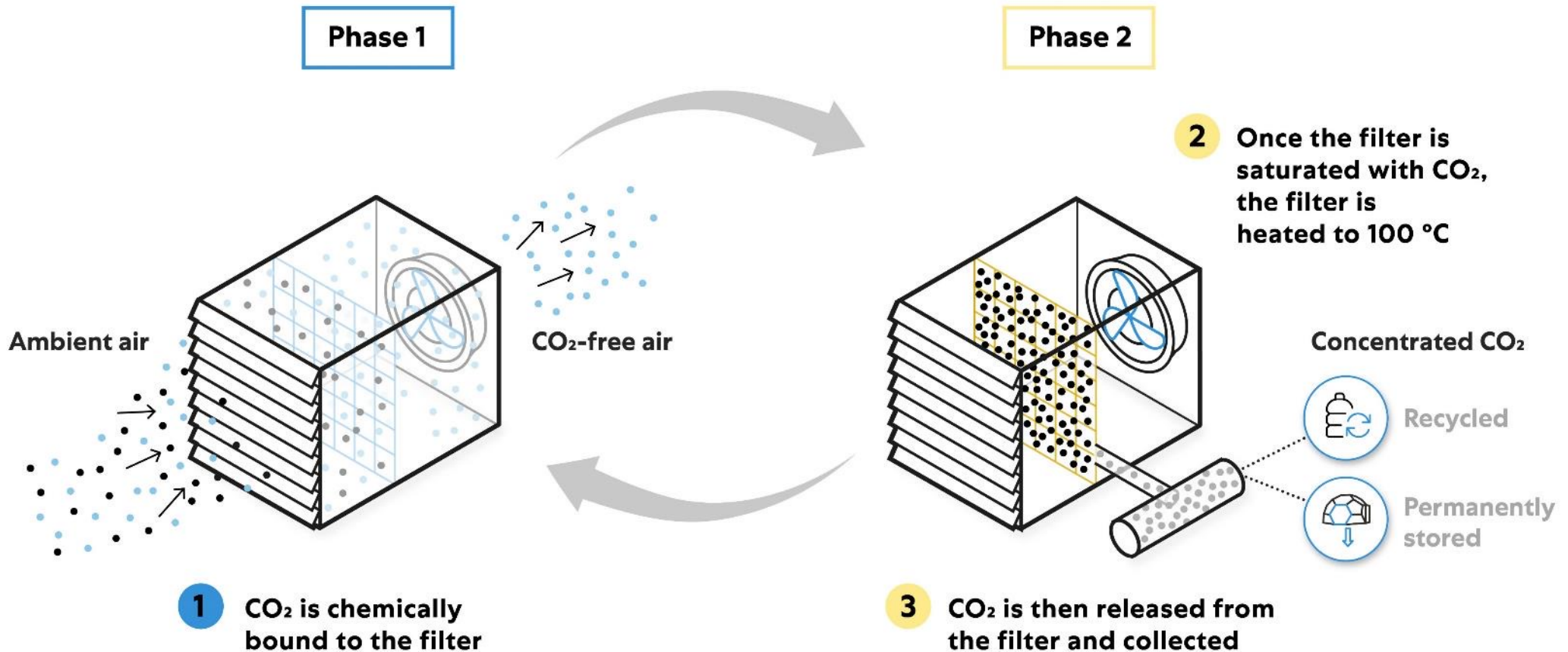
- 1 Hard-to-abate emissions**
- 2 Historical emissions**

Direct air capture and storage (DAC+S) vs. carbon capture and storage (CCS)

