WEBINAR

Bio-CO_2 from biomethane

Closing the carbon loop, driving a growing market

25 SEPTEMBER 2025

10h-11h CEST

EBA
European Biogas Association

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Welcome

Angela Sainz Arnau

Communications Director

European Biogas Association

AGENDA

10:00 | Welcome
Angela Sainz Arnau, Communications Director
European Biogas Association

10:05 | Keynote
Mathilde Fajardy, Energy Technology & Policy Analyst
International Energy Agency (IEA)

10:15 | Key takeaways on EBA's White Paper: Current and future state of bio-CO2 CCUs from biomethane in Europe
Pablo Molina, Technical and Project Officer
European Biogas Association

10:30 | Insights from a CCUS operator
Nick Primmer, Policy Lead
Future Biogas

10:40 | Bio-CO2 market trading insights
Eunice Ribeiro, Senior Public Affairs Advisor
STX Group

10:50 | Q&A session
Moderated by Angela Sainz Arnau, Communications Director
European Biogas Association

11:00 | Conclusion and wrap up
Harmen Dekker, CEO
European Biogas Association

Keynote

Mathilde Fajardy

Energy Technology & Policy Analyst
International Energy Agency (IEA)

International Energy Agency

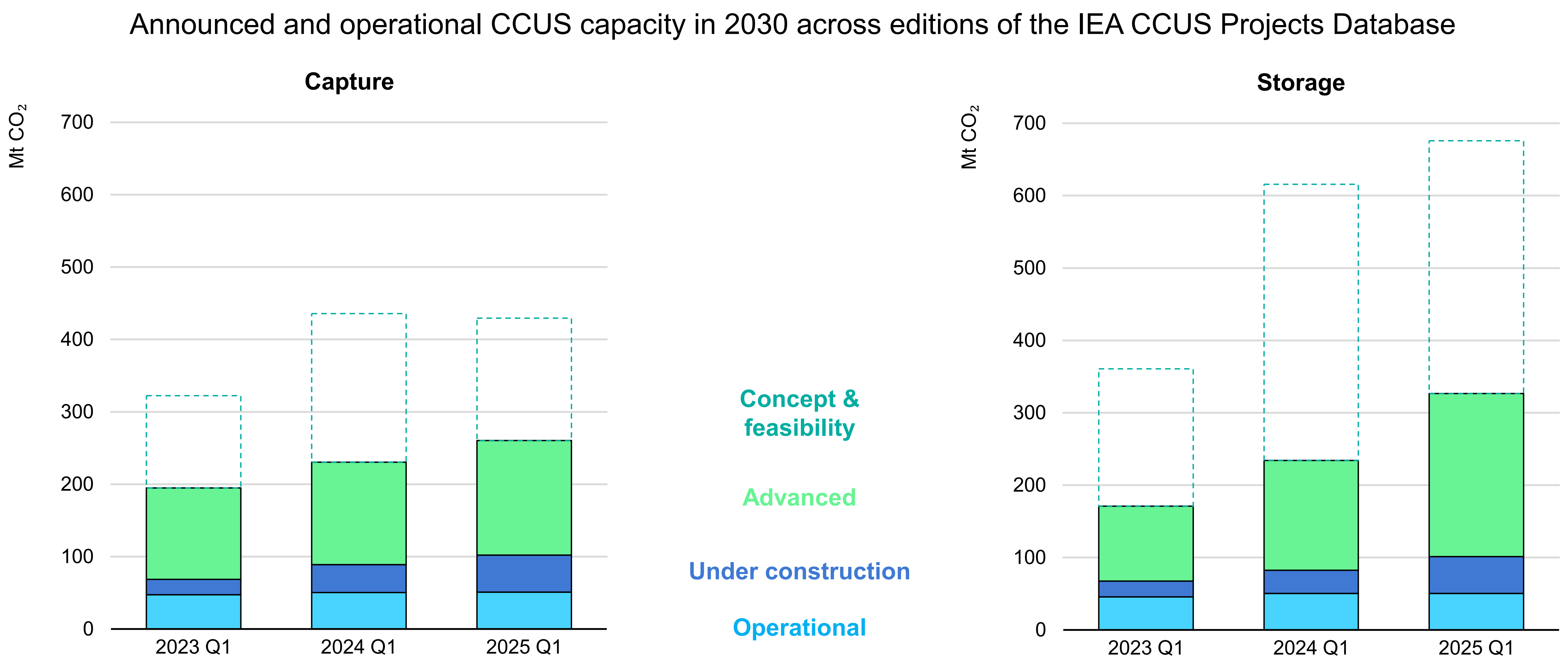
CCUS and bio-CO_2 in clean energy transitions

Mathilde Fajardy, Energy Technology and Policy Analyst

25 September 2025

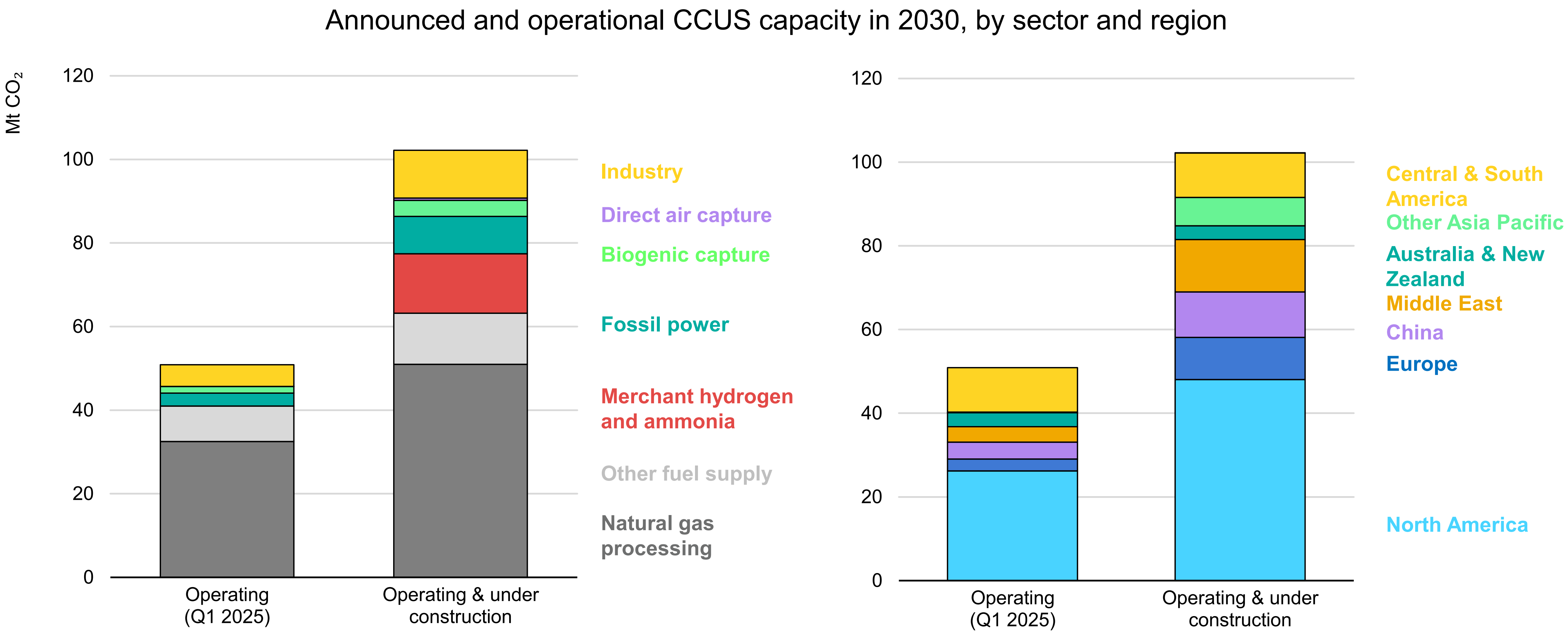
European Biogas Association webinar: ‘Bio-CO_2 from biomethane – Closing the carbon loop, driving a growing market’

CCUS projects around the world are reaching new milestones



Industry is putting greater emphasis on moving existing projects ahead. If completed, all projects currently under construction could double operational capacity in the next couple of years

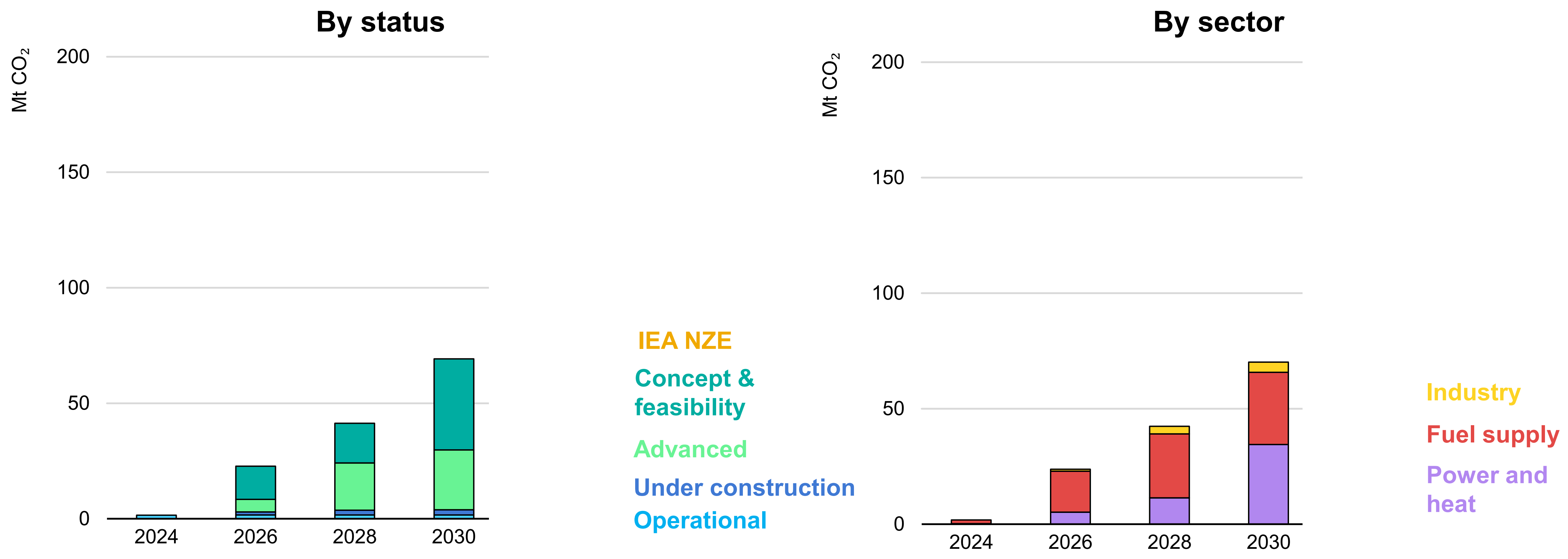
The CCUS project pipeline is diversifying but not set in stone



