

Subtask 2

“Circular Carbon”

Task XXI
Decarbonizing industrial systems in a circular economy framework

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10th May 2023 - Gothenburg

Terminology and delimitation

Despite a broad interpretability of “circular carbon” focus of the subtask is on ...

- ... closing the loop for CO₂ – “circular CO₂”
- ... carbon capture technologies and their integration
- ... industry and (re-)utilization in industry

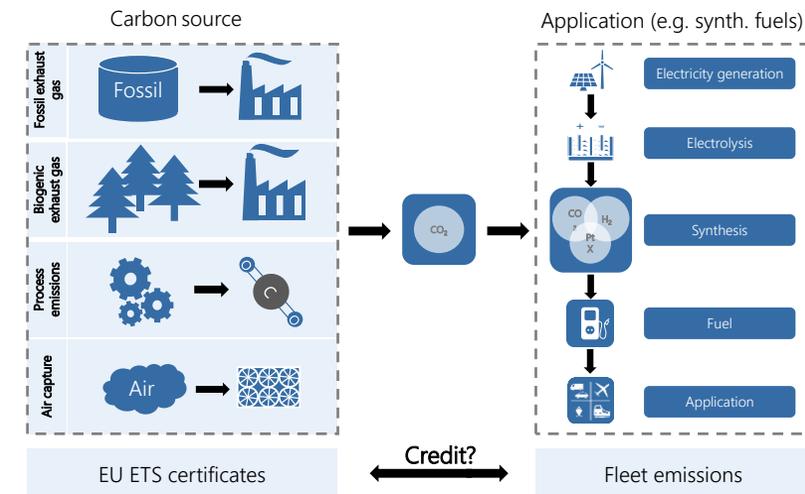
Activity A: LCA and Energy System modelling

Issue: In common assessment methods (LCA, TEA) CO₂ is treated as emission, potentially afflicted with costs (technical treatment, ETS)

Aim: Determine how a **beneficial utilization** in terms of

- reducing net GHG emissions,
- providing a renewable/sustainable feedstock,
- long-term fixation of fossil CO₂,
- reducing resource and/or energy efficiency

can be properly considered in process and energy system modelling.



Activity B: Integration of carbon capture in industry

Aim: Examine the origin and quality of waste gas streams, CO₂ separation technologies, options for intermediate storage and utilization, and the integration of these systems in industries (by sector).

This includes ...

- ... discussing potentially **applicable technologies**,
- ... matching of **capture technologies** and source streams,
- ... assessing potentials for **off-site use** (transport & storage),
- ... assigning **carbon feedstock prices** (and penalties) acc. to their origin.

Current projects & activities

C-CED – Carbon Cycle Economy Demonstration

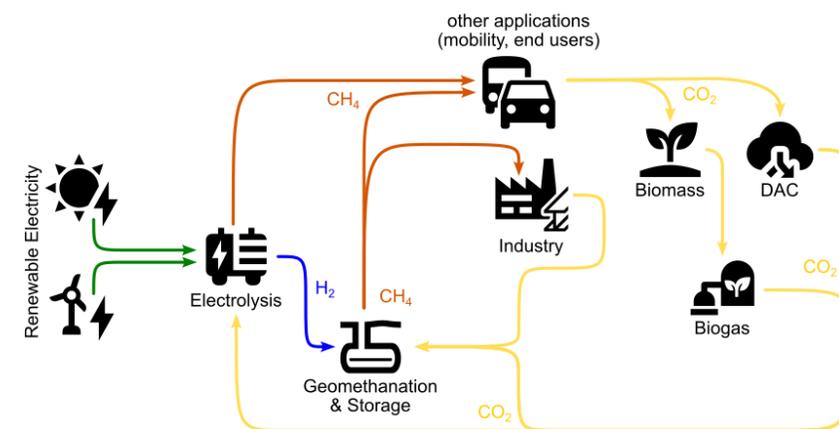
Flagship project within the Austrian hydrogen energy model region WIVA P&G, which focuses on demonstration and coupling of various CO₂ capture and CO₂ utilization technologies to establish a sustainable and closed carbon cycle that includes an inter-seasonal storage function for renewable energy.

