

# MANAGING CARBON

Impacts of CCUS from an Austrian Perspective

15.04.2026, ISEC, Graz

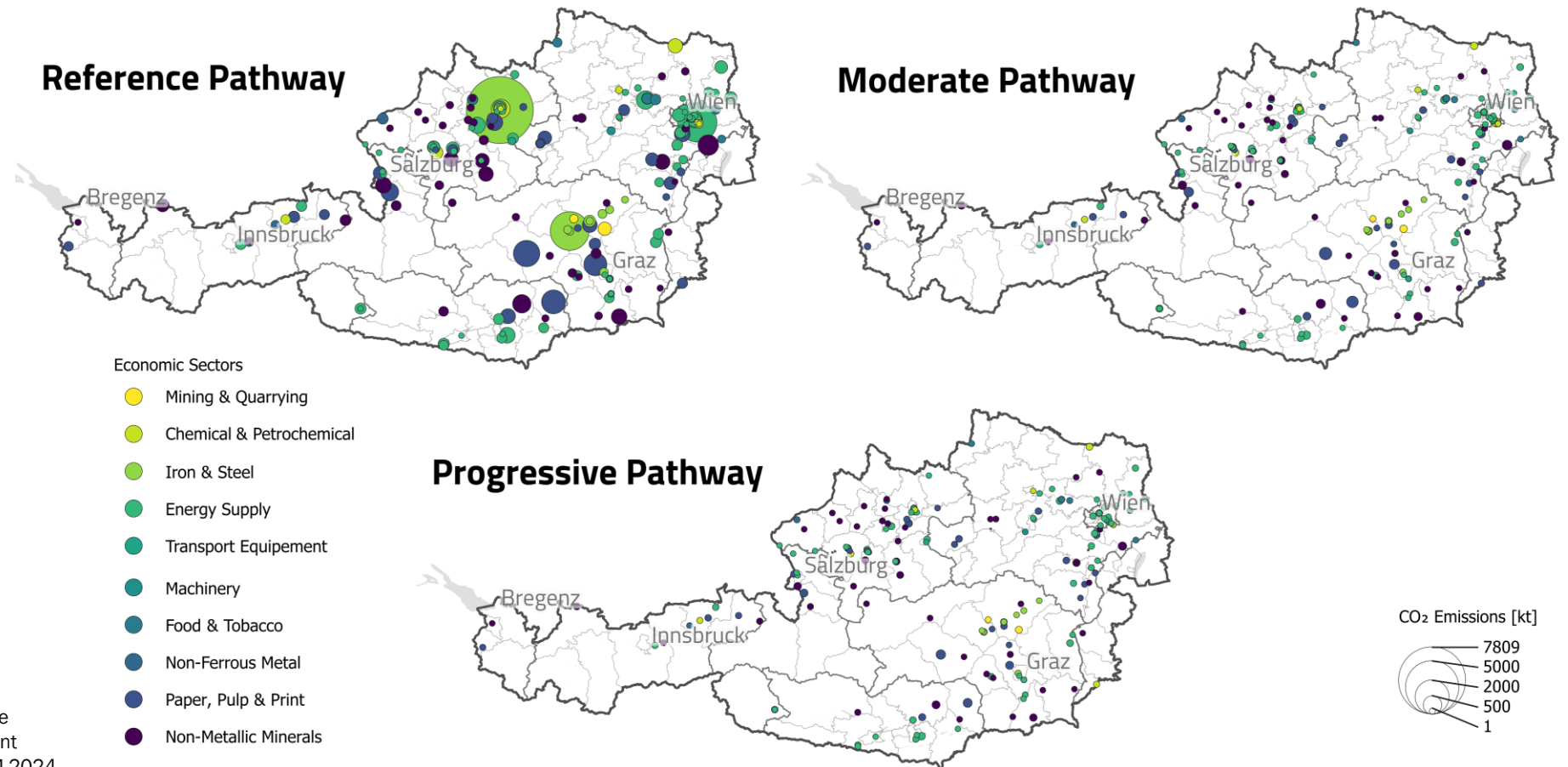
Hans Böhm

Karin Fazeni-Fraisl

Valerie Pfeffer-Rodin

# Potentials for CO<sub>2</sub> Utilization

## Development of CO<sub>2</sub> sources in Austria



Hochmeister S. et al. "A methodology for the determination of future Carbon Management Strategies: A case study of Austria". IJSEPM 2024