Announcements show a diversification of applications but more investment is needed outside of historical sectors. Regional deployment may stay concentrated unless rapid developments in key markets shift the landscape

More efforts are needed in biogenic capture in particular

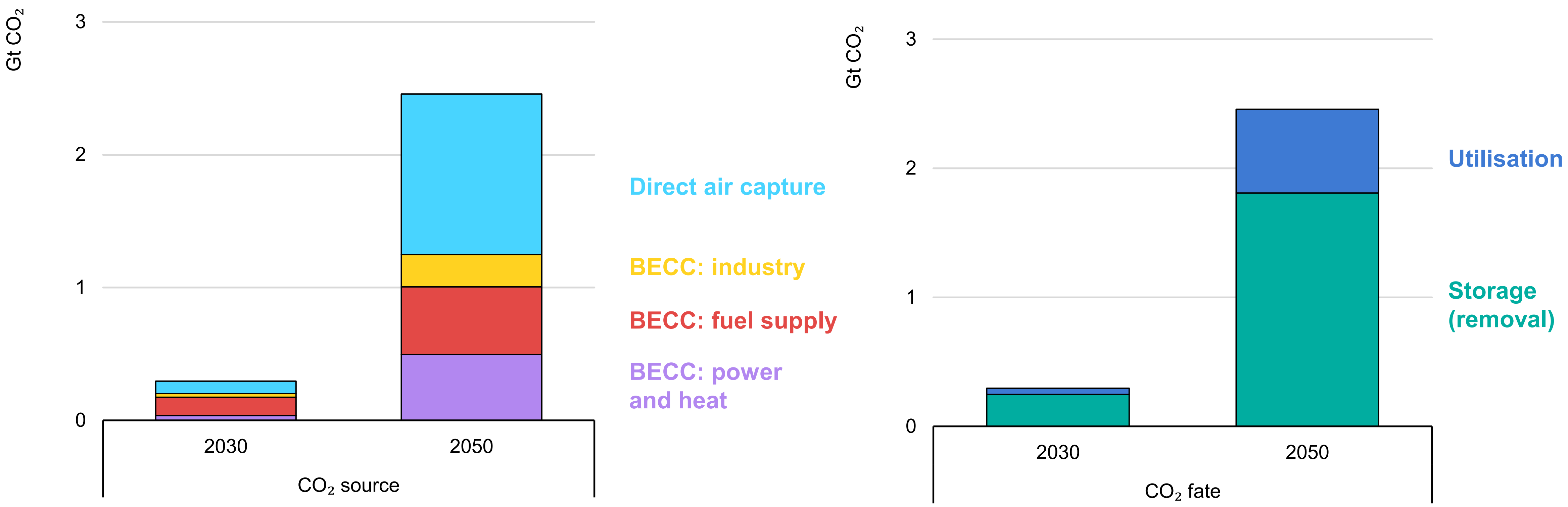
Announced biogenic capture capacity compared to IEA NZE scenario, 2024-2030



Less than 5% of capacity announced for 2030 is either operational or under construction.
Deployment lags behind what would be needed in a net-zero scenario by 2030, particularly in fuels and industry.

CO_2 removal or CO_2 utilisation?

Source and fate of CO_2 captured from biogenic applications and from the air in the IEA NZE Scenario, 2050



By 2050, 2.5 Gt CO_2 would need to be captured from biogenic sources and from the air to reach net-zero. Around 75% is stored for removals (1.8 Gt), and 25% is used as carbon-neutral feedstock in fuels and chemicals.

Four priorities to boost bio-CO_2 capture

1

Build-up demand for high-quality carbon removals

2

Develop internationally agreed approaches to certification and accounting

3

Develop CO_2 transport infrastructure, including hubs

4

Foster innovation across the value chain

Key takeaways on EBA's White Paper:
Current and future state of bio-CO2 CCUs from biomethane in Europe

Pablo Molina

Technical and Project Officer
European Biogas Association

What’s in this presentation for you?

- CO_2 Markets and Future Landscape
- Economics of bioCO_2 from biomethane
- Future potential of bioCO_2 from biogases in the EU-27
- Mapping of current and future biomethane facilities capturing bioCO_2
- Conclusions

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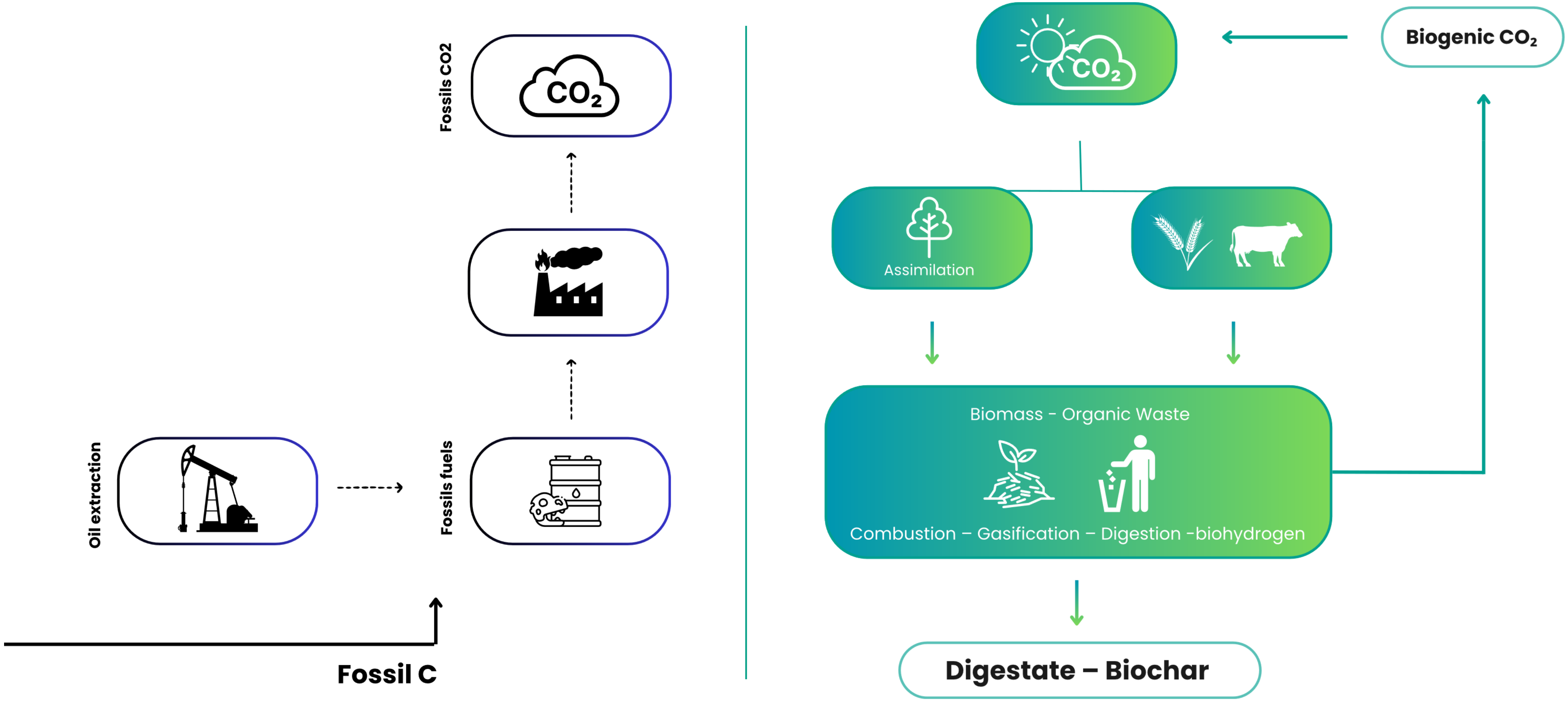
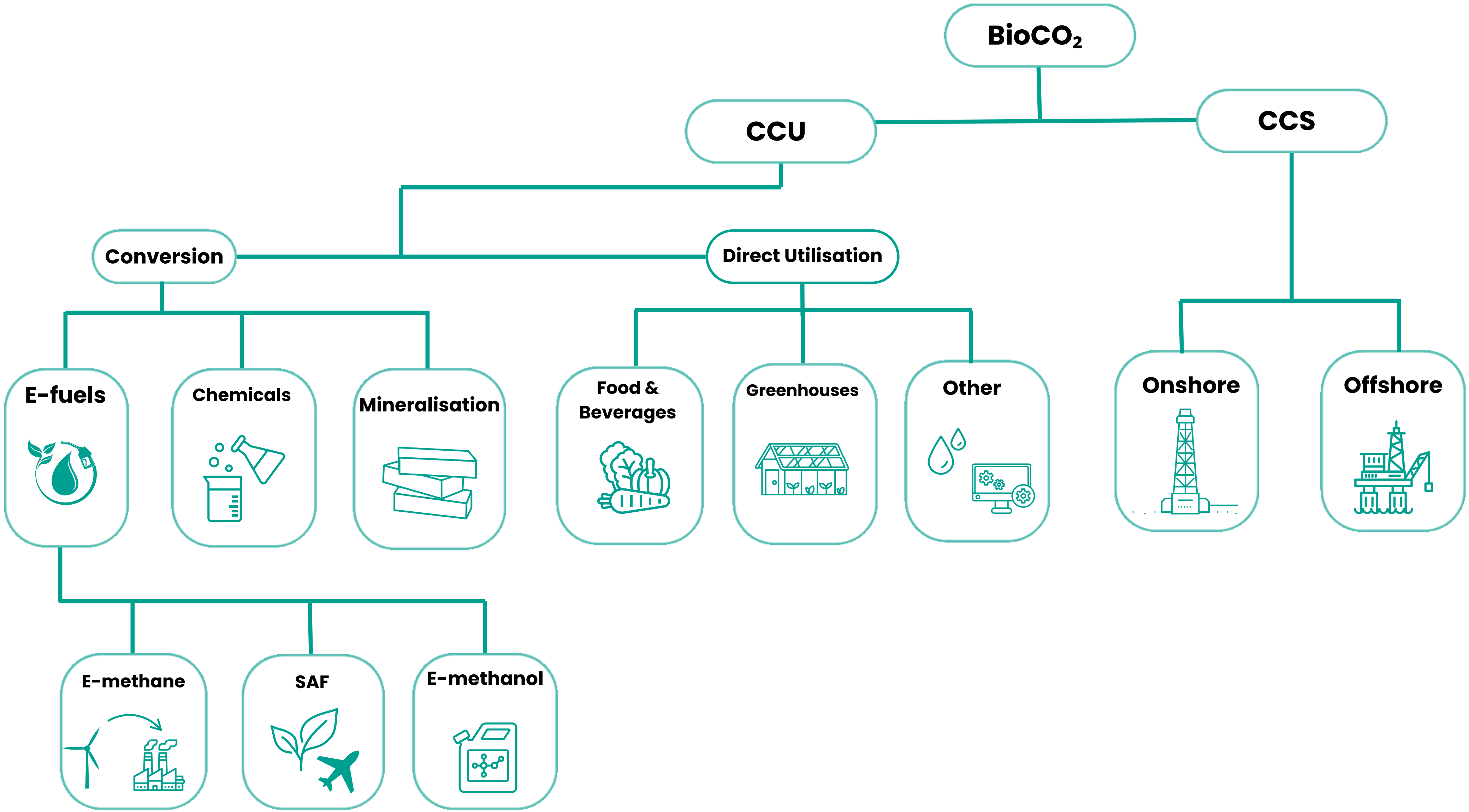
What is biogenic CO_2?



