

CCED



Carbon-Cycle Economy Demonstration

Michael Derntl¹, Irmela Kofler¹, Stephan Bauer², Erwin K. Reichel³,
Horst Steinmüller³

¹) K1-MET GmbH Metallurgical Competence Center, Linz, Austria

²) RAG Austria AG

³) WIVA P&G Wasserstoffinitiative Vorzeigeregion Austria Power & Gas, Linz, Austria

Goal

CO₂ capture and utilization technologies to establish a sustainable and closed carbon cycle

Abstract

Carbon - Cycle Economy Demonstration (C-CED) is a flagship project, which focuses on demonstration and coupling of various CO₂ capture and CO₂ utilization technologies to establish a sustainable and closed carbon cycle.

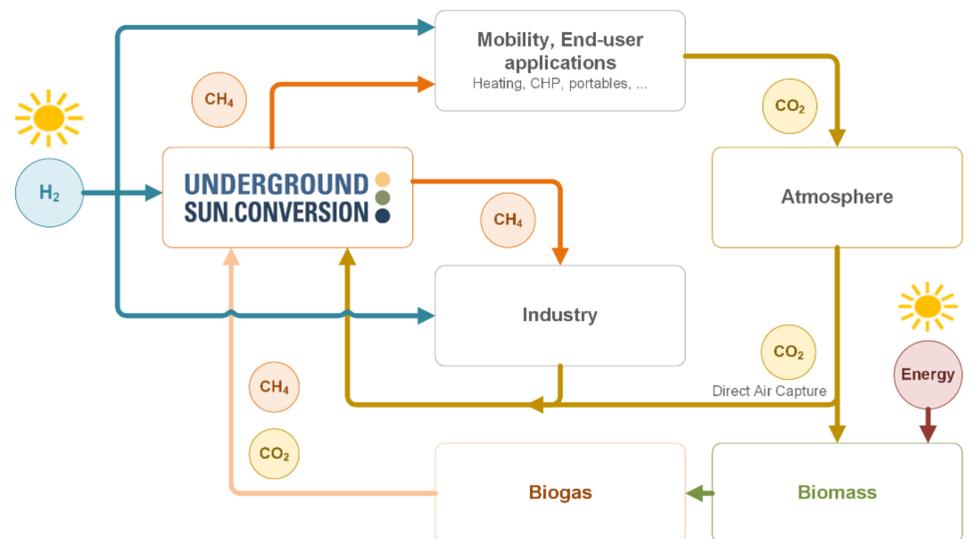
The C-CED project demonstrates the production and storage of synthetic methane (SNG) with renewable hydrogen and various CO₂ gas sources.

Purified CO₂ will be available from the following carbon capture technologies:

- Amine scrubbing technology to separate up to 800 kg/day CO₂ from off-gas of the steel industry
- CO₂ capture with membrane technology
- Amine scrubbing technology to separate CO₂ from raw biogas
- Innovative direct air CO₂ capture technology.

The innovative methanation process is demonstrated through the following technologies

- Bioelectrochemical methanation
- Geo-methanation in an underground reservoir



Schematic of the closed carbon cycle using renewable energy sources to produce green hydrogen for energy storage and methanation.

Circular Carbon Economy (CCE) is characterized by 4 Rs [1]:

- **Reduce:** By using energy efficient technologies to mitigate the amount of carbon entering the atmosphere, while noncarbon emitting renewables can play a role.
- **Reuse:** By using innovative technologies to capture carbon that can then be used to increase production and productivity.
- **Recycle:** By transforming CO₂ into new products such as fertilizer, cement, or other forms of energy.
- **Remove:** By direct capture from the atmosphere, or through nature-based solutions.

C-CED is demonstrating CO₂ capture and methanation technologies in coupled operation to close the carbon cycle. The potential of geo-methanation for seasonal storage of renewable energy is investigated in a realistic environment.

Preliminary results:

- No H₂ induced alteration in rock permeation
- No spurious generation of gases like H₂S
- No solubility or absorption in minerals
- Stability of cement in H₂/CO₂ atmosphere
- Installation of amine scrubber plant in progress

References

[1] The Circular Carbon Economy (CCE) - The wider available tools that can accelerate world efforts towards achieving climate change targets, UN SDG Knowledge Platform, <https://sustainabledevelopment.un.org/index.php?menu=2993&nr=7998&page=view&type=20000> (dl: 27.10.2021)