# Potentials for CO<sub>2</sub> Utilization

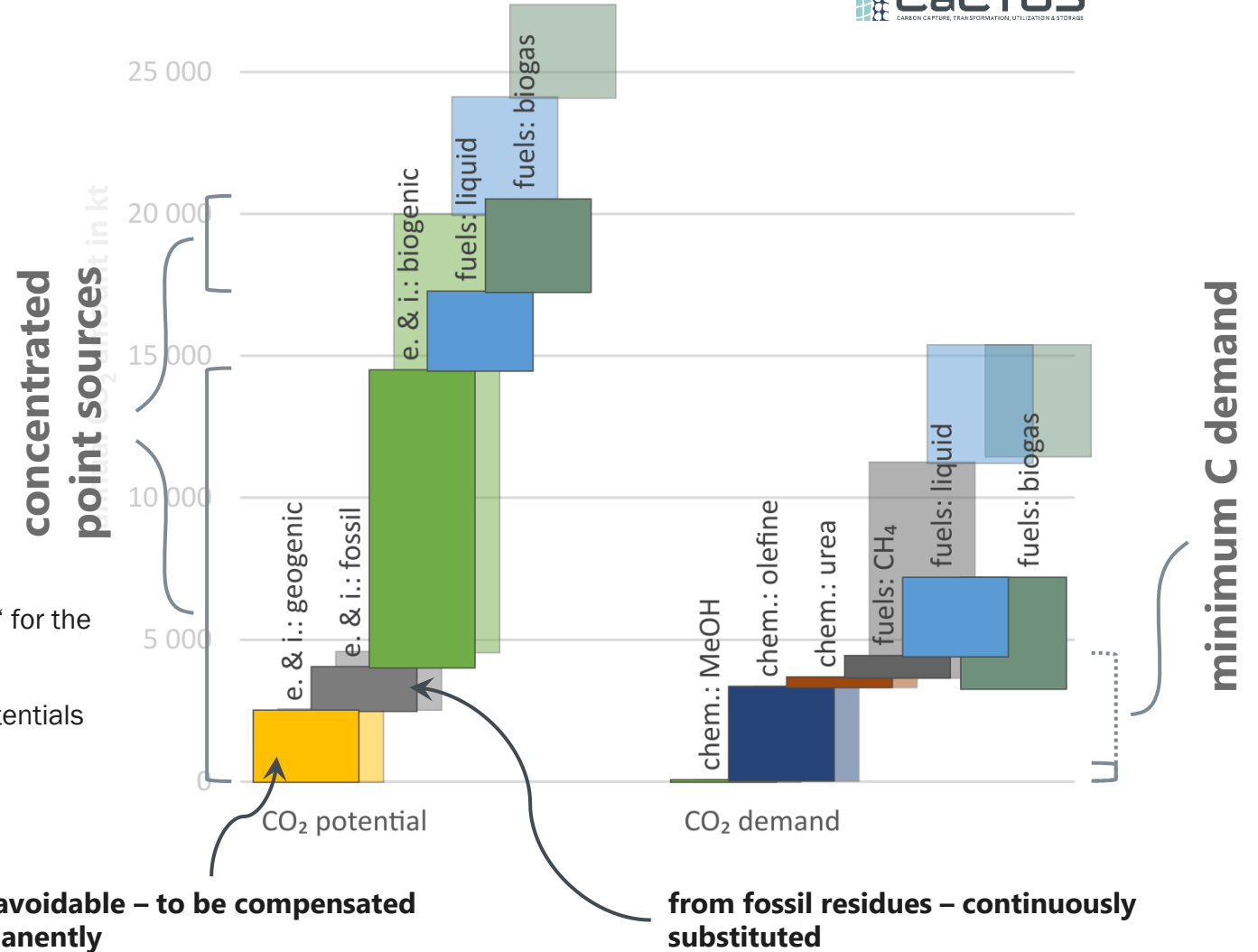
## Identifying relevant products & demands

### Carbon balance\*

→ Total “emissions“	17,3–27,3	Mt/a
→ capturable	14,5–23,2	Mt/a
→ fossil/geogenic	4,0–4,6	Mt/a
→ Utilizable CO <sub>2</sub> **	3,3–15,4	Mt/a

\* Evaluation of the CaCTUS scenarios „Progressive“ and „Moderate“ for the year 2050