WIVAP&G
Energy Model Region

CCED
Carbon-Cycle Economy Demonstration

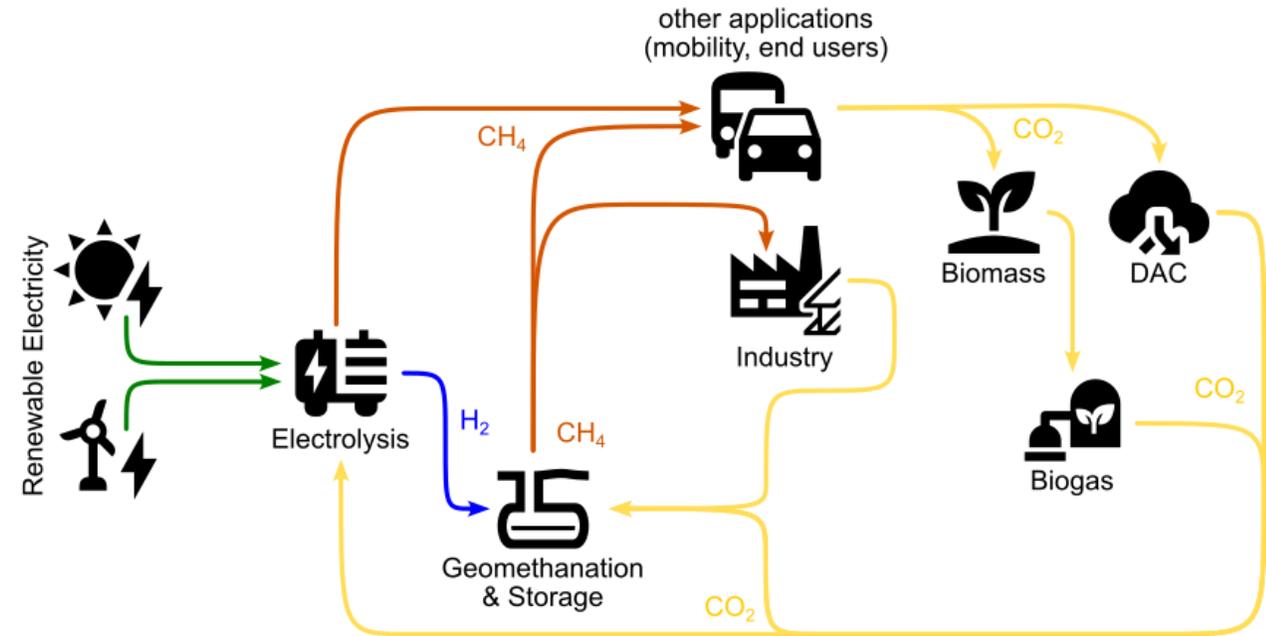
Relevant contents:

- Capturing from long-term available industrial carbon sources
- Evaluation of valuable utilization pathways within the framework
- Incorporation of intermediate (seasonal) storage capabilities
- Thorough techno-economic, ecological, socio-technical and regulatory assessment of the identified process routes



