

Carbon Dioxide Utilization: Accelerating The Uptake of CCUS

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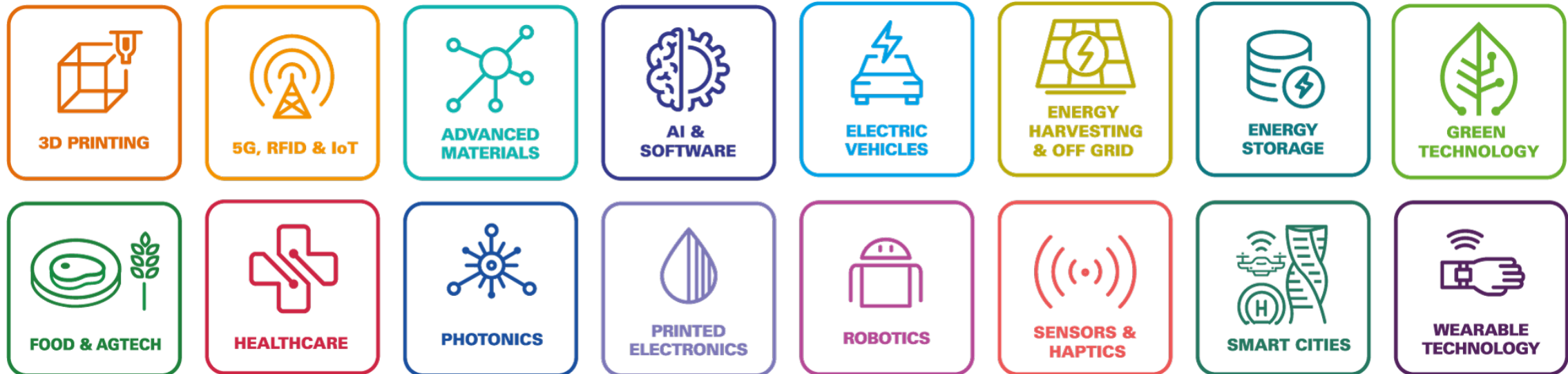