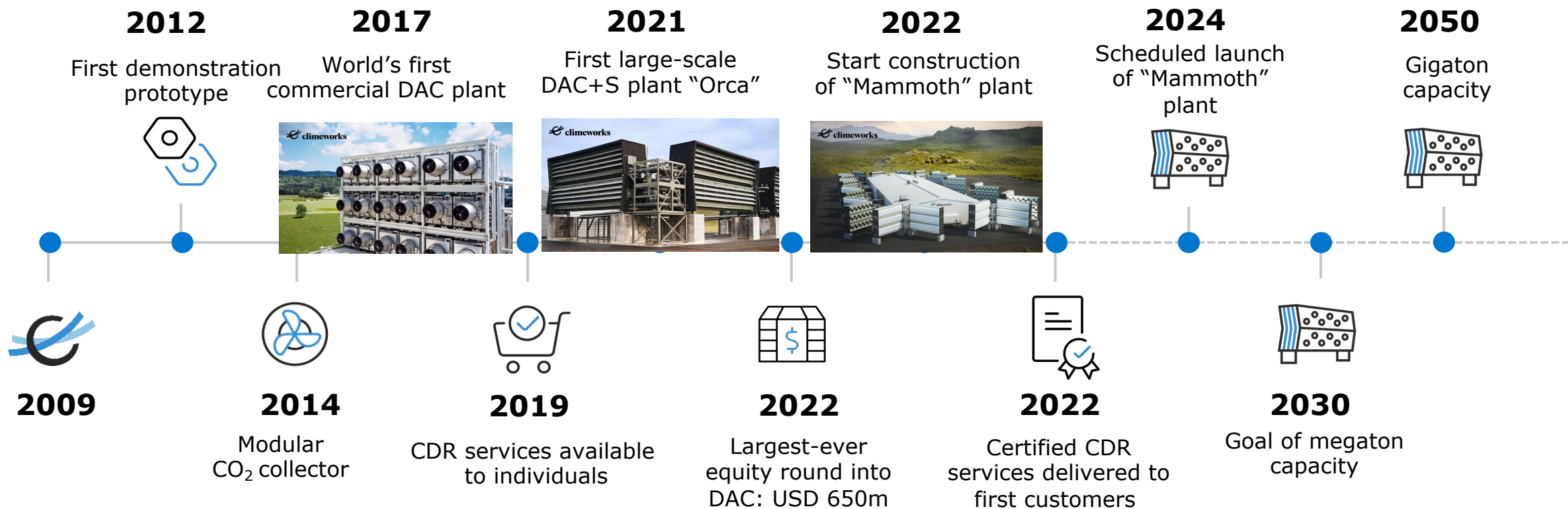


- A** CDR via **DAC+S** removes CO₂ directly from the atmosphere, resulting in **negative emissions**
- B** **CCS** captures fossil CO₂ at point sources before it enters the atmosphere & stores it, resulting in **avoided emissions**

Climeworks' solid sorbent-based adsorption process



Climeworks' journey to impact at scale



- Most advanced DAC player with **real world** experience

- World's **largest DAC+S facility** in commercial operations

Orca – our living proof



The world's **first** and **only commercial** direct air capture & storage facility

Operating since September **2021**

4'000 tons of CO₂ nominal capture capacity per year

Powered 100% by **geothermal energy**

CO₂ permanently stored underground through **mineralization**

First **third-party verified** carbon dioxide removal deliveries

What's next



Mammoth, Climeworks' newest and largest DAC+S plant; up to **36,000 tons of CO₂** nominal capture capacity per year.



The construction is expected to last 18-24 months before **operations start in 2024**.

- Jun 2022: **Groundbreaking** in Iceland.
- Dec 2022: **Process hall's** cladding completed.
- July 2023: **CO₂ injection boreholes** underway.

Climeworks' global projects & activities



- Ongoing project development work
- Operational plant
- Research & exploration



Mammoth

- In June 2022, Climeworks broke ground in Iceland to build its newest and largest DAC+S plant (36,000 tons nominal capture capacity per year)

Iceland

Norway

United Kingdom

Belgium

Switzerland

Austria

Italy

Germany

Northern Lights

- Full-chain CO₂ project targeting industrial decarbonization

DoE projects

- DAC+S projects in Louisiana, North Dakota and California selected by US Department of Energy.

United States

Orca

- In 2021 Climeworks opened the world's first DAC+S plant capturing nominally 4,000 tons of CO₂ per year



Orca

Capricorn

- Climeworks realized the first commercial DAC facility in 2017 near Zurich, supplying food-grade CO₂ to Coca Cola and others
- Operations completed in 2022



Capricorn

Oman

44.01

- Oman has the perfect conditions to store CO₂ through the natural process of mineralization in peridotite and an abundant supply of renewable energy

Great Carbon Valley Agreement

- In September 2023, Climeworks and Great Carbon Valley announced their collaboration to explore developing a large-scale DAC+S plant in Kenya

Kenya

Focus on Norway

- **Climeworks is exploring potential for large-scale DAC+S in Norway.**
Abundant geological storage, decarbonized energy, and a skilled workforce
- **Collaboration with Northern Lights** for safe and permanent storage as a service.
- **Significant CDR policy development in Norway**
 - Parliament is currently investigating how DAC can be scaled up and made profitable. A joint effort by the Ministry of Energy and the Ministry of Climate and Environment.
 - Ambition to reduce CO2 emissions by 90-95% in 2050.
 - The Norwegian Environmental Agency recommended that the government should consider supporting DAC due to its high relevance to the climate targets. The main suggestion was a negative tax of approximately 180 USD per tCO2.
 - Enova, the main government body for sustainability funding, is considering supporting large-scale DAC projects, though it currently focuses solely on DAC feasibility studies and smaller innovation grants.
 - The Climate Committee 2050, reporting to the Ministry of Climate and Environment, cites DAC as the primary CDR method for Norway to achieve net zero.