C-CED – Carbon Cycle Economy Demonstration

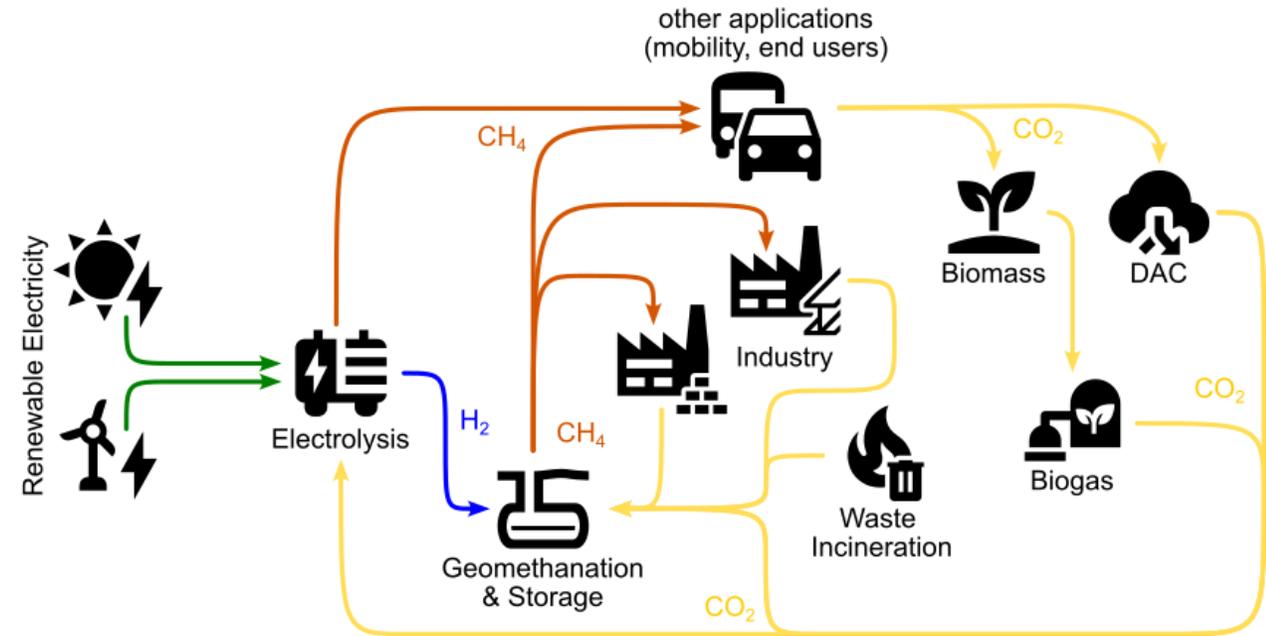
Proponents within the proposed project
framework ...



C-CED – Carbon Cycle Economy Demonstration

Proponents within the proposed project
framework ...

... extended within the assessment

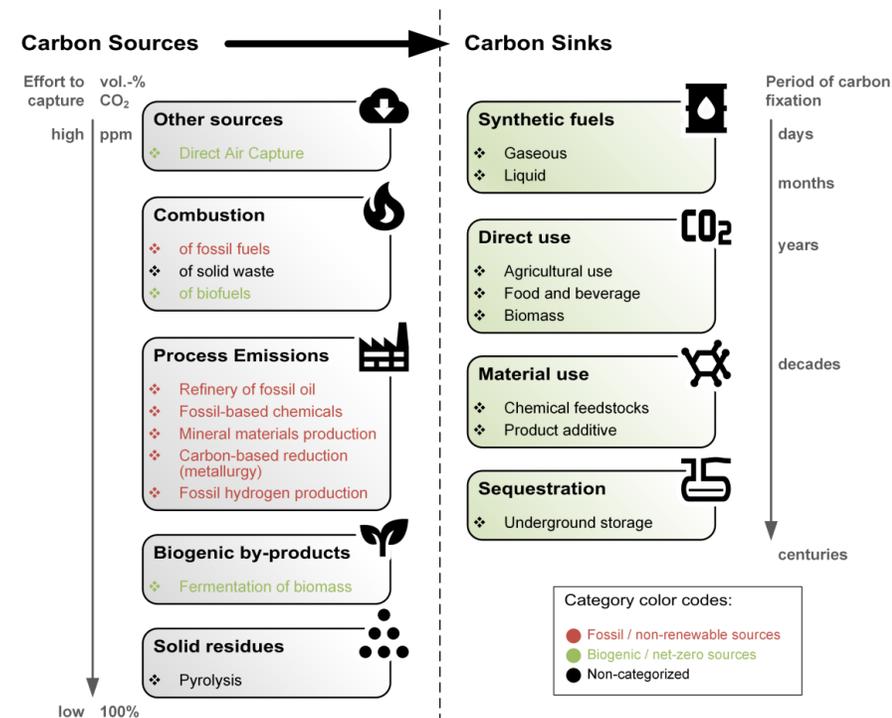


CaCTUS – Carbon Capture, Transformation, Utilization and Storage

Austria's climate neutrality: An in-depth evaluation of the potential contribution of CCU and CCS for the Austrian long-term climate goals.