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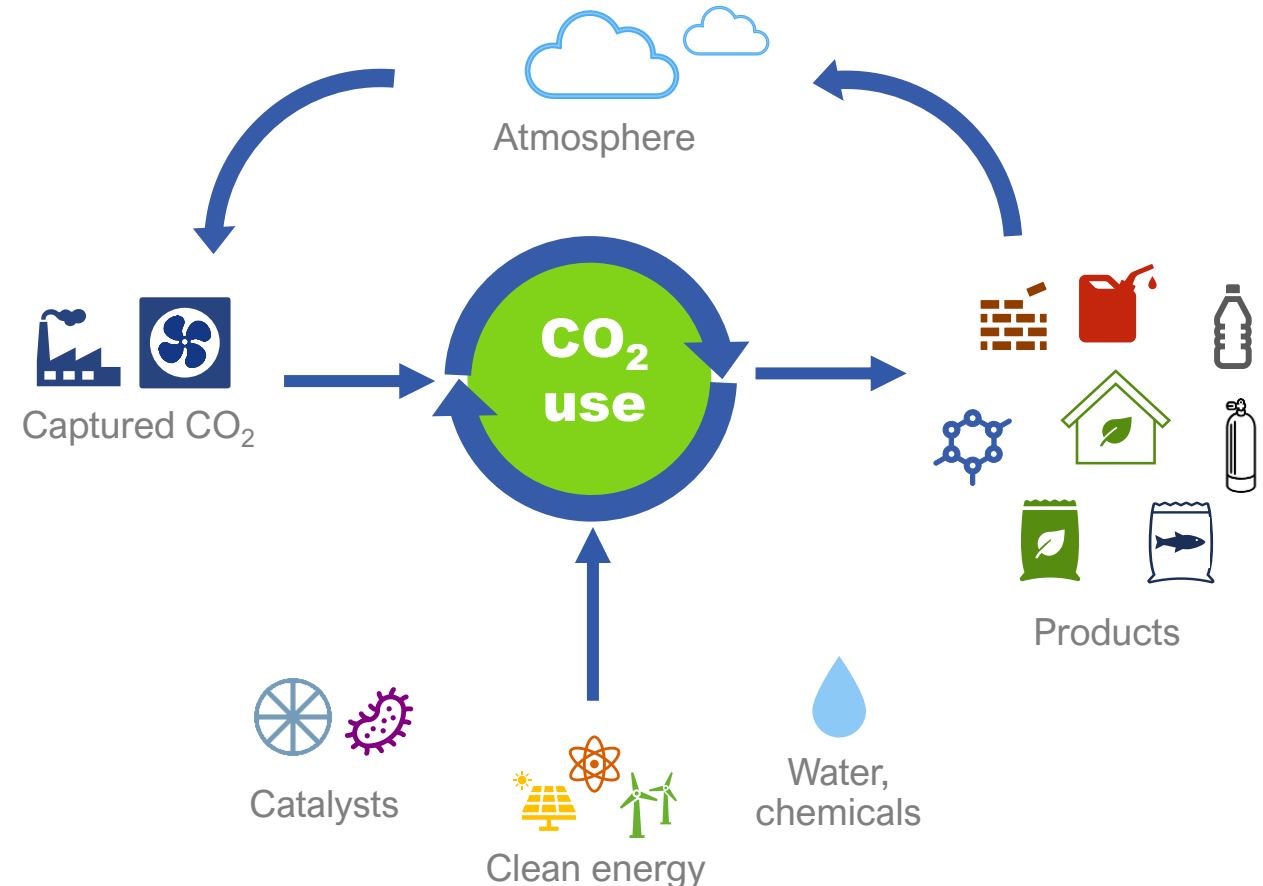
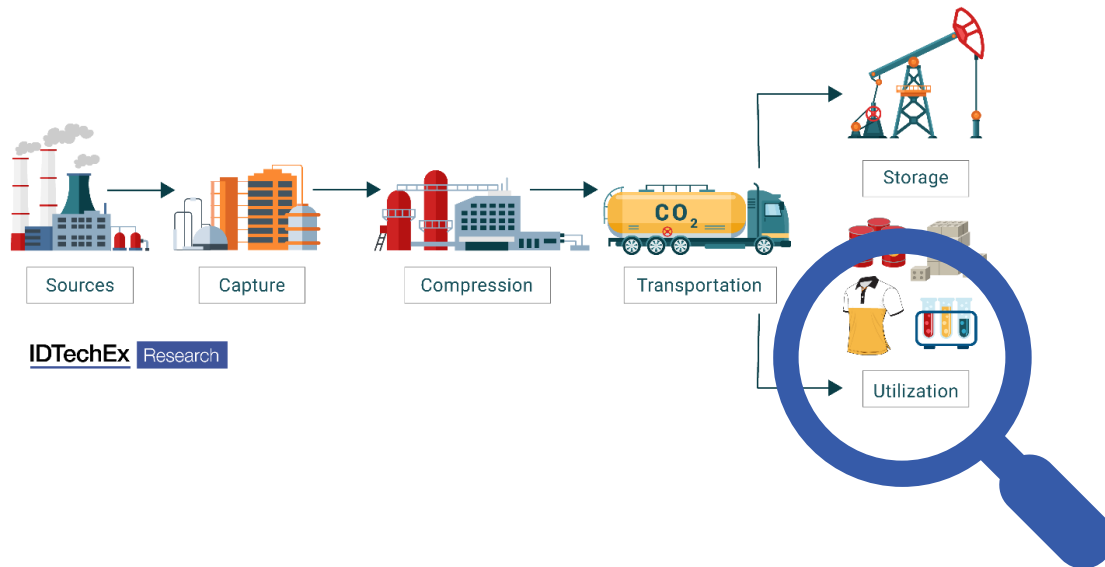


What is carbon dioxide (CO₂) utilization?

CO₂ utilization – circular carbon economy

The practical use of waste CO₂ with potential for *financial* benefits & net CO₂ **emissions reduction or removal**