CO_2 Markets and Future Landscape

CO_2 Applications



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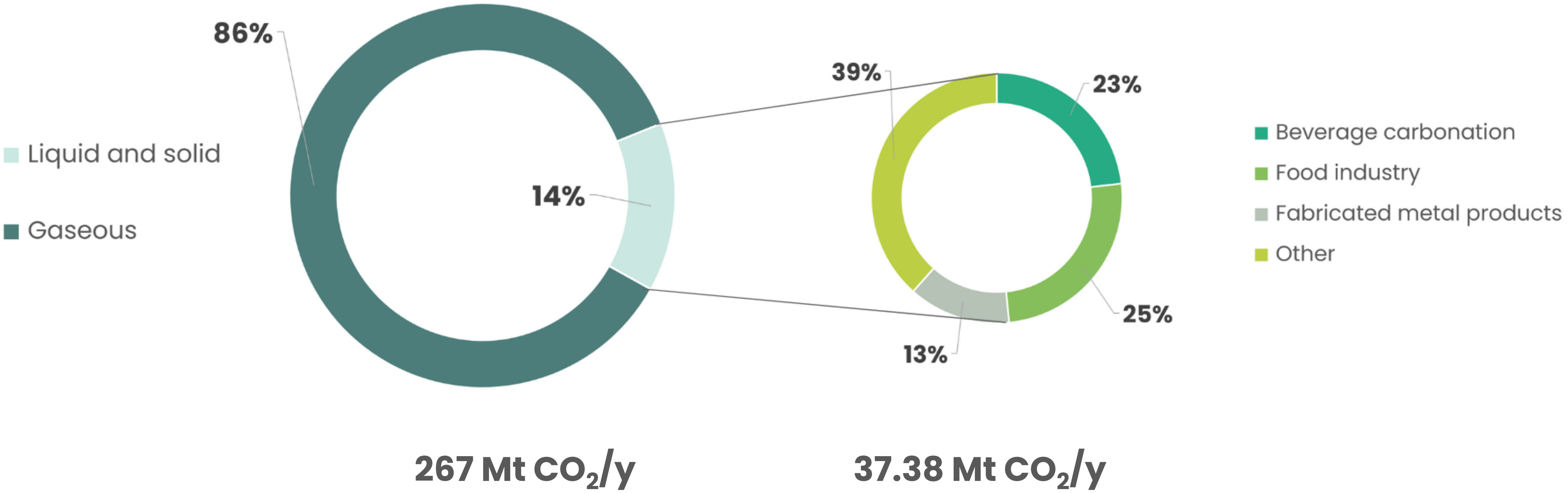
Global CO_2 demand in 2024



North America and mainland China are the **largest markets**

European market share (gaseous, liquid and solid) is **5%**

In global liquid and solid market European share is **20%**

S&P Global Commodity Insights (2024).

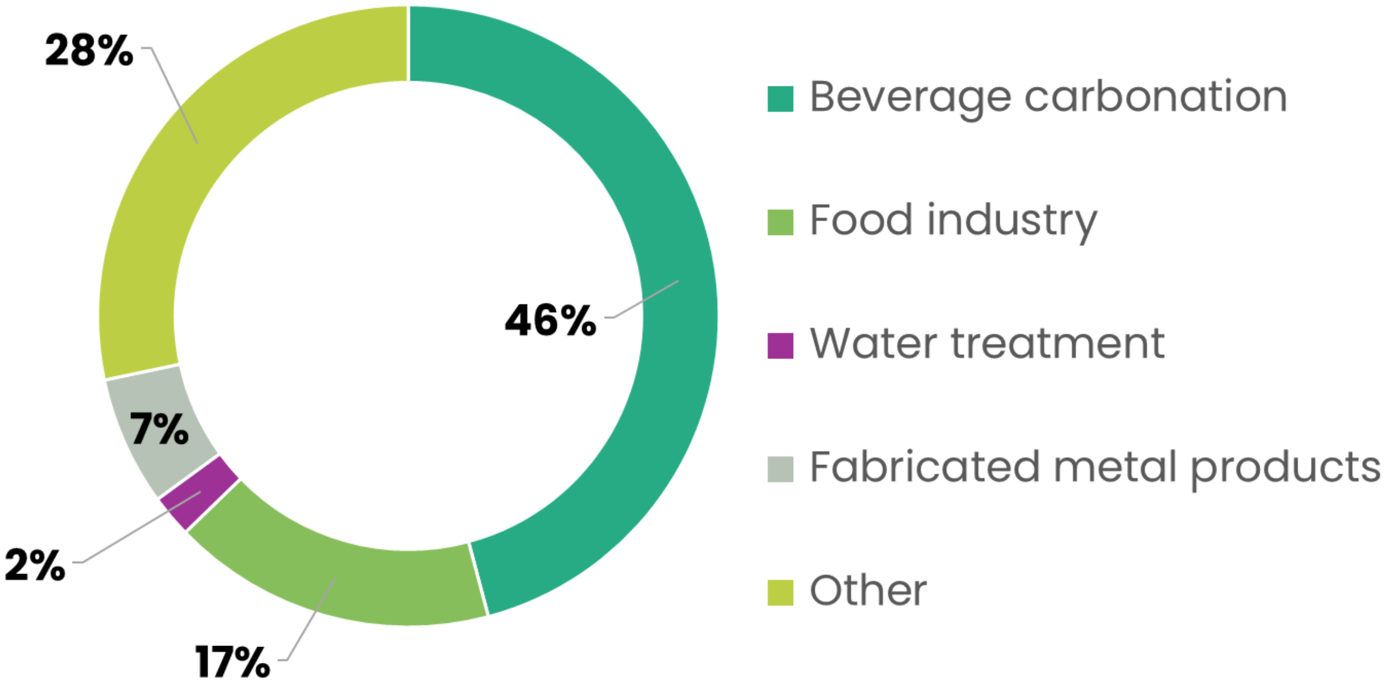
European liquid and solid CO_2 demand in 2024

7.7 Mt CO_2 were consumed in Europe

- Food & Beverages dominate current markets
- Other applications: dry ice, medical, refrigeration…
- Merchant CO_2 structured around regional supply chains

Demand on conventional uses not expected to grow significantly

Liquid and solid CO_2 demand in Europe based on S&P Global (2024).



S&P Global Commodity Insights (2024).

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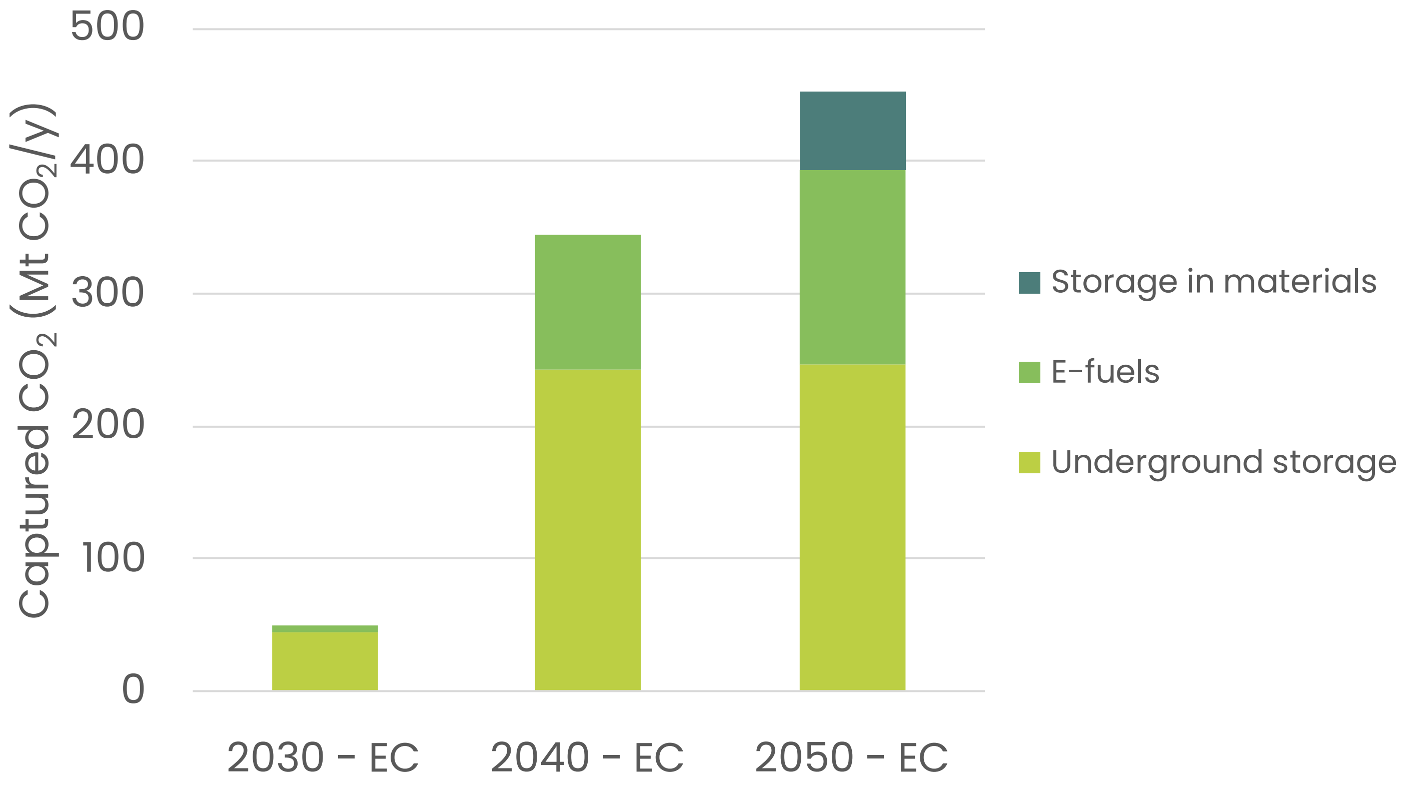
CCUS Shares in the future – EC Impact Assessment