Relevant contents:

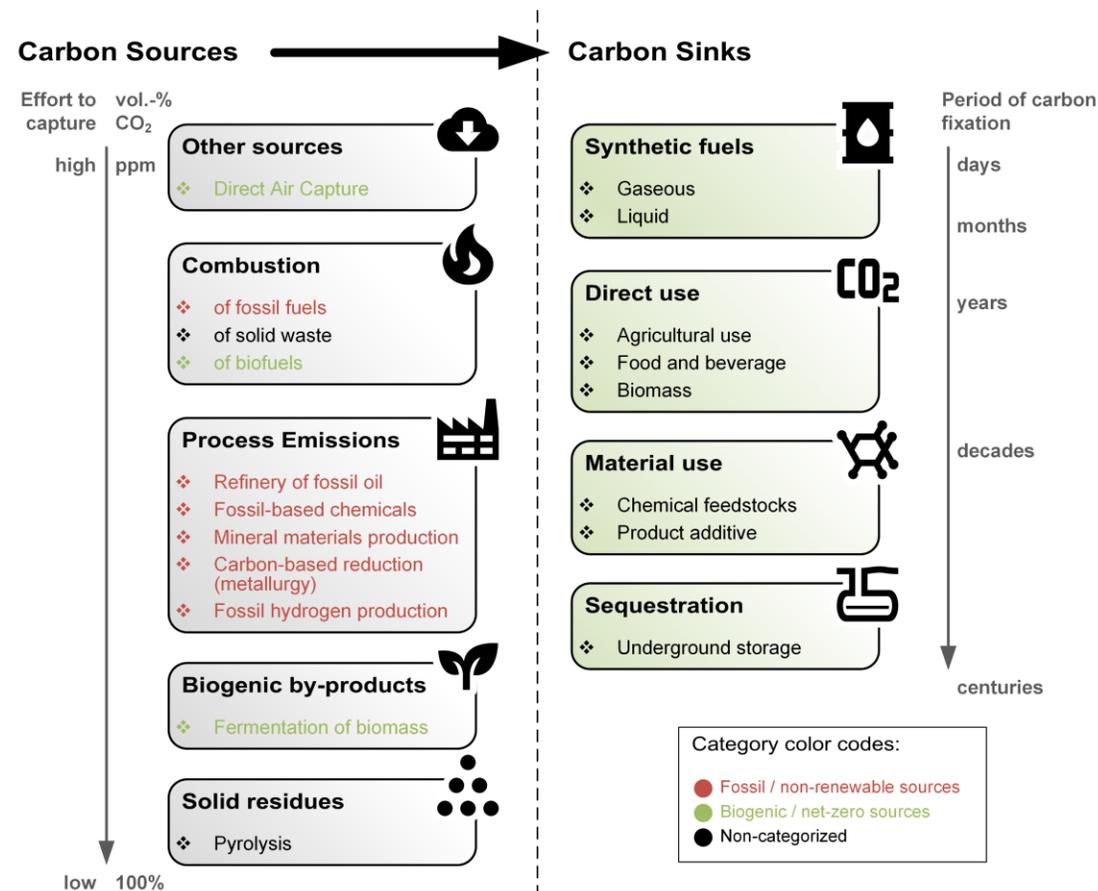
- Identification of today's and future carbon sources and sinks
- Evaluation of potential fixation periods of different CCU paths
- Involvement of industrial, political and scientific stakeholders
- Determination of preferable source-to-sink routes
- Techno-economic, ecological and regulatory assessment