Carbon Capture Utilization and Storage



Carbon Capture Utilization and Storage needed to limit global warming

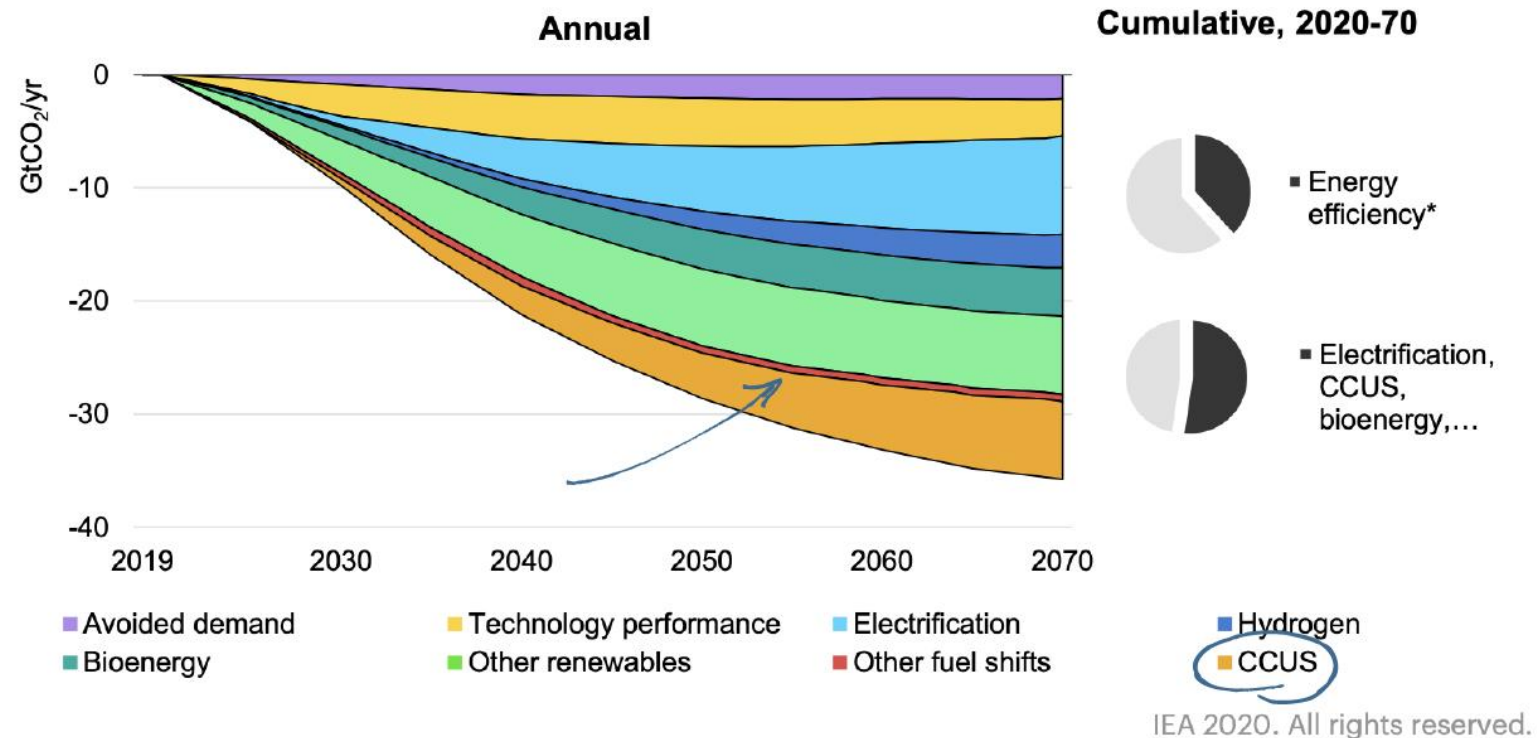


Image: IEA, CCUS in Clean Energy Transitions, 2020.



Why CO₂ utilization and why now?

CO₂ capture is ramping up fast, but we need more

↗ 4x

CO₂ capture capacity has grown in the past 20 years

Utilization gives captured CO₂



A destination



A business model

Million tonnes CO₂ needed to be captured from 2030 in the IEA Net Zero Emissions by 2050 Scenario