\*\* if all e-fuels produced in AT; upper boundaries without biogas potentials



# Potentials for CO<sub>2</sub> Utilization

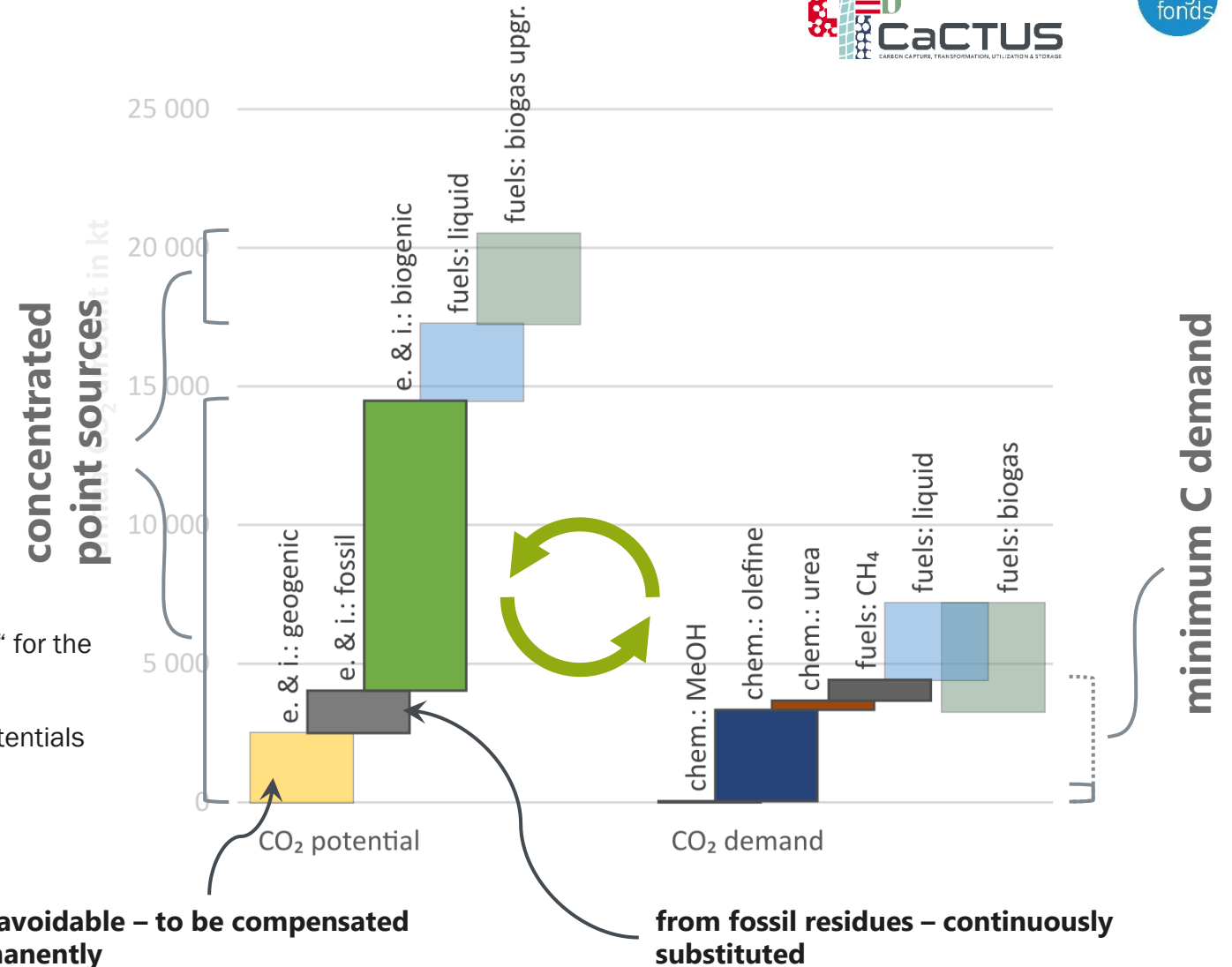
## Identifying relevant products & demands

### Carbon balance\*

→ Total “emissions“	17,3–27,3	Mt/a
→ capturable	14,5–23,2	Mt/a
→ fossil/geogenic	4,0–4,6	Mt/a
→ Utilizable CO <sub>2</sub> **	3,3–15,4	Mt/a
→ circular	4,0–11,2	Mt/a

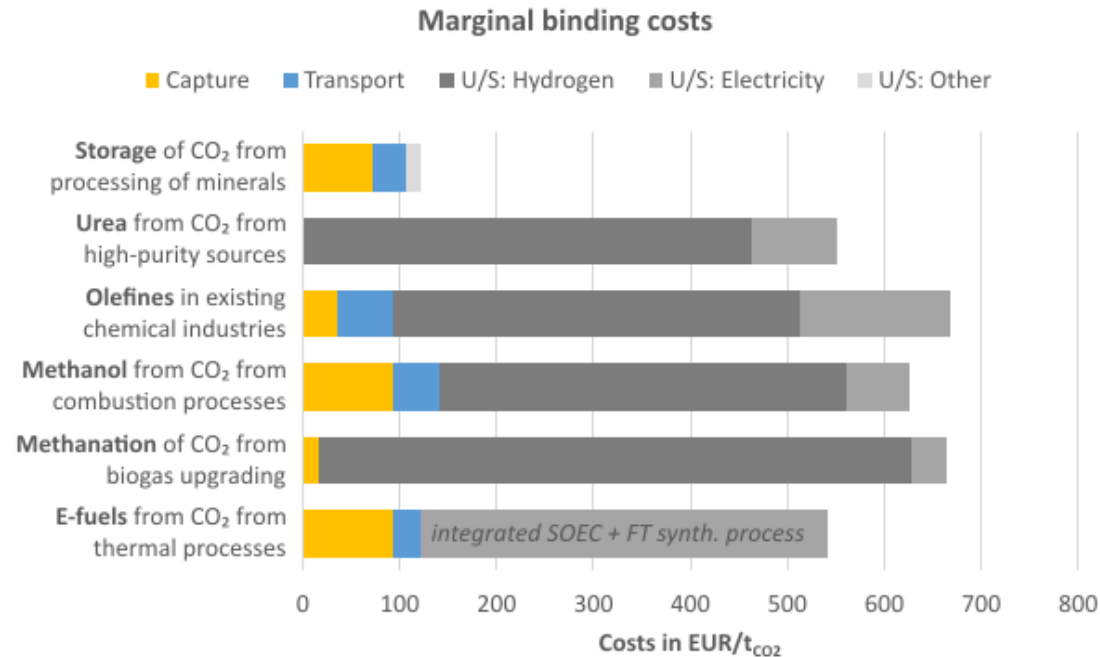
\* Evaluation of the CaCTUS scenarios „Progressive“ and „Moderate“ for the year 2050

