

Disclaimer: This document does not present a draft of the Green Deal call to be part of the Horizon 2020 work programme update, nor any future position of the European Commission. It aims to support the development of the call and its content is subject to change.

Title: Closing the industrial carbon cycle to combat climate change

Industrial feasibility of catalytic routes for sustainable alternatives to fossil resources

Specific challenge:

Greening of industrial and energy production¹ by using CO₂ emissions from industrial processes.

The challenge is to sustainably convert CO₂ emissions from industrial processes into synthetic fuels and chemicals utilising renewable energy driven processes with novel, highly optimised and energy efficient catalytic systems. This has the potential to reduce by over 50% the current 370Mt of CO₂ emissions per annum² related to the chemical industry. However, it is necessary to demonstrate the industrial and economic feasibility of producing synthetic fuels and chemicals by scaling-up the developed technologies to reach industrial production levels and validate the industrial exploitability.

Expected impact:

- Industrial scale demonstrator operational by 2026 based on Industrial Symbiosis and novel, highly optimised and energy efficient catalytic systems.
- Significant reduction of industrial CO₂ emissions (~200Mt p.a. reduction by 2050) with the potential to achieve a carbon intensity below 20g CO₂eq/MJ.
- Enhance the effectiveness of renewable energy sources (i.e. solar, wind) by enabling the production and transmission of a flexible high energy density storage medium in the form of synthetic fuels to be used for specific industry segments (e.g. aviation, chemical, shipping, defence) and validated through Techno-Economic and Life Cycle assessment (TEA/LCA).

¹ Masterplan for a Competitive Transformation of EU Energy-Intensive Industries Enable a Climate-neutral, Circular Economy by 2050. Report by the High-Level Group on Energy-intensive Industries, 2019

² Low carbon energy and feedstock for the European chemical industry, DECHEMA 2017

- Demonstrate and validate the industrial feasibility and cost effectiveness of the technologies, at pilot plant level with a minimum chemical production capacity of 4000 tons per annum, while enhancing Europe's sustainable competitiveness.
- Significant indirect impact on air quality and citizen health through the filtering of flue gas emissions from large industrial plants (e.g. energy, cement, chemical and steel).
- Foster a cross-sectorial European innovation eco-system to deploy sustainable alternatives to fossil resources and create demonstration capacity for sustainable catalytic systems of superior efficiency towards 2030 and 2050.

Scope:

1. Develop and deploy highly innovative catalytic material systems to facilitate the production of synthetic fuels and chemicals from industrial CO₂ (including CO and H₂) flue gas emissions, aiming at 50% increase in the overall efficiency compared to the State-of-the-Art.
2. Develop innovative, renewable energy driven, catalytic processes, to produce synthetic fuels and chemicals, at a sufficiently large scale to demonstrate its cost effectiveness.
3. Demonstrate the full value chain for industrial production of synthetic fuels and chemicals, whilst reducing greenhouse gas emissions.
4. Address financial, regulatory, environmental, land and raw material constraints, as well as public acceptance issues related to the proposed technological pathways.

Proposals are expected to bring the core technology from TRL 4-5 up to TRL 7 at the end of the project. The Commission considers that proposals requesting a contribution from the EU of up to EUR XX million and with a duration of up to 5 years would allow this specific challenge to be addressed appropriately.

Type of action: Innovation actions (IA) (min. 2 projects funded)

Cross-cutting Priorities: International cooperation