1,665

44

Million tonnes CO₂ captured at point-source in 2021

Data source: IEA, World Energy Outlook, 2021





Bottom-up market pull
reported by players



US\$1B

global private funding 2008-2018¹



180+ companies
using CO₂ to create products²

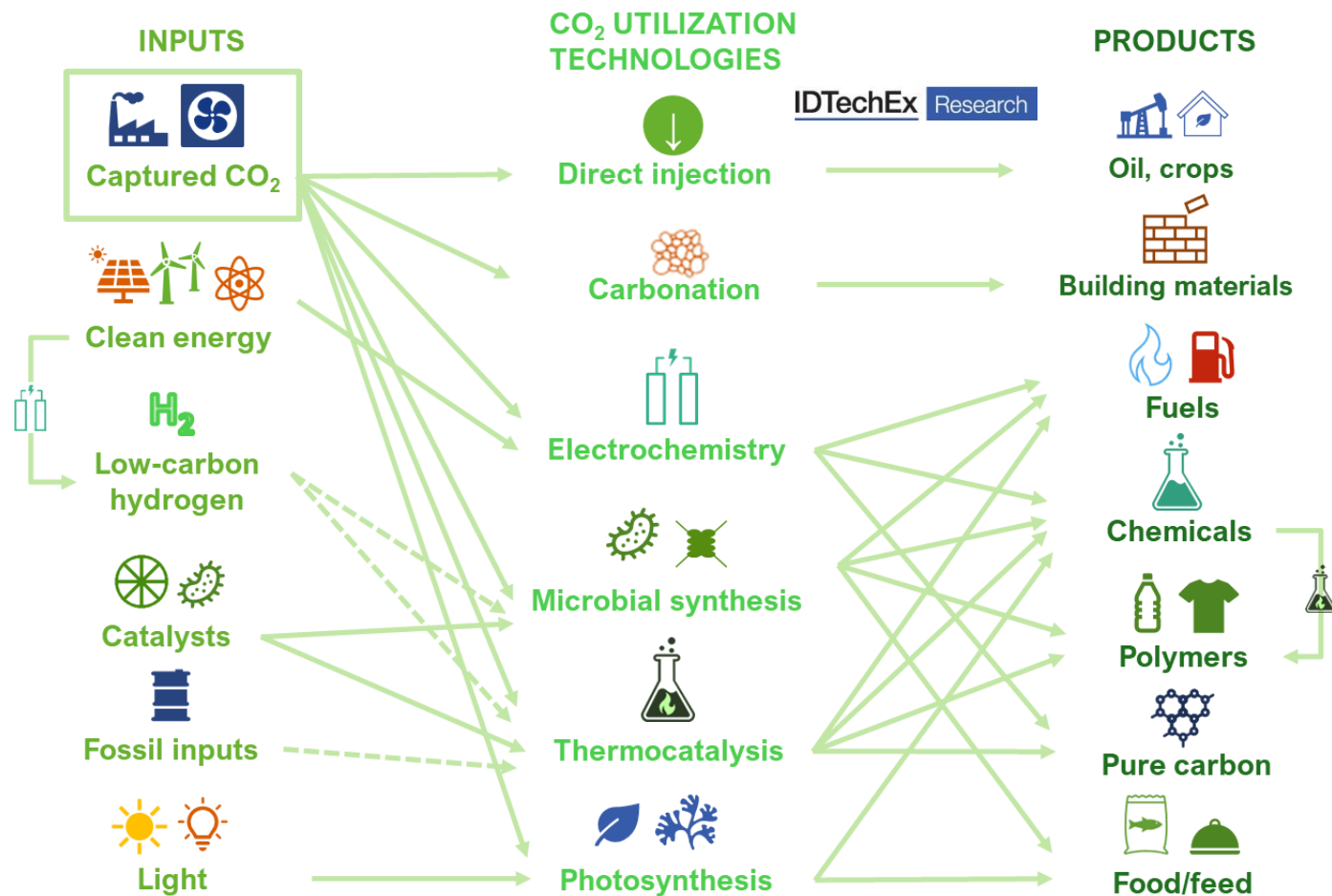


Policies

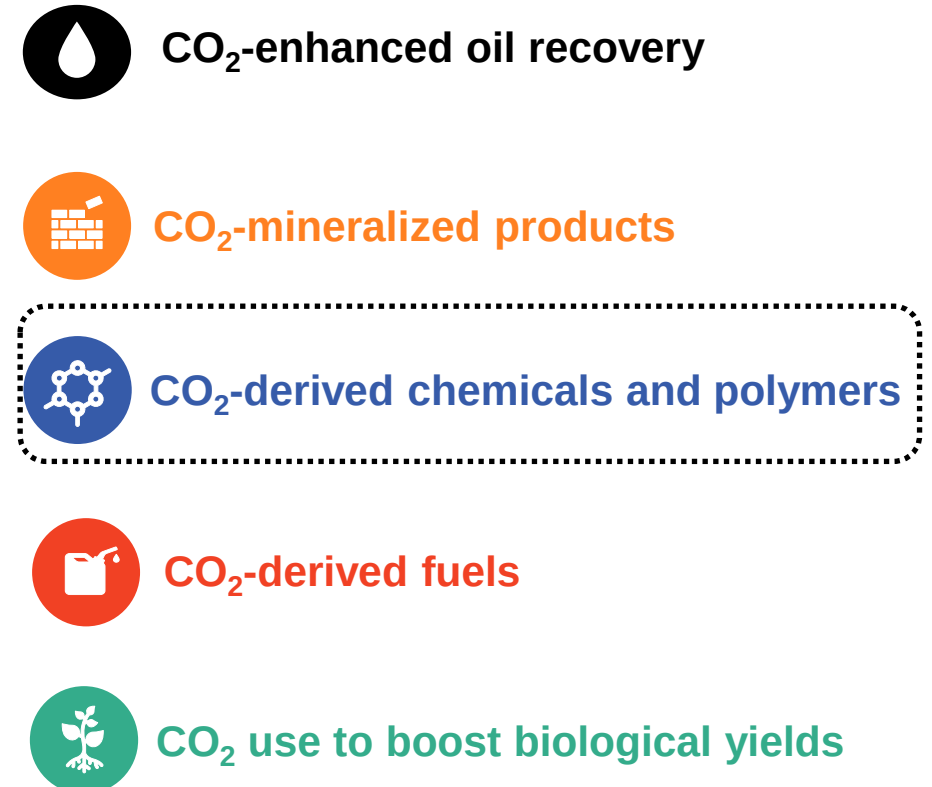
Carbon prices; US's 45Q; EU's Fit for 55

¹IEA, 2019. ²IDTechEx research.





Key application areas in CO₂ utilization



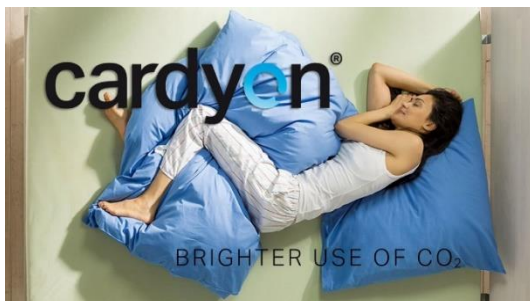
CO₂-polymers: small-scale but already commercial

AsahiKASEI

WONDERLITE®



Polycarbonate resin



CO₂-based polyols



EMPOWER
MATERIALS



QPAC Poly(alkylene)
carbonates



NEW LIGHT AIRCARBON



Poly-hydroxy-alkanoates (PHA)