\*\* if all e-fuels produced in AT; upper boundaries without biogas potentials

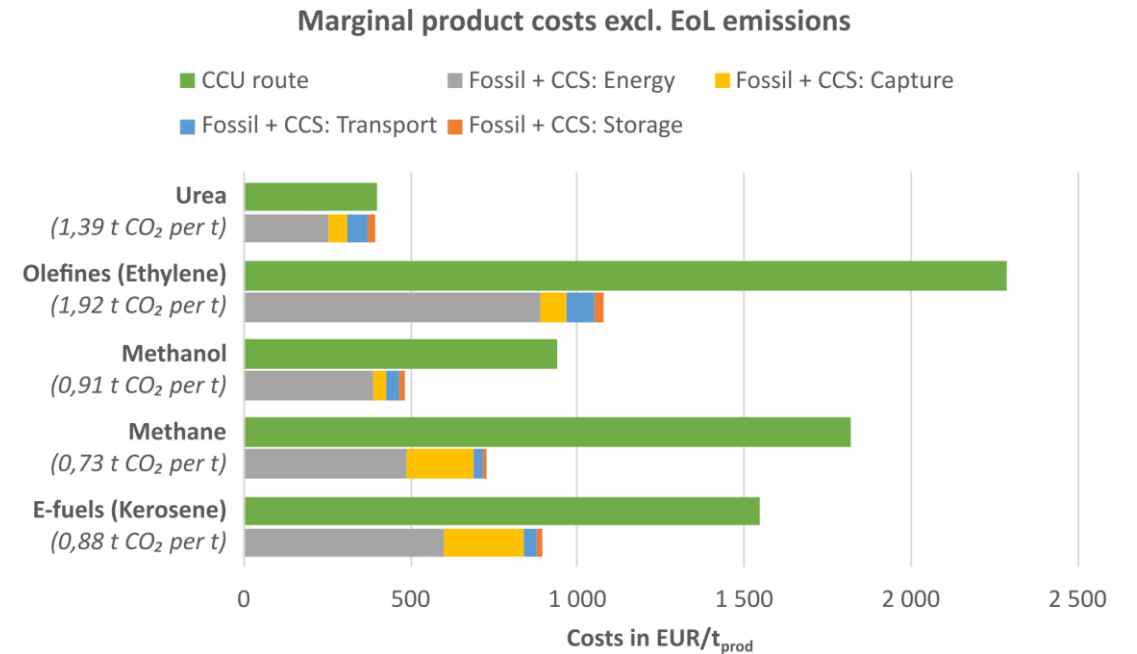


# Costs of CO<sub>2</sub> Conversion

## CO<sub>2</sub> binding costs



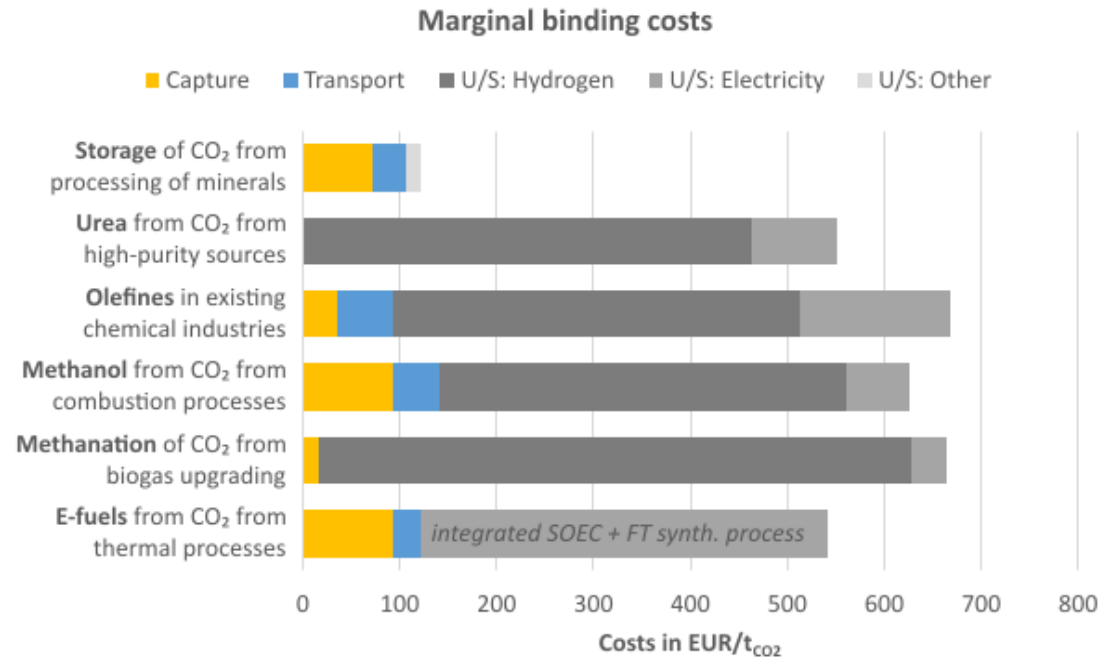
## CCU product costs vs. conventional



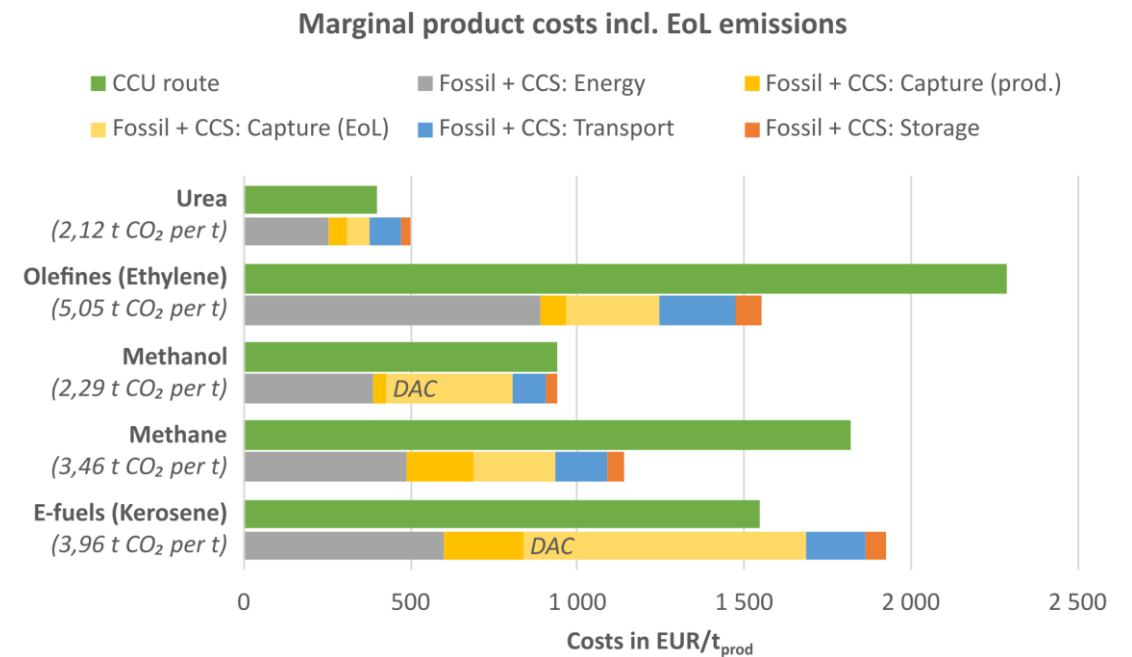
marginal cost approach: unified energy costs (electricity: 65 €/MWh; H<sub>2</sub>: 100 €/MWh; heat: 55 €/MWh; natural gas: 35 €/MWh; naphtha: 50 €/MWh)  