344 Mt CO_2 to be captured by 2040

- E-fuels by 2040 more than **thirteen times** today's merchant CO_2
- Chemicals not included in the model

Underestimates biogases contribution:

- 22 Mt by 2040
- 30 Mt by 2050



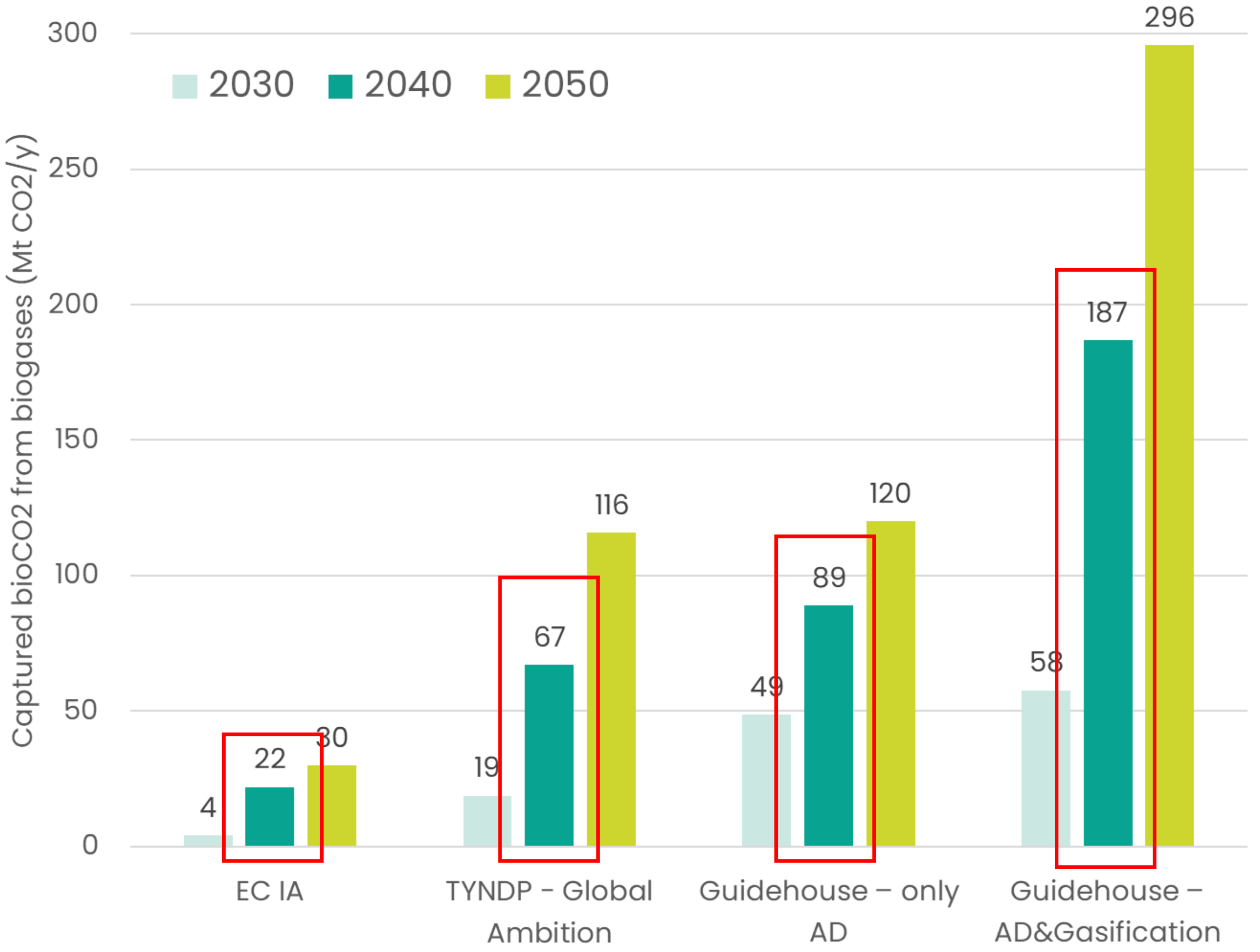
Captured CO_2 by end use based on EC(2024)

$BioCO_2$ potential from biomethane production (EU-27)

Biogas sector, for CO_2 capture, represents one of the best:

- available,
- cost-effective,
- and scalable technologies

A **stable regulatory framework** is needed to unlock this potential



$BioCO_2$ potential based on different models

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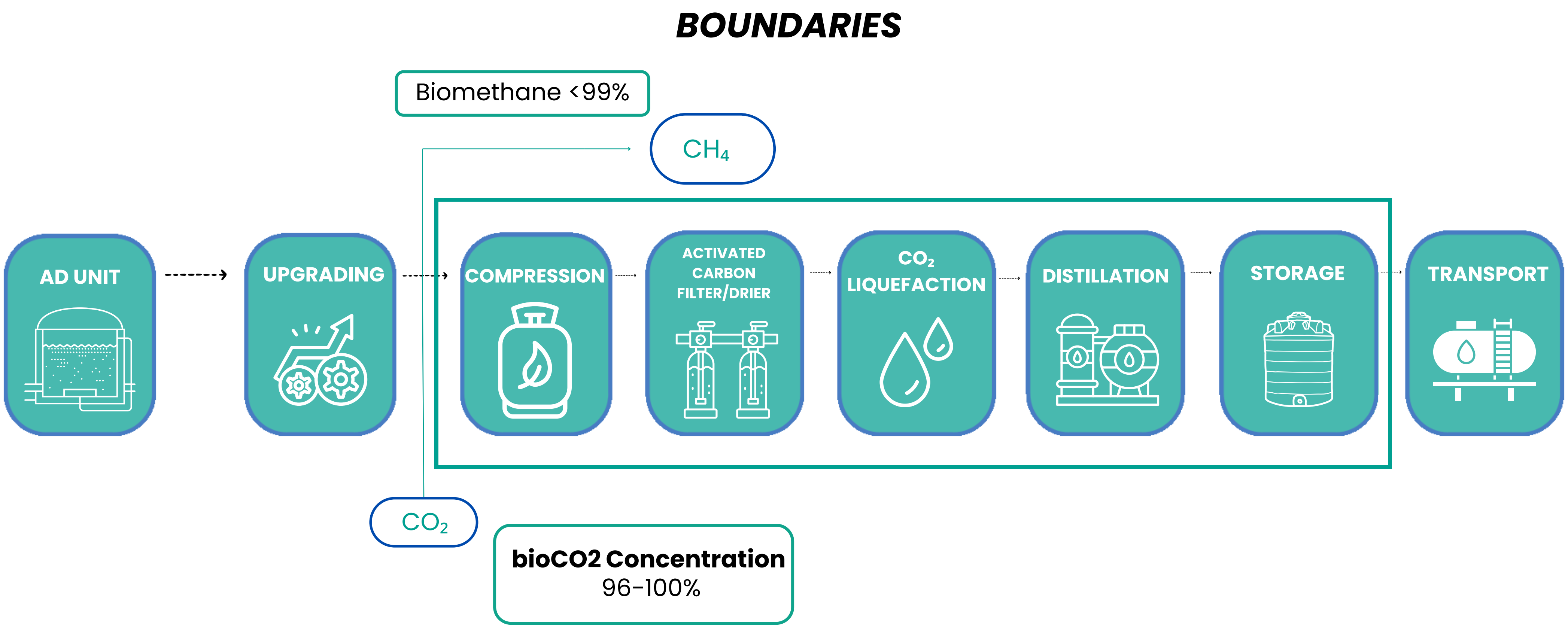
Economics of bioCO_2 from biomethane

Data economics exercise – CAPEX AND OPEX



- **Objective:** calculate LCOC
- Commercial-scale projects
- Direct data from project developers and operators

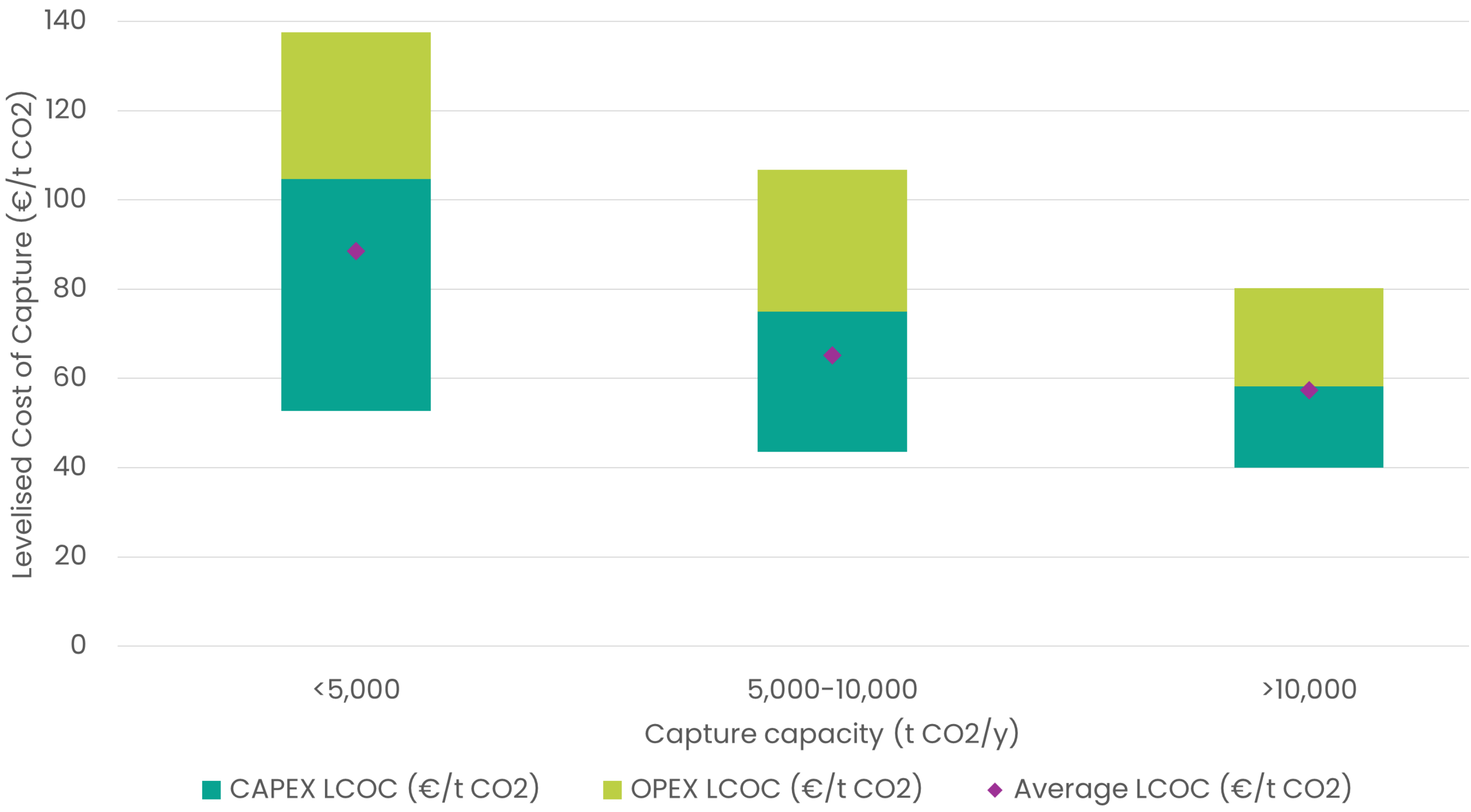
Levelised Cost of Capture (LCOC)

