ZEF Microplant

Publieke samenvatting / Public summary

Aanleiding

Global warming by rising CO2 concentrations in the air ask for sustainable energy solutions. The industry needs to cut emissions and fuel companies are looking for cost competitive alternative renewable fuels. Renewable liquid hydrocarbons are a promising solution for the heavy industry, flying, shipping and long haul trucking. CO2 will be used as feedstock for the production of hydrocarbons and renewable electricity can be used for the production to make it fully sustainable. Methanol is the simplest CO2 based liquid hydrocarbon. Methanol is an existing bulk chemical (70 million tonne / year) that can be used for both fuels and products and is easy to transport and store. Methanol is a clean burning fuel and can easily be mixed with existing fuels. In addition Methanol is a key building block for the chemical industry and is currently produced from fossil sources (gas & coal). Technically it is possible to capture CO2 and convert this into renewable methanol. However, current production of 100% renewable methanol is economically not feasible. Therefore there is a techno-economical challenge to reduce the production costs of renewable CO2 based methanol.

Doelstelling

The ZEF micro-plant is an add-on to a solar panel to produce methanol instead of electricity. CO2 and water are captured from air and will be converted into methanol using solar energy only. The micro-plant is a small scale modular production unit that will handle the fluctuating solar energy by dynamic control without the need for expensive power electronics. A 12 MW solar methanol farm will

Projectinformatie / Project information

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Algemene informatie / General information

Penvoerder / Secretariat
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Publicaties en materialen / Publications and attachments

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consists of 40.000 solar panels and 40.000 micro-plants and has a yearly output of 2.800 tons renewable methanol (88 trucks) and captures 3.850 tons CO2 from air. The plant is easy to scale without scaling risks by adding more panels and micro-plants; numbering up versus scaling up. Grid connection is not necessary and all feedstocks (air and sun) are free. The low solar energy cost (remote sun intensive locations), low cost micro-plant (mass manufacturing) and low operation cost (automated) will result in economically feasible renewable methanol. The innovative micro-plant solution can be used for the transition to an affordable and sustainable energy system. The goal of this feasibility project is to determine if renewable methanol production for €350 per ton is possible.

Korte omschrijving

The feasibility study contains three parts and is based on the previous research of ZEF. The first part is aimed at determining the technical feasibility of the micro-plant concept and is the main focus in the feasibility study. In total 9 subsystems will be designed, built and tested to determine the potential of system efficiency, production quantities, and integration of the 9 subsystems into one product. This part will be executed by ZEF at the TU Delft. The second part of the feasibility study focusses the cost price potential of the micro-plant. The cost price is essential for the economic feasibility. System requirements, micro-plant weight, number of components, material selection and production technologies will be researched by Promolding to determine the cost price potential of the micro-plant. The last part of the feasibility study is a techno-economic evaluation of a solar-methanol production plant. This evaluation will support the business case and further development of the micro-plant. This part, executed by ZEF, will determine if large scale application of the micro-plant results in cost competitive renewable methanol production.

Resultaat

The result of the project is the design of a cost effective micro-plant for the production of

renewable CO2 (from air) based methanol. The design will be based on the test results of the subsystems. A clear development roadmap for the further development of the micro-plant will be delivered, including a technical risk analysis, planning, financing and development partners. Furthermore a business case for solar methanol farms, including a financial model will be used to determine the economic feasibility of renewable methanol production with the micro-plant concept. After a successful feasibility study the next step is the further development of the micro-plant and realization of a solar-methanol farm for the production of CO2 based renewable methanol. The solar-methanol farm will be an attractive alternative for replacing fossil based methanol production and can offer a circular solution for the transport industry (renewable fuels).

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