Results are valid only for the selected representative scenarios and may vary depending on the source and transport of CO<sub>2</sub>.

# Costs of CO<sub>2</sub> Conversion

## CO<sub>2</sub> binding costs



## CCU product costs vs. conventional



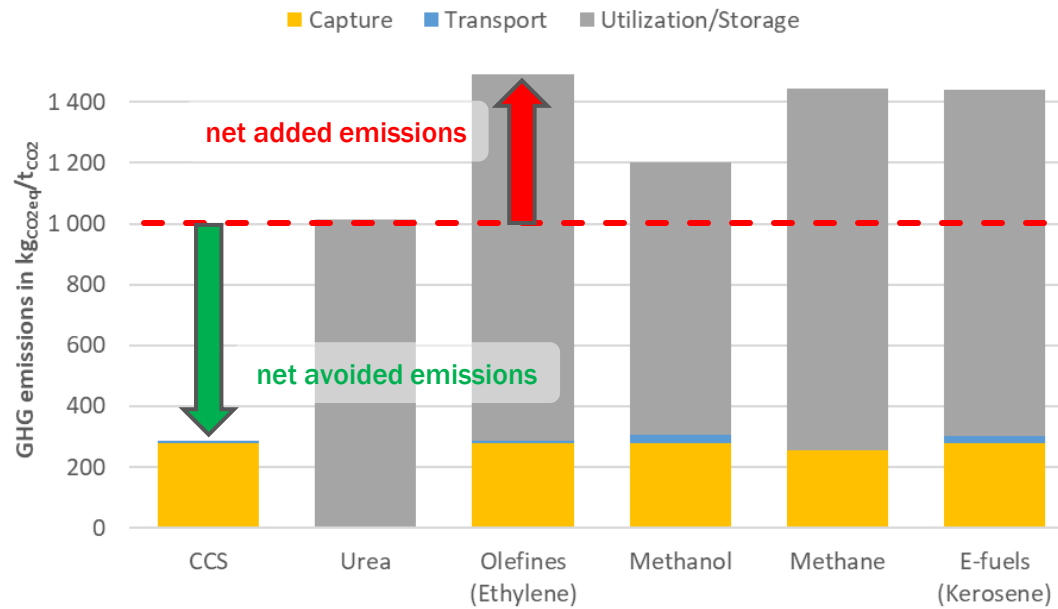
marginal cost approach: unified energy costs (electricity: 65 €/MWh; H<sub>2</sub>: 100 €/MWh; heat: 55 €/MWh; natural gas: 35 €/MWh; naphtha: 50 €/MWh)  
Results are valid only for the selected representative scenarios and may vary depending on the source and transport of CO<sub>2</sub>.