Driven by Multiple Factors

- **Economies of scale** allowing cost degression
- **CAPEX**, liquefaction unit most cost intensive
- **OPEX**, electricity for liquefaction accounts for the highest (over 60%)
- Greenfield vs brownfield

Volume aggregation drives additional cost reduction

LCOC of bioCO2 from biomethane depending on range of capture capacity



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Current and Future Biomethane Facilities Capturing BioCO_2 in Europe

CCUS of bioCO_2 from biomethane production

Biogases' contribution to the biogenic CO_2 industry

125 biomethane plants in Europe

- Capturing 1.17 Mtonnes of biogenic CO2/year

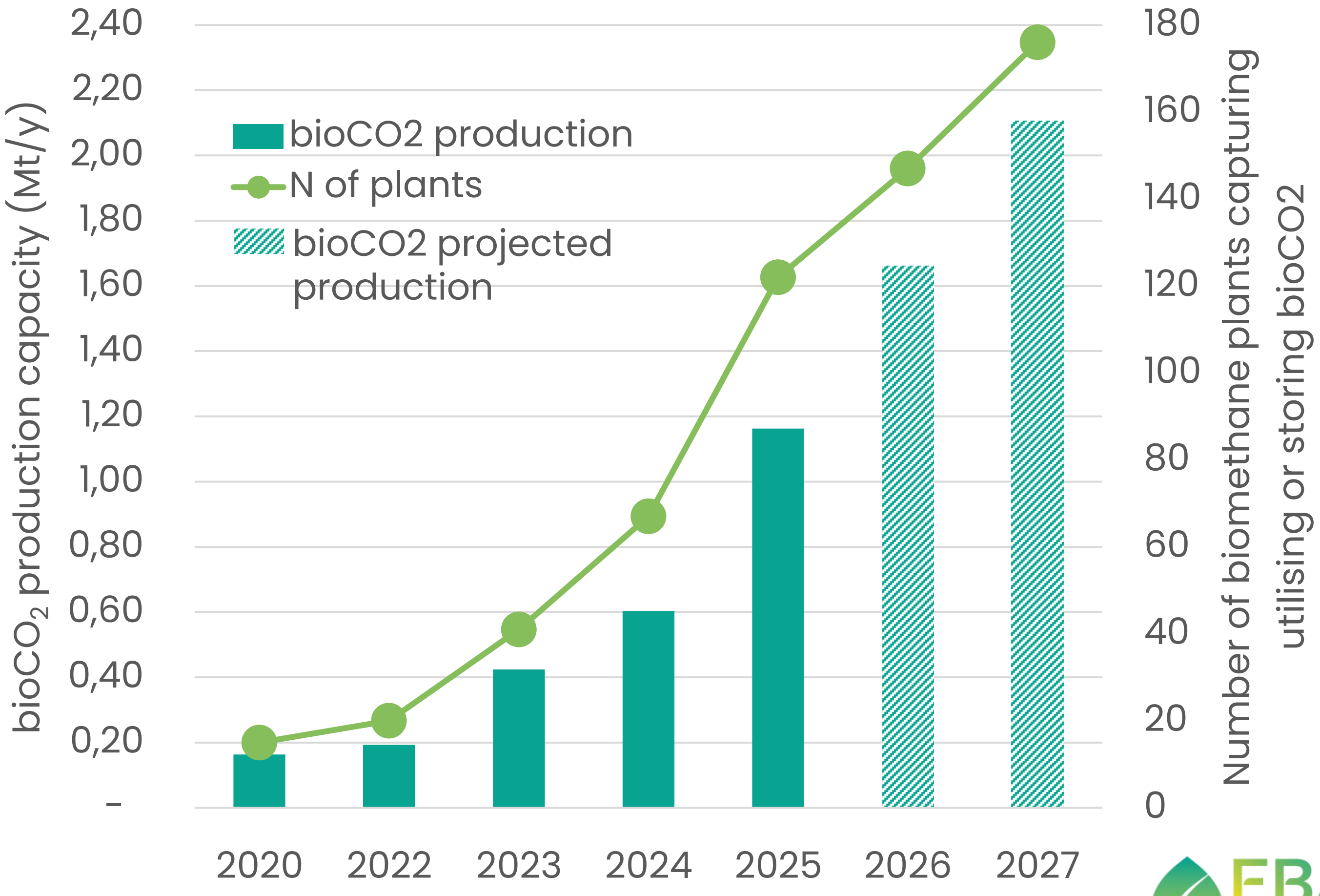
25 additional bio-CO_2 plants expected by 2026

- Set to add 0.5 Mtonnes of captured biogenic CO2/year

75% of captured bio-CO_2 directed to CCU

- 32% Greenhouses
- 21% Food and beverages
- 10% e-fuels

BioCO_2 Captured, Utilised, or Permanently Stored from Biomethane Production



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Distribution per country by 2027: bioCCU or bioCCS?

UK expected to remain the leading capturer from biogas

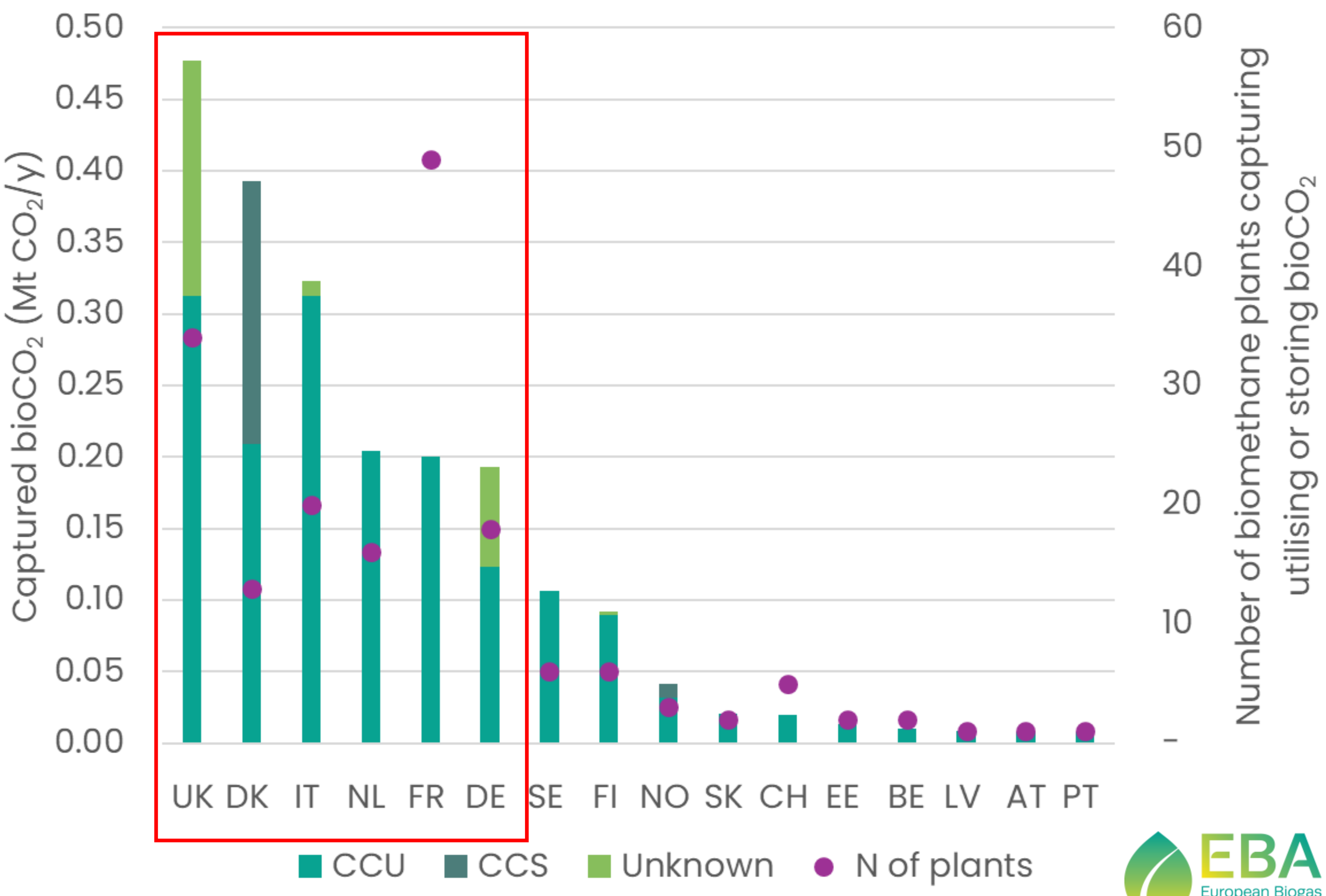
- Instability of local CO_2 markets

Denmark, CCS adding considerable capacity

- E-fuels driving demand
- Larger scale projects

Distribution beyond 2027 will depend on: infrastructure, e-fuels developments, ETS, bioCO_2 certification schemes, support schemes…

BioCO_2 Captured, Utilised, or Permanently Stored from Biomethane Production per country by 2027



Conclusions

Conclusions

$BioCO_2$ from biogas is already in the market, offering a **scalable, efficient, and low-cost solution**, crucial to achieve the Climate Law objective.

