$MefCO_2$

Methanol fuel from CO_2

Synthesis of methanol from captured carbon dioxide using surplus electricity

The challenge

Decarbonising the energy and industry sectors and integrating additional renewable energy in the energy mix are two challenges for the EC towards their energy 2020 and 2030 goals.

The problem

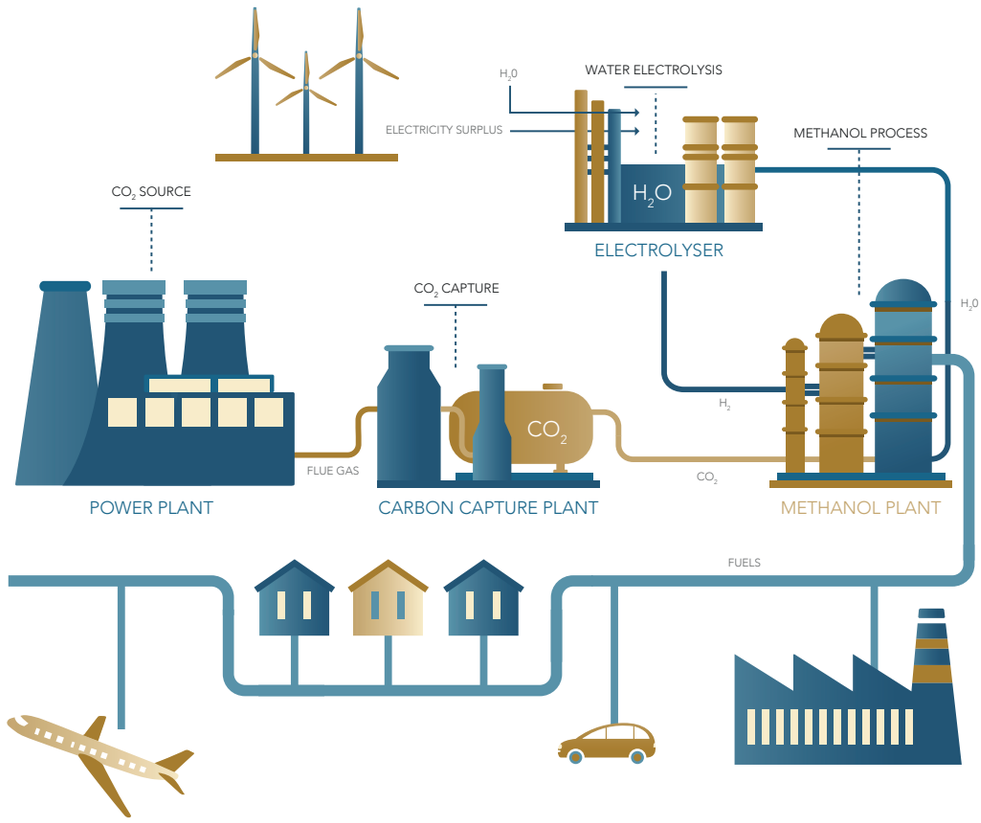
- CCS can achieve significant CO_2 reductions in emission intensive industries and power generation plants but its cost is the main burden for commercial deployment.
- The increasing share of non-manageable renewable energy in the energy mix creates opportunities that cannot be fully exploited without investments in energy storage and transport infrastructures and sustainable business models that support them.

Aim

$MefCO_2$ wants to demonstrate the economic feasibility of valorising captured CO_2 by turning it into a versatile platform chemical and renewable fuel such as methanol using hydrogen produced from renewable energy surplus.

Concept

$MefCO_2$ aims to produce green methanol as energy vector from captured CO_2 and hydrogen produced using surplus renewable energy. The technology is being designed in a modular intermediate scale, with the aim of being able to adapt it to varying plant sizes and gas composition.



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Project overview

Methanol is one of the most common and widespread platform chemicals and is also widely used as a fuel in gasoline blends or used in fuel cells. Methanol is traditionally produced from synthesis gas, obtained by the reforming of natural gas or coal. The current project is to encompass flexible (in operation and feed) methanol synthesis with high carbon dioxide concentration-streams as an input, the latter originating from thermal power stations using fossil fuels or industrial processes such as steel or cement production. The other synthesis reactant, hydrogen, is to originate from water hydrolysis using surplus energy, which would be conversely difficult to return to the grid.

MefCO$_2$ produced methanol is especially attractive since it complies with the requirements set in the amended Fuel Quality Directive and Renewable Energy Directive Annex IX for advanced fuels and feedstock which states that the energy content of (a) renewable liquid and gaseous fuels of non-biological origin and (b) carbon capture and utilization for transport purposes, contributes twice towards the renewable energy content of fuels.

Project benefits

- **MefCO$_2$** provides a valorisation alternative for captured CO$_2$ which contributes to building a more attractive business case around CCS.
- Flexible hydrogen production from water electrolysis contributes to a more efficient operation of electric grid by absorbing surplus renewable generation and providing valuable ancillary services.
- Using renewable methanol in fuels can contribute to the achievement of the EC ambitious targets for renewable energy use in 2020 and 2030 and increase its energy security and sovereignty by reducing fossil fuel imports.

Project team

- **i-deals (Spain):** Coordination, dissemination & exploitation.
- **National Institute of Chemistry (Slovenia):** Catalysis and reaction engineering.
- **Mitsubishi Hitachi Power Systems Europe (Germany):** System integrator.
- **Cardiff Catalysis Institute (UK):** Research in catalyst synthesis.
- **Carbon Recycling International (Iceland):** CO$_2$ to methanol technology developer.
- **DIME - University of Genoa (Italy):** Thermo-economic analysis and process optimisation.
- **Hydrogenics Europe (Belgium):** Electrolyser technology developer.
- **University of Duisburg Essen (Germany):** CO$_2$ capture technology provider.

Contact Project Coordinator for additional information:

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Sustainable Process Industry through Resource and Energy Efficiency