# GHG Footprint of CCU

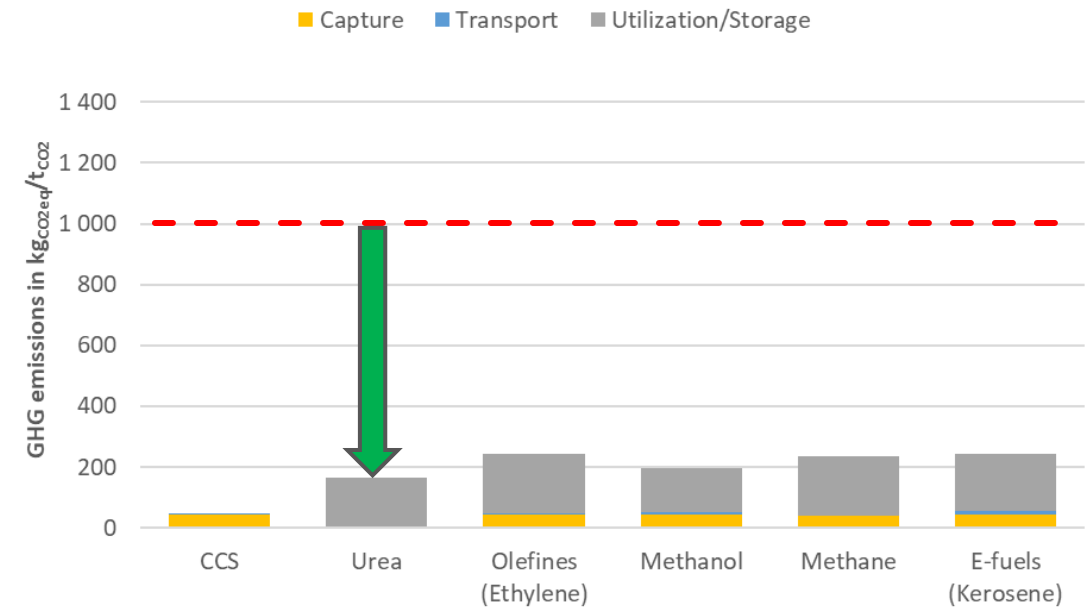
MAX: SoA (2019) energy mix

MIN: Transition (2040) energy mix

Max. (2019) CCUS-related (avoided) GHG emissions



Min. (2040) CCUS-related (avoided) GHG emissions



Results are valid only for the selected representative scenarios and may vary depending on the source and transport of CO<sub>2</sub>.