Emerging applications (e-fuels, materials) will require significant quantities with $bioCO_2$ as a key source.

Europe must tackle **policy and infrastructure barriers** to fully unlock the potential of $bioCO_2$

Strong need for **targeted incentives**, integrated CO_2 infrastructure, harmonised **certification** and traceability **schemes**

Report available on EBA Website

Scan the QR and download the full report!

europeanbiogas.eu

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Insights from a CCUS operator

Nick Primmer

Policy Lead
Future Biogas

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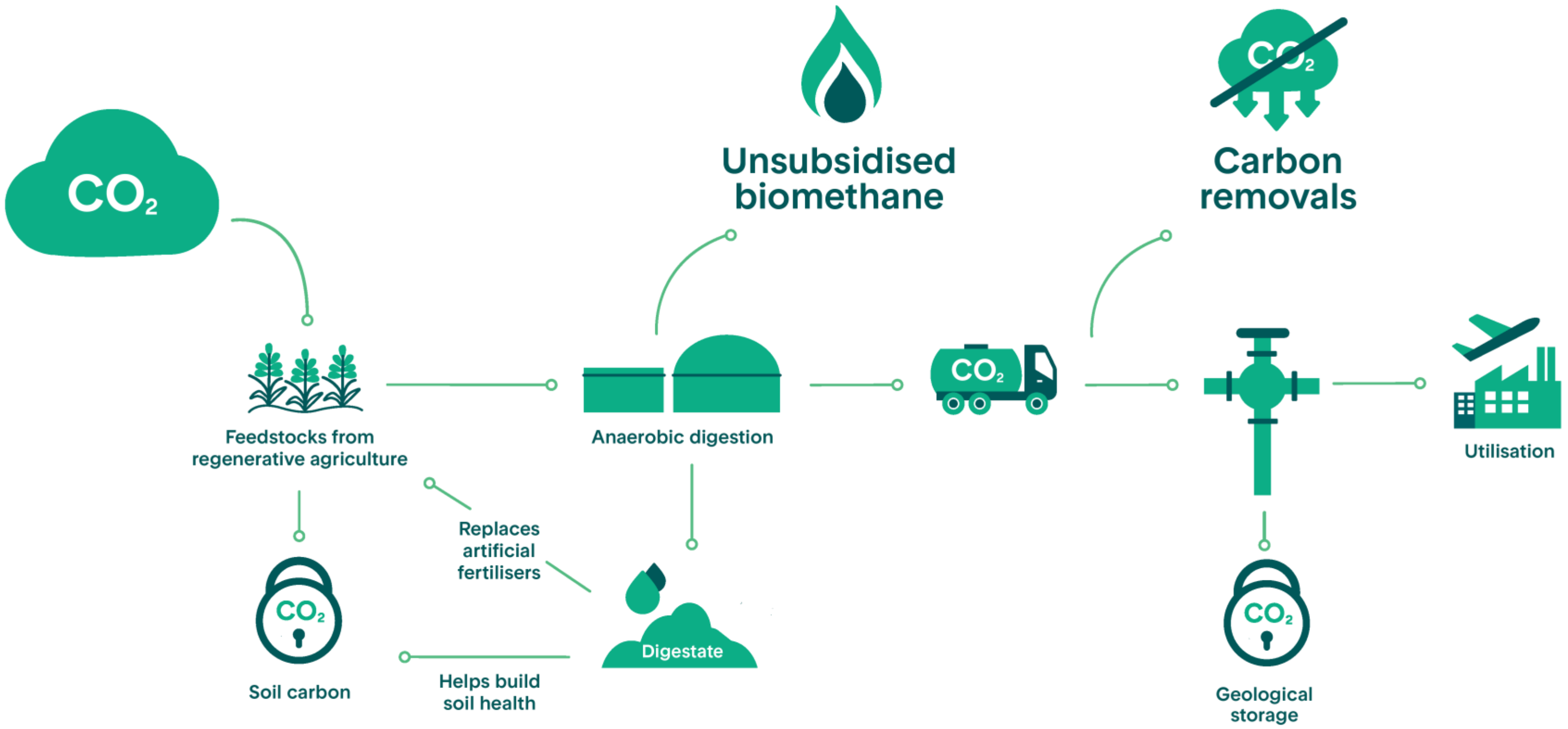
Your journey to Net Zero

Unsubsidised biomethane and permanent carbon removals

Leading UK operator

TODAY	TOMORROW
12 AD plants	30+ AD plants
0.6 TWh per year of biomethane	3.0+ TWh per year of biomethane
16k Tonnes of biogenic CO_2 per year	500k Tonnes of biogenic CO_2 per year
230+ farmers working with us	400+ farmers working with us

Project Carbon Harvest



Every year, each new plant could:

✓ Sequester **>4,000t** carbon in soil

✓ Avoid **30,000t** CO_2 emissions

✓ Remove **20,000t** atmospheric CO_2

The UK's first unsubsidised biomethane plant

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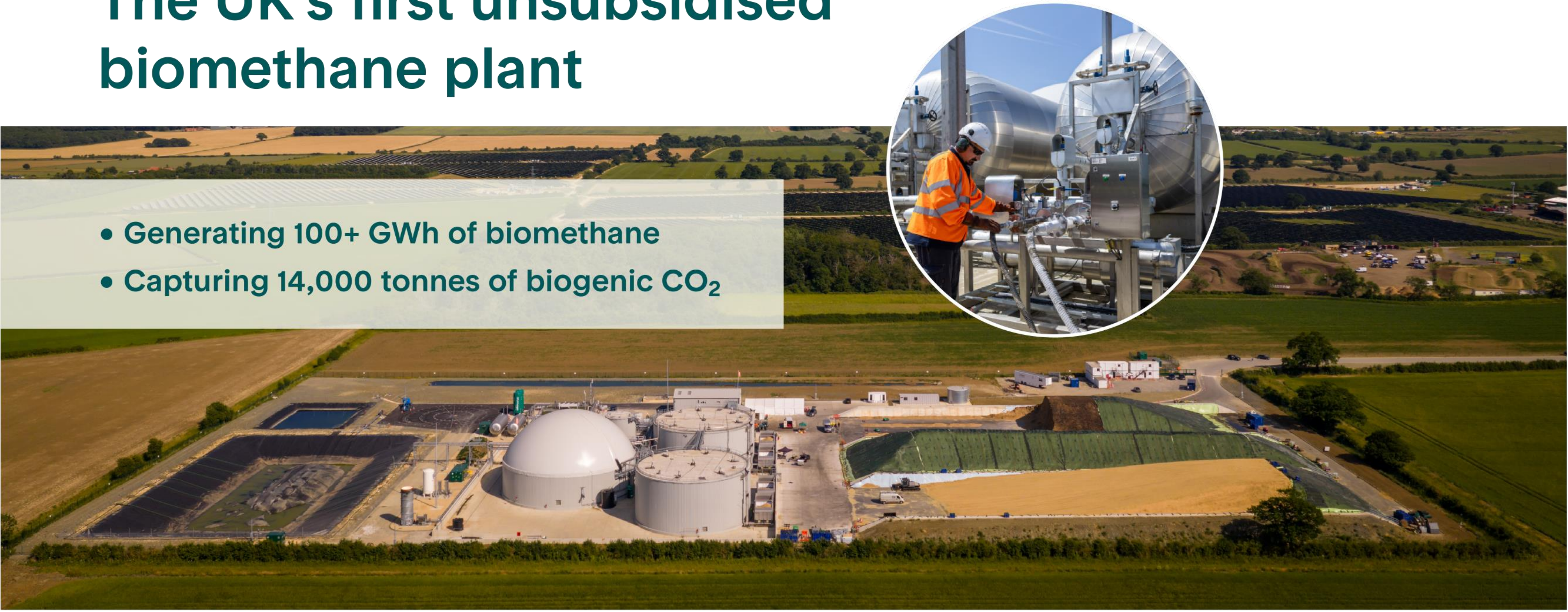

- Generating 100+ GWh of biomethane
- Capturing 14,000 tonnes of biogenic CO_2

Moor Bioenergy | **Fully operational:** 27th February 2025

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CCS opportunities

Our plants are always built within accessible reach of Carbon Capture and Storage (CCS) terminals.

Existing sites

Moor Bioenergy
Carbon, Capture Storage (CCS) biogas plant site

CO_2 terminal

CO_2 offshore storage terminial

Carbon capture utilisation (CCU)

The key pathways available in the UK for biogenic CO_2 to be valorised into end-use products.

Healthcare

Used in diagnostic, therapeutic, and surgical purposes.

Sustainable Aviation Fuel (SAF)

Combined with hydrogen to create a renewable alternative to fossil-based liquid fuels.

Aggregates

Used to stabilise alkaline waste materials, forming low-carbon building materials.

