

Production Of Wind Energy and other Renewable Energy based DME

Publieke samenvatting / Public summary

Aanleiding

According to the Dutch climate agreement (MMIP 6) the industrial sector will be climate neutral and at least 80% circular by 2050. Therefore, the industrial sector must be provided with renewable fuels and feedstock which can only be achieved with a mix of biobased and synthetic products. Synthesis of these from CO₂ in residual biomass and industrial streams is the ultimate form of carbon recycling. Converting CO₂ to added value renewable hydrocarbons through hydrogenation requires substantial amounts of green hydrogen. Therefore, it is crucially important to ensure that evolving processes for CO₂ conversion provide highest possible energy efficiency and selectivity towards desired products as well as economic attractiveness for small-scale applications and flexibility to accommodate the intermittency of renewable energy supply. POWERED will pilot an efficient renewable dimethyl ether (rDME) production technology with an intrinsically low CO₂ footprint. rDME, produced from CO₂ and green hydrogen, is a future commodity chemical feedstock molecule that can also substitute LPG and diesel.

Doelstelling

The primary goal of POWERED is to pilot the innovative sorption-enhanced DME synthesis (SEDMES) technology and prepare a first commercial demonstration in a follow-up project lead by industry partners. SEDMES technology will significantly reduce internal recycling streams, simplify heat management compared to

Projectinformatie / Project information

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MOOI422003

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Algemene informatie / General information

Penvoerder / Secretariat
Nederlandse Organisatie voor
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Onderzoek TNO

Publicaties en materialen / Publications and attachments

- 28.02.2025

MOOI422003
Voortgangsrapportage 1

- 28.07.2025

MOOI422003
Voortgangsrapportage 2

- 21.08.2026

MOOI422003
Voortgangsrapportage 3

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conventional DME production, allow nearly complete single-pass H₂ conversion and thus, reduce costs for compressors, utilities and downstream purification processes. The intermittent character of wind based electricity production inherently result in flexibility demands of the overall production process, like electrolysis and DME synthesis. The electricity price cost is also expected to fluctuate according to availability. POWERED will develop an agile energy management system (EMS) allowing for the overall required flexibility and mitigate possible risks of a system failure.

Korte omschrijving

POWERED activities include the development of an advanced system controller based on experimental campaigns. The technology will be piloted in industrially relevant environments in the FLiE facilities in Rotterdam and Engie location in Burgum. The main activities within the project include: - SEDMES cycle designs for different H₂ inputs and CO₂ sources - Integration of recycles & Product purification & storage - Green electricity input based on weather forecast & power quality (PQ) measurements for risk mitigation Energy Management System (EMS) for dynamic SEDMES operation - Long duration operation at different pressures, analysing effect of impurities from industrial gases - Advanced reactor design, Improved heat management - Demo plant conceptual design & Levelized costs renewable DME - Policy & sustainability assessment - Markets for various CO₂ sources & DME applications & social innovation and dissemination

Resultaat

This project developing the SEDMES process will lead to a conceptual design for the first-of-a-kind demonstrator, including all unit operations. The dedicated techno-economic assessment (TEA) will quantify the capital investments of the scaled SEDMES for different design choices and indicate the sensitivity of the levelized cost of rDME taking into account the intermittent RES costs. The environmental benefit of synthetic fuels and feedstock will be transparently and convincingly

demonstrated. POWERED determines these aspects through societal innovation studies, detailed impact, safety and application studies, and sustainability assessments including carbon footprint , using life cycle analysis.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

Voor meer informatie over de Topsector Energie, ga naar www.topsectorenergie.nl.

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