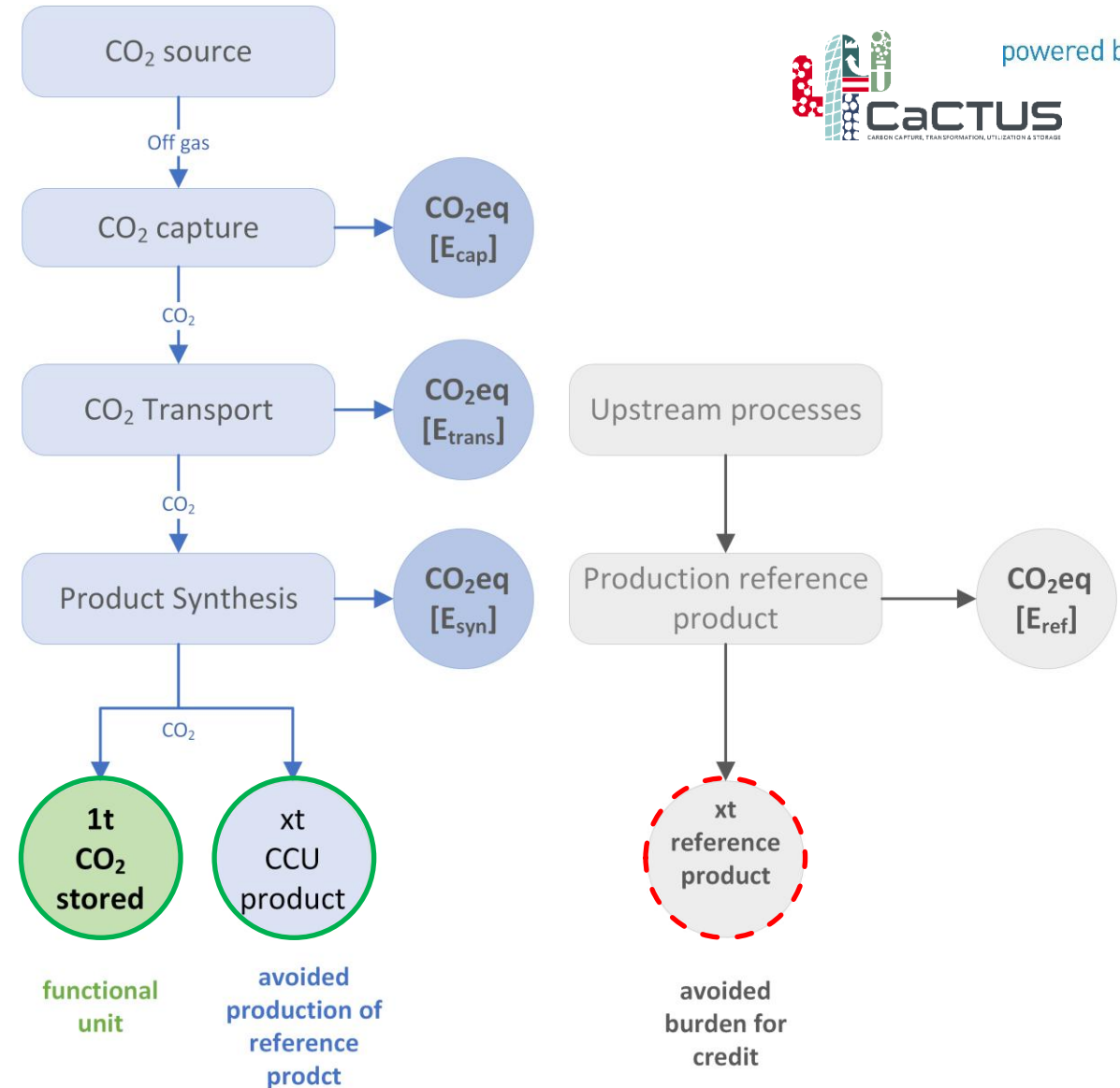
# GHG Footprint of CCU

## Multi-functionality – substitution

CCU provides double functionality

1. (temporary) storage of CO<sub>2</sub>
2. generation of a product → substitution of a fossil product

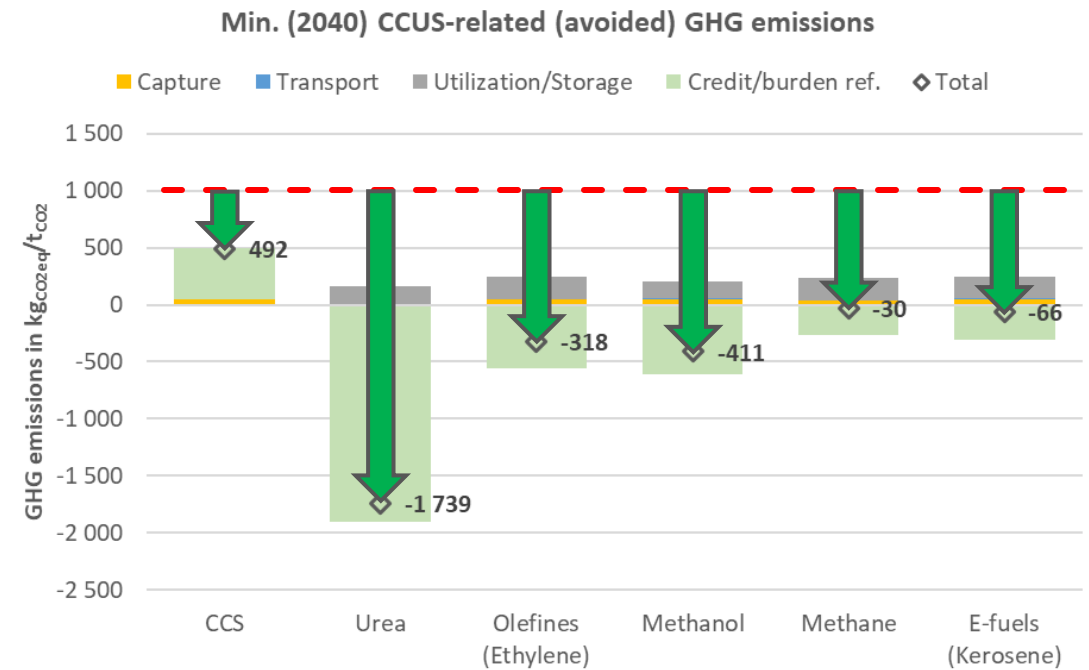
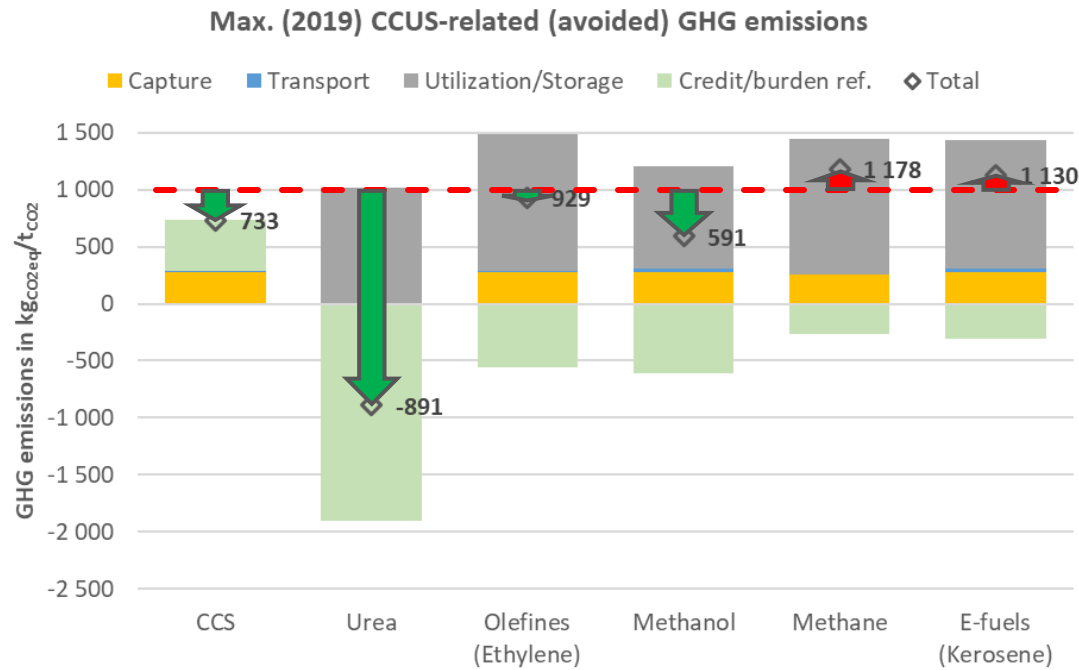
→ Consideration of an appropriate credit in the assessment of GHG emissions