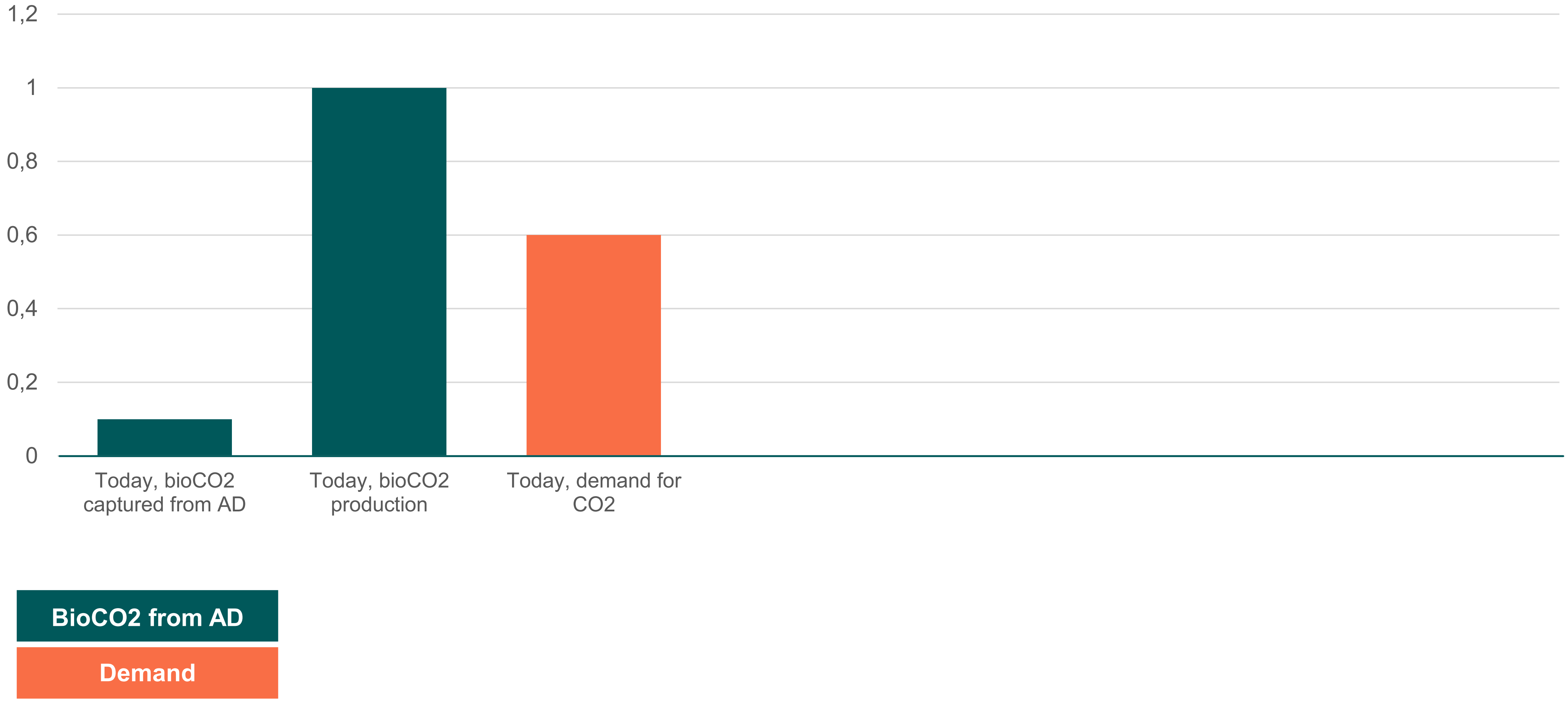
E-chemicals

Used as a feedstock for methanol, ethanol, and formic acid production.

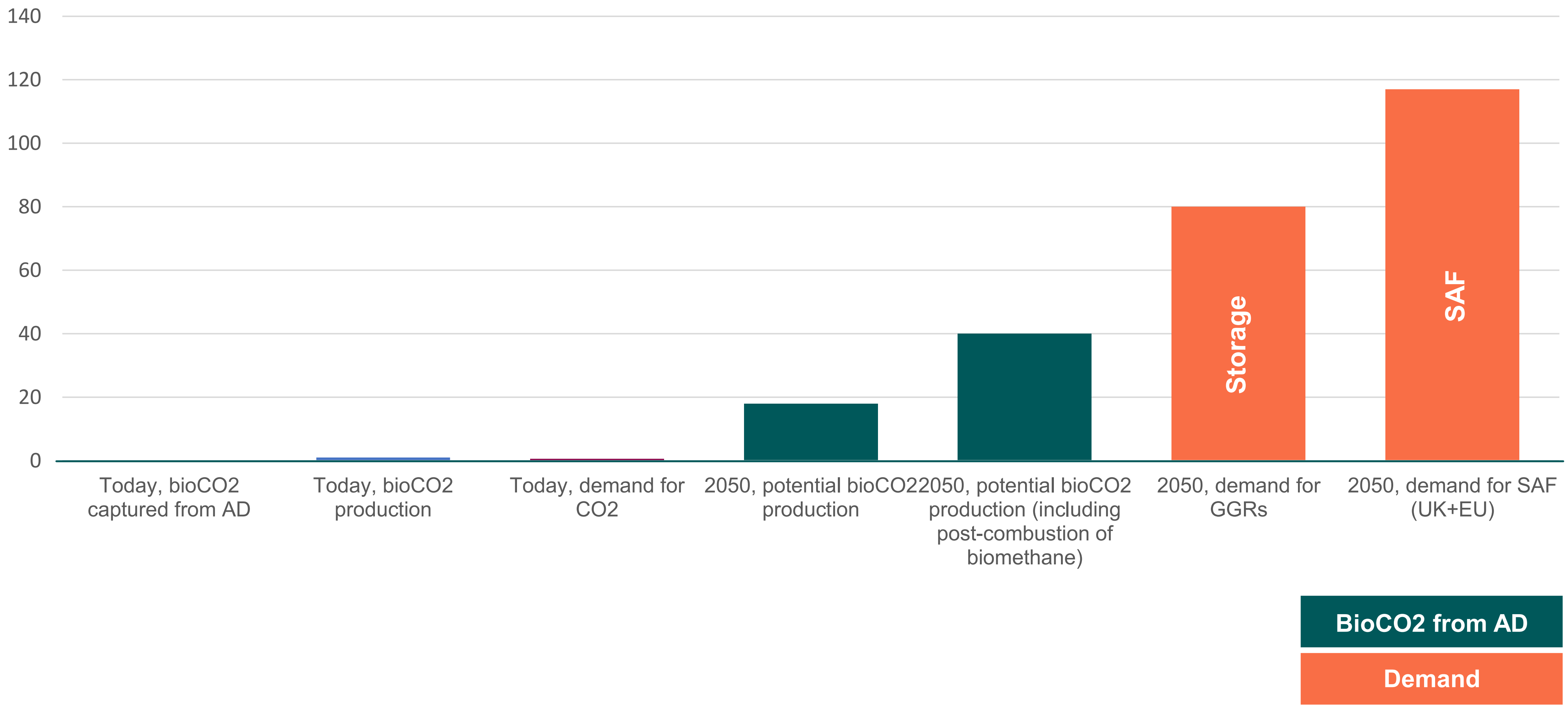
Carbonated drinks

Used to carbonate soft drinks and some alcoholic beverages.

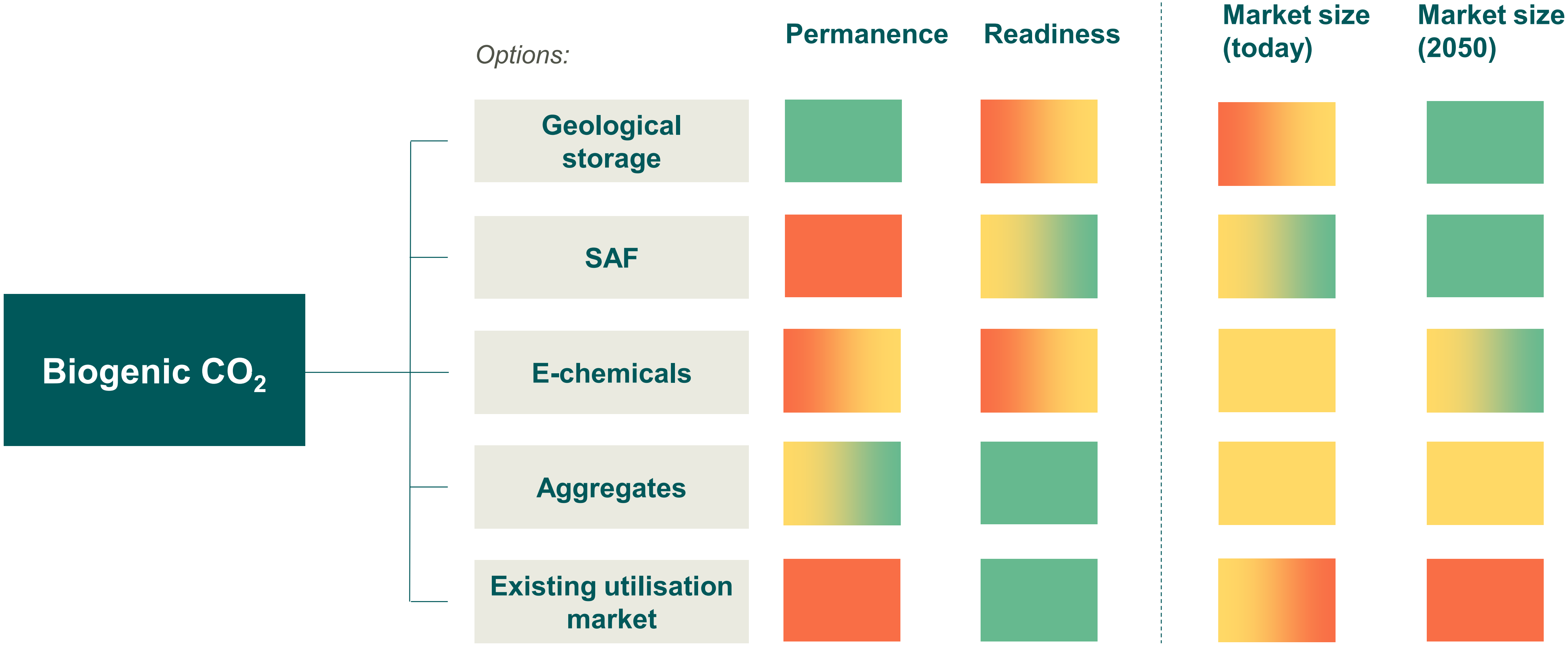
Demand for biogenic CO_2



Demand for biogenic CO_2



Biogenic CO_2 markets



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Thank you

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Bio-CO2 market trading insights

Eunice Ribeiro

Senior Public Affairs Advisor
STX Group

STX

Unlocking the Biogenic CO2 market

A trader’s perspective

Eunice Ribeiro

eunice.ribeiro@stxgroup.com

25/09/2025

STX Group

Founded in 2005 as a pioneer in environmental commodities trading, STX has grown to become one of the main players in renewable certificates and physical products trading.

Today, STX counts on a global presence, a solid and growing equity base, and a diversified product portfolio.