CaCTUS – Carbon Capture, Transformation, Utilization and Storage

Additional aim and scope of the project are

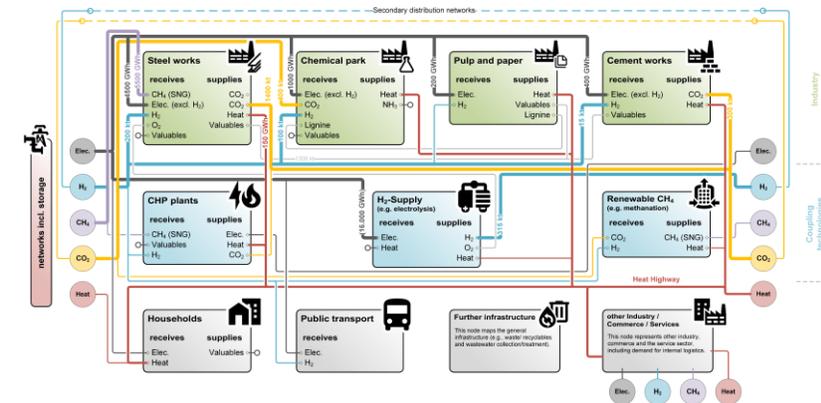
- a comprehensive database on potentials, costs, and environmental impact of CCU & CCS in Austria
- a comprehensible deduction of policy recommendations to support sustainable applications of CCU & CCS in Austria



Regional sector coupling and carbon recycling

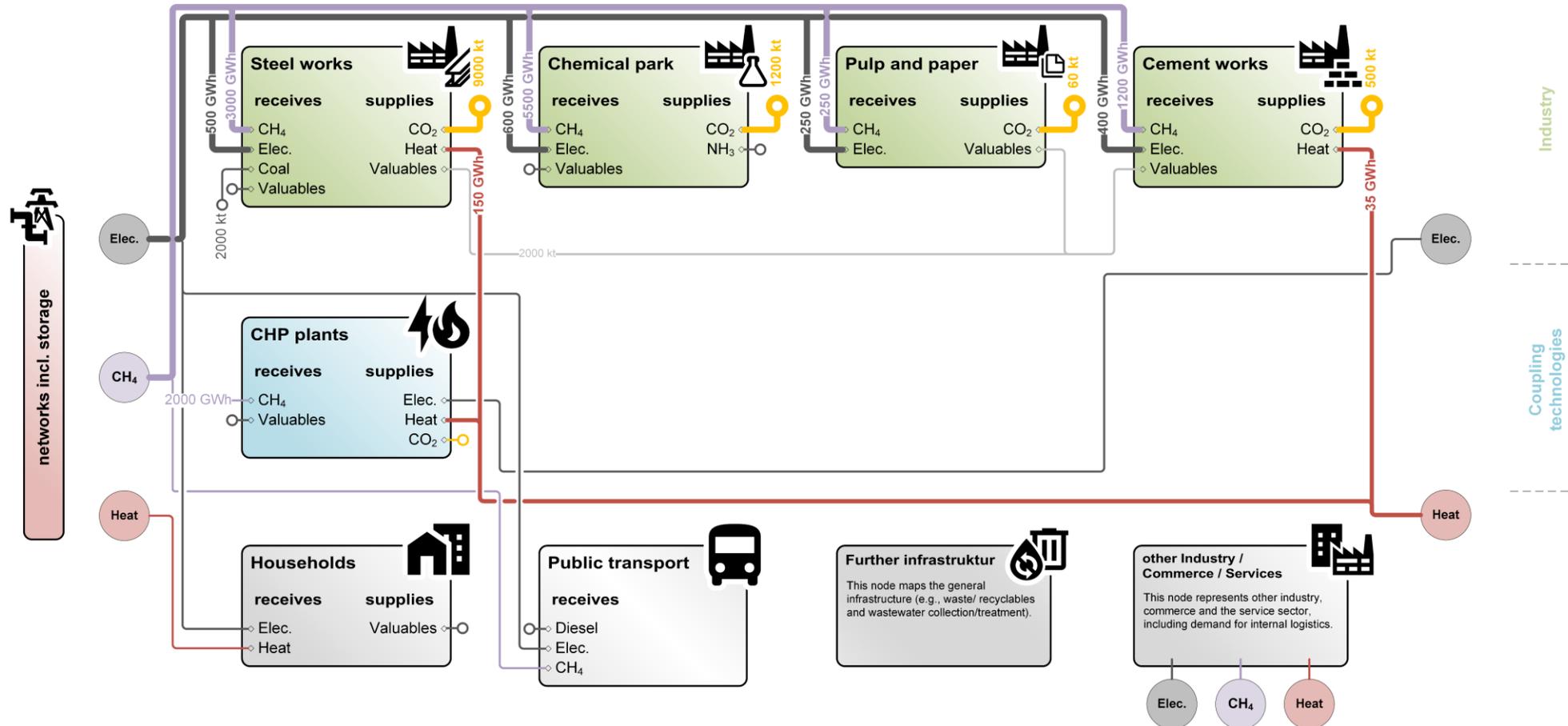
Estimating regional industrial potentials for sector coupling and carbon recycling.