# GHG Footprint of CCU

MAX: SoA (2019) energy mix

MIN: Transition (2040) energy mix

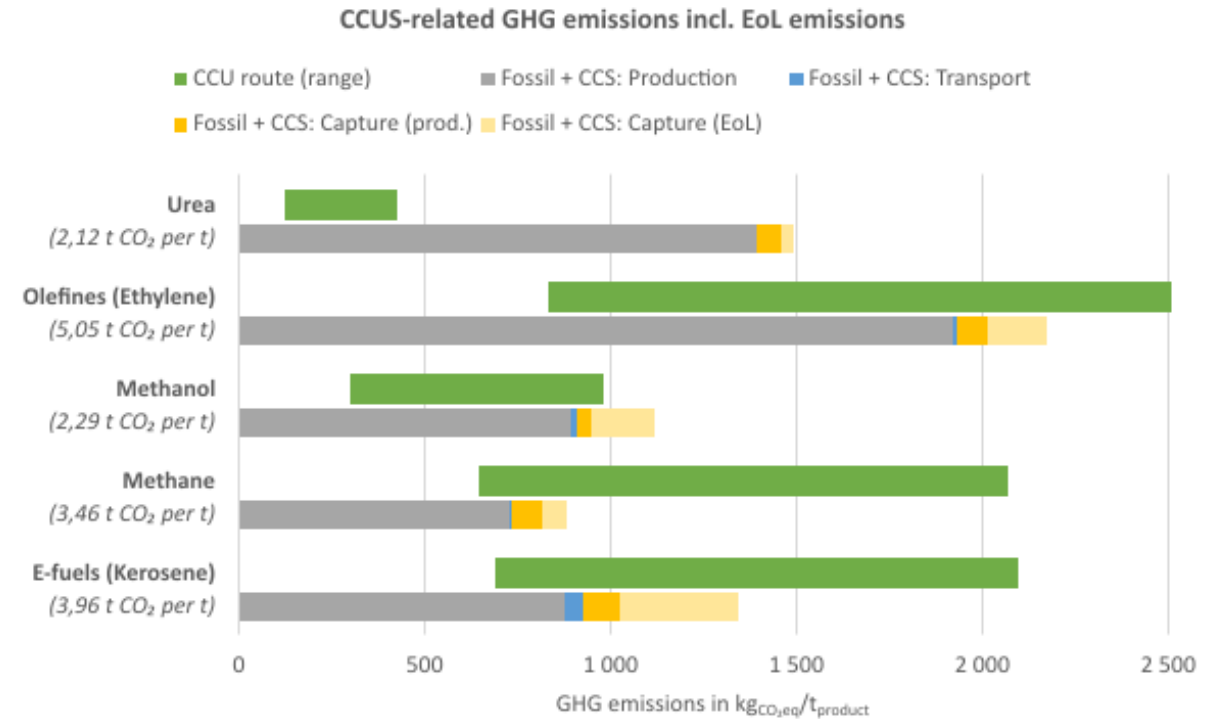


Results are valid only for the selected representative scenarios and may vary depending on the source and transport of CO<sub>2</sub>.

# Derived implications

## CCU route vs. CCS & general remarks

- **Product synthesis drives** CCU costs and GHG emissions (savings)
- Within product synthesis **H<sub>2</sub> demand** and related electricity demand is **dominating**
- **Renewable electricity is mandatory** to minimize GHG footprint
- Applied **energy mix determines** the general **ability to avoid net emissions** via CCU
- Under given conditions, CO<sub>2</sub> **transport only has a marginal role**



Results are valid only for the selected representative scenarios and may vary depending on the source and transport of CO<sub>2</sub>.

# Conclusions

## Summary

- CO<sub>2</sub> can be a **valuable resource** and feedstock material as part of energy transition.
- **Resource potentials** for CO<sub>2</sub> from point sources **are high**, even with substantial defossilization (biogenic CO<sub>2</sub>)
- Potential for **implementing carbon cycles** is high, especially for industrial point sources.
- Sustainable implementation of **CCU relies on a renewable energy system**, both from an economic and an environmental perspective.
- **CCU can be competitive** to fossil production (with CCS), if emissions along the whole product life are considered.
- Enabling of **scaling effects and utilization of synergies** will be required to maximize economic efficiency of CO<sub>2</sub> conversion.

## Thanks for your interest! Any questions?

Further information and results on the CaCTUS project:

[www.project-cactus.at](http://www.project-cactus.at)



DI Dr. mont. Hans Böhm

Senior Researcher – Technology Assessment

[boehm@energieinstitut-linz.at](mailto:boehm@energieinstitut-linz.at)

+43 732 2468 - 5665

Energieinstitut an der JKU Linz | Altenberger Straße 69 | 4040 Linz | Austria