Employees

500+

- Key Account Managers
- Product experts

Offices

14

- America
- EMEA
- LATAM
- APAC

Products

50+

- EAC
- Carbon compliance
- Renewable Gas
- VERs
- Energy Efficiency
- Physical Biofuels

Active clients

7000+

- Producers
- Corporates
- Utilities
- O&G majors
- Other

Environmental Finance Annual Market Rankings Winner 2020, 2021, 2022

CDP GOLD ACCREDITED PROVIDER 2024

ICROA Accredited

BRONZE 2023 ecovadis Sustainability Rating

EnergyRisk Awards 2024 Winner Climate risk manager of the year STX Group

STX Group offers a holistic decarbonization service for corporates

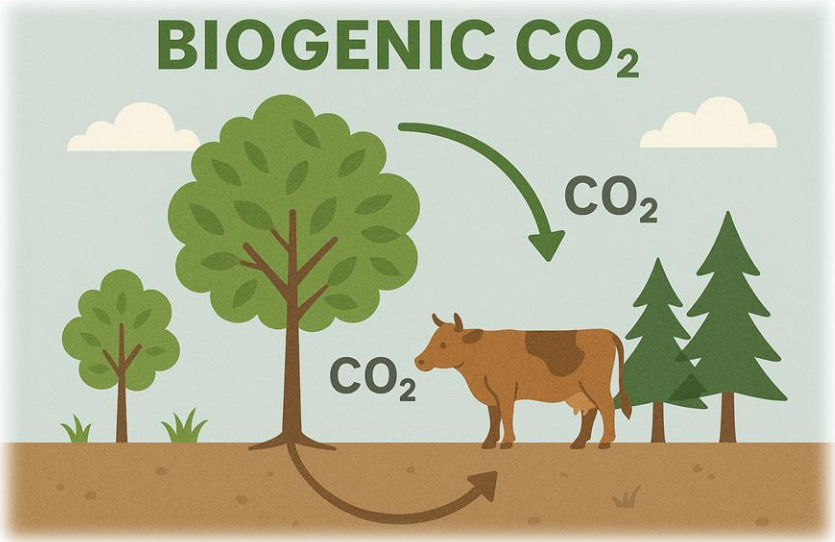
We support enterprises to understand and meet their environmental compliance needs, besides helping them to achieve Net Zero targets

UNDERSTAND	TAKE ACTION			COMPLY
Measure & Commit	Reduce Your Own Emissions	Decarbonize Supply Chain	Neutralize & Contribute	Adhere to Regulations
Inventory & target setting GHG[1] Reduction Roadmap	Energy efficiency Renewable electricity Renewable gas Renewable fuels	Carbon insets	Carbon removals & reductions	ETS[2] strategy & procurement Carbon Credits

1 Greenhouse Gases
2 Emissions Trading System

From Waste to Value: where does Biogenic CO_2 belong?

Waste?



By-product?

Commodity?

Biogenic CO_2 has the **potential to become Europe's next key environmental commodity**, but only if we manage to develop the right framework for it to thrive.

AI generated picture in Co-Pilot.

What are the best Bio-CO_2 applications downstream?
CCU, CCS, or an interlinkage between both?

	CCU	CCS
Applications	Feedstock for green chemicals, synthetic fuels, food & beverage, refrigeration, etc.	Permanent storage delivers genuine negative emissions.
Advantages	Creates **circular value chains**, where CO_2 becomes a **raw material**.	Ensures permanent carbon removals are embedded in corporate compliance + EU climate framework, **complementing, not replacing**, reductions on the road to net-zero.

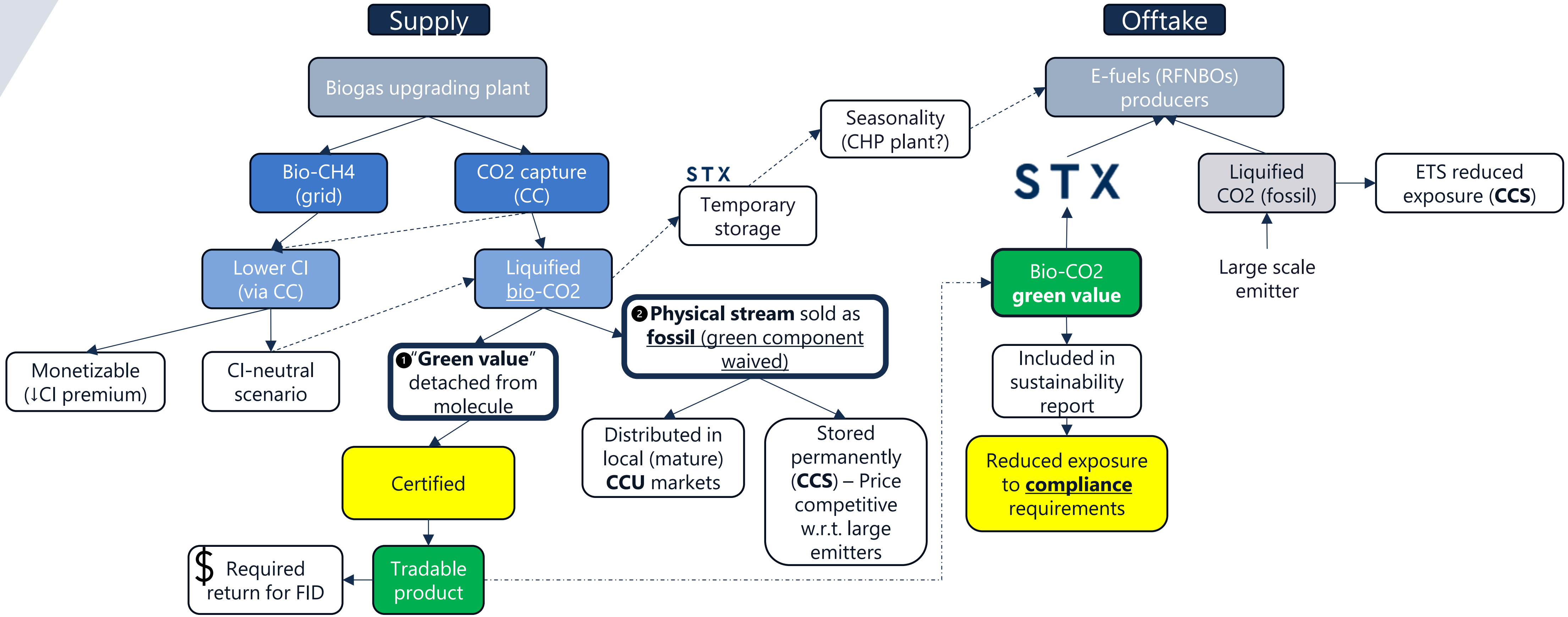
And more importantly…
How can these pathways **deliver both climate impact <u>and</u> market value?**
What would be the **right market enablers** to provide liquidity to BioCO2 trading?

Building blocks for the Biogenic CO2 market

1. Demand enablers	2. Market enablers	3. Structural enablers
• Clear EU **regulatory framework** • Precise definitions and scope • Accounting flexibility • The right **incentives** to increase demand	• **Certification**: common methodologies across applications with a mass balancing system (where applicable) and/or "**book & claim**" infrastructures.	• Enable delivery to the highest-value use, not just the nearest site (logistics constraints) • Support **integration and synergies** with biomethane, e-fuels, and other markets

Example: Currently, captured biogenic CO_2 via CCU does not reduce the end-product's footprint, thus removing the incentive for biomethane producers to pursue CCU under RED

"Book & claim" schemes unlock value and reduce logistic burdens

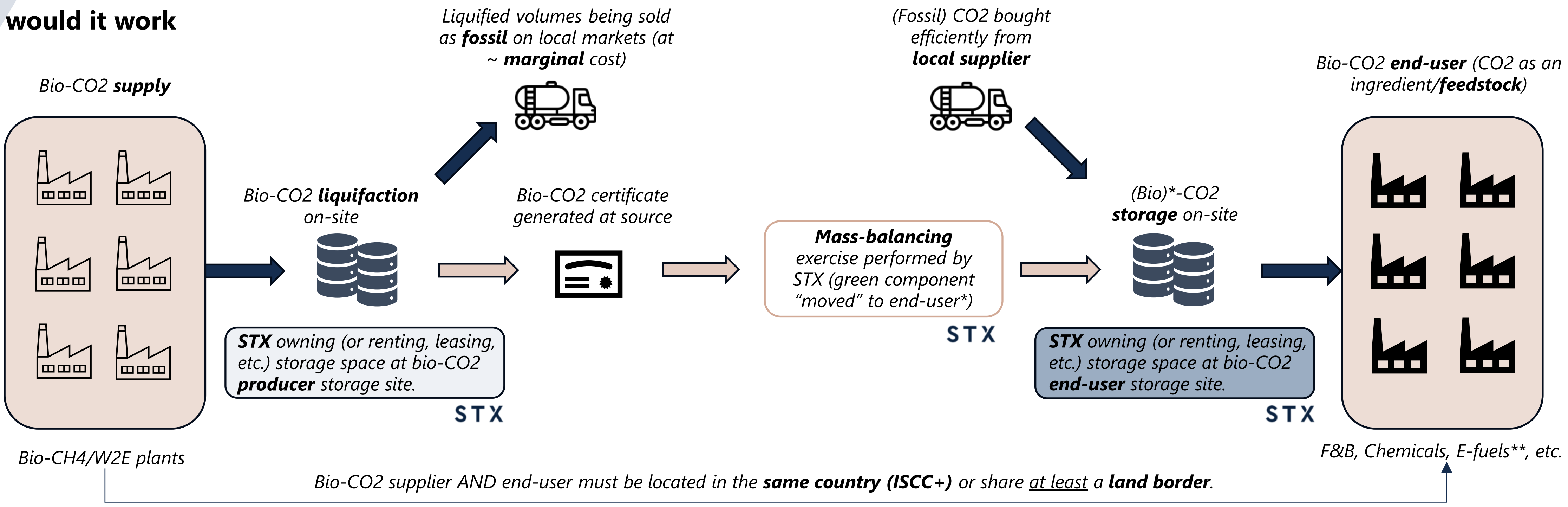


Summary of intended structure

1. Possibility for companies to **detach "green value" of bio-CO2** by placing it into a certificate (verified independently)
2. "Green value" sold over to companies exposed to CO2 sustainability requirements (**compliance vs voluntary**)
3. Ongoing efforts to **test this value proposition** with verifiers (compliance) and with end-buyers (compliance/voluntary)
4. Significant opportunity in **RFNBOs trade dimension**

Mass balancing rules need to be integrated in the existing framework

How would it work



Upstream

The above structure allows bio-CO2 suppliers to sell physical streams at cost locally, while gaining a premium from the "green component" that is transferred via certificate to the end-user.

Midstream

The **midstream segment is significantly simplified** → limited need to build any transport/logistics infrastructure to match S&D. Need to encounter a **local off-taker** (at supply) and find a **cheap CO2 source close to end-user**.

Downstream

End-user rents out to STX (part of) their storage facility and via mass-balancing of bio-CO2 volumes can source fossil volumes (cheaply) and **receive the green component as accompanying certification.**

Thank you

Bio-CO_2, if supported by a well-designed regulatory framework, can become one of the next **key environmental commodities** globally.

The EU can position itself at the forefront and take advantage by **closing the loop**, creating **tangible value**, and positioning Europe as a leader in the **Circular Carbon Economy**.

Q&A session

Moderated by Angela Sainz Arna, Communications Director
European Biogas Association

Conclusion and wrap up

Harmen Dekker

CEO
European Biogas Association

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Leading Globally, Acting Locally

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13-17 OCTOBER 2025

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