aramco
chemicals

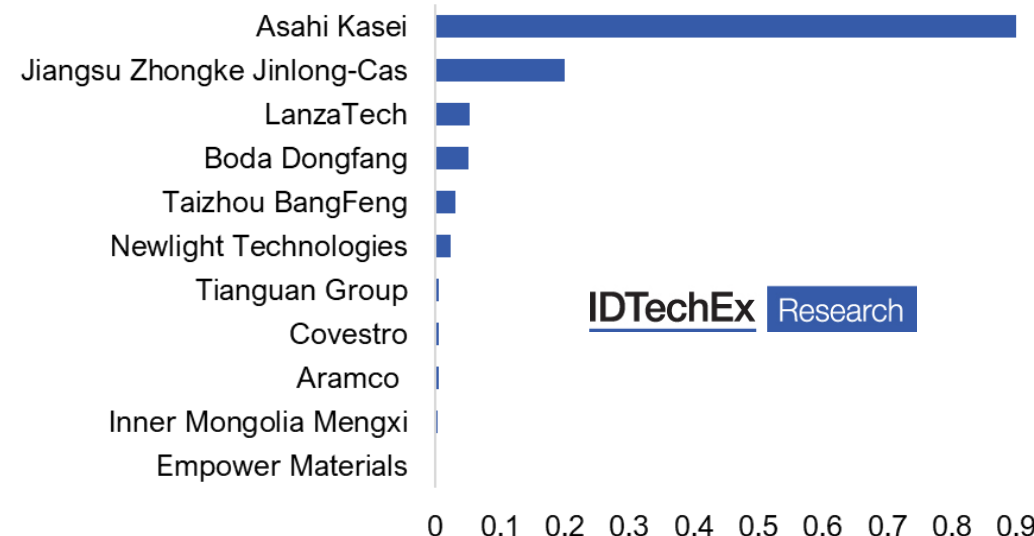


CO₂nverge®



CO₂-based polyols

Current manufacturing scale (million
tonne/year of product)¹



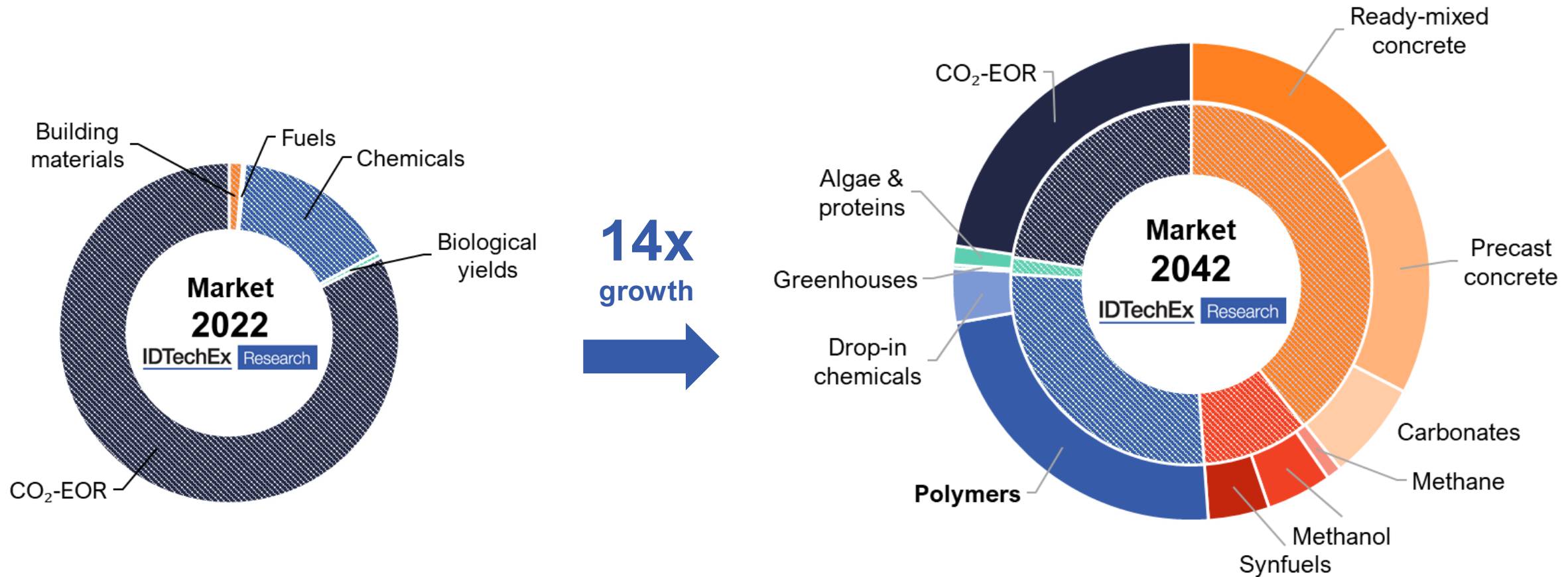
LanzaTech



CO₂-to-ethanol or MEG² (precursors)

Images: companies' websites. ¹Data: IDTechEx research. ²MEG: monoethylene glycol.





Source: IDTechEx. EOR: enhanced oil recovery.



Pros

- Creates demand for captured CO₂
- Provides a business model to CCUS
- Fossil-carbon displacement
- Solution for hard-to-abate industries

Cons

- Unfavorable thermodynamics
- Low existing volumes
- Economic viability will be a major challenge for CO₂ utilization
- Sequestration permanency of certain products

Biggest challenge

Scale



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Carbon Dioxide (CO₂) Utilization 2022-2042: Technologies, Market Forecasts, and Players

Granular forecasts, interview-based company profiles, benchmarking, and market outlook of CO₂ utilization technologies in enhanced oil recovery, building materials, fuels, polymers, commodity chemicals, crop greenhouses, algae, and proteins.

IDTechEx Research



This presentation was based on IDTechEx's recent report:

Carbon Dioxide Utilization 2022-2042

[IDTechEx.com/CO2U](https://www.IDTechEx.com/CO2U)

Sample pages are available for all IDTechEx reports