How can today's industrial agglomerations develop towards a sustainable energy use in a climate neutral energy system?

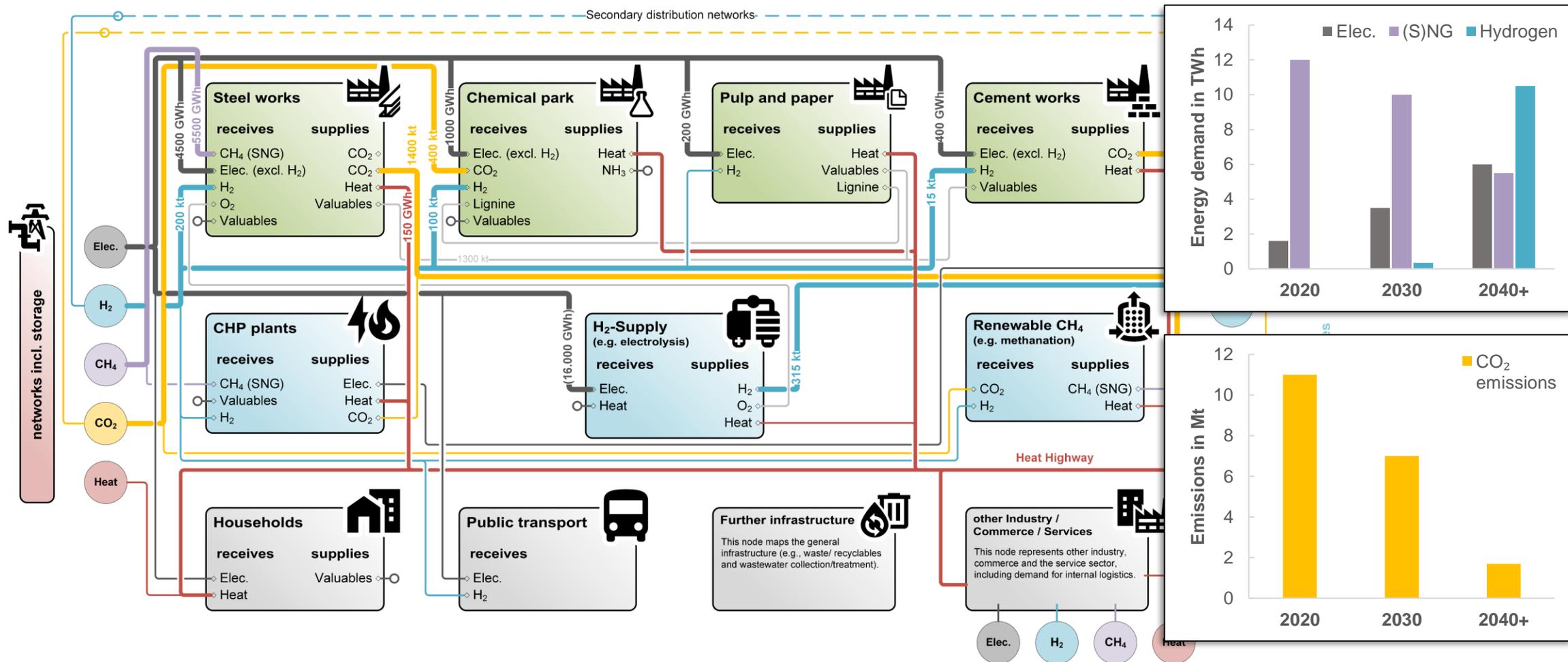


Regional sector coupling and carbon recycling

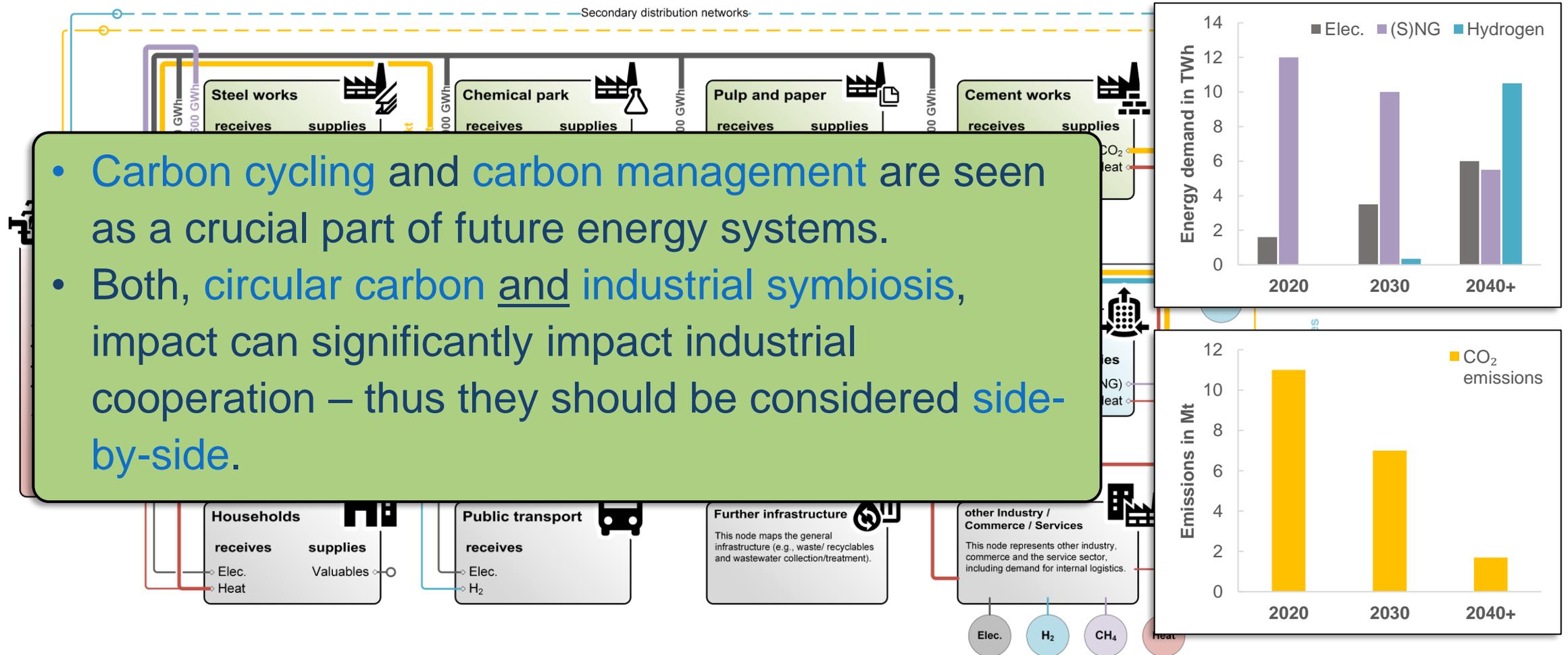
2020



Regional sector coupling and carbon recycling



Regional sector coupling and carbon recycling



- Carbon cycling and carbon management are seen as a crucial part of future energy systems.
- Both, circular carbon and industrial symbiosis, impact can significantly impact industrial cooperation – thus they should be considered side-by-side.

Thanks for your attention!

DI Dr.mont. Hans Böhm

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