Our business model: CO₂ removal as a service



SWAROVSKI



JPMORGAN CHASE & CO.



For companies

High-quality CO₂ removal as part of corporate emissions reduction roadmaps to achieve net zero and beyond.

Public

For individuals

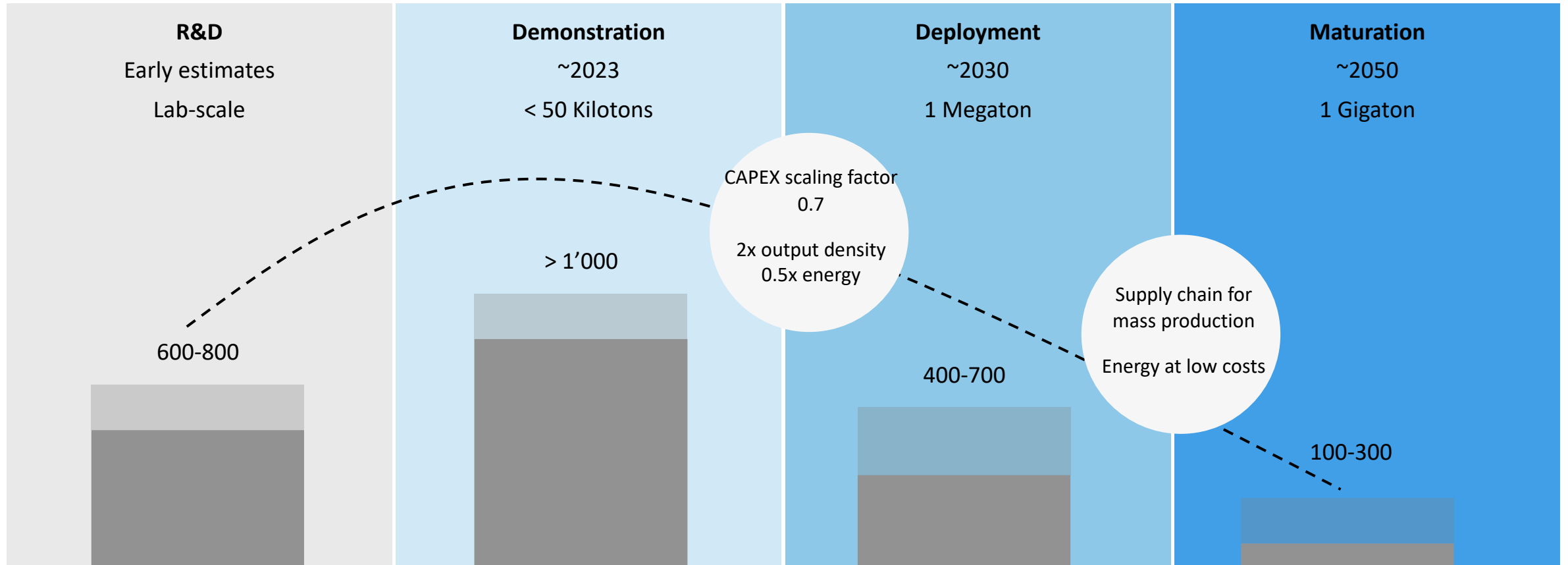
CO₂ removal as a service for individuals to remove emissions and enable DAC's scale-up:

www.climeworks.com/subscriptions

Climeworks DAC cost roadmap



Indicative CDR cost, in 2023 USD / t CDR



Thoughts on the future of DAC



1



DAC is central to enable a net-zero world

Reducing CO₂ emissions must be the **number 1 priority** in the fight against climate change

Beyond emission reduction, **CDR will be required at Gt-scale to reach a net-zero world.**

DAC can lead the way to large-scale CDR

2



DAC can reach \$100-300/t CDR when scaling beyond multi-Mt scale

Current costs are not representative and largely not understood since they are at the **beginning of the "cost mountain"**

DAC is already cost competitive for ~20% of today's emissions that have abatement costs > \$1'000/t CO₂¹

3



DAC maturation and cost reduction happens in the field

Solid technology is required that can withstand the forces of outdoor conditions and will mature over several learning cycles

The DAC market needs to **get started today to enable net-zero tomorrow**

1. Source: Goldman-Sachs 2022 carbon abatement curve



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