Benelux's First E-Methanol System: HyGear Provides PEM-Elektrolyser for Sustainable Fuel Production

Arnhem, Netherlands — **HyGear will deliver a 1,25MW elektrolyser with polymer electrolyte membrane (PEM) technology for the production of hydrogen that will be used in the E-Methanol project TANDEM: 'Towards Acceleration and Demonstration of E-Methanol'. This joint project between HyGear, Bright Renewables, both part of the HoSt Group, and the University of Twente, received a total of nearly €4 million subsidy. The project, which will require an €8 million investment, aims to develop technology for producing E-methanol, a sustainable fuel alternative to conventional fuels for heavy-duty transport, including ships and aviation. Spanning four years, the project anticipates producing its first batch of renewable methanol by the third quarter of 2025.**

Henk Kleef, CEO of HyGear: "HyGear already has an extensive experience in on-site hydrogen production for more than 20 years and with more than 100 systems operating worldwide based on steam methane reforming and alkaline electrolysis. The extension of the portfolio with PEM electrolysis enables us to adapt the production of hydrogen to the supply of renewable electricity and reduce fluctuations of the electricity grid".

A key benefit is: "The green hydrogen which is produced in this process can be used directly or used as a reactant for the production of other chemicals such as methanol in this case. We are eagerly looking forward to having this 1.25 MW system running on our premises in the coming years", says Henk.

In this consortium, HyGear (Arnhem) is providing a 1MW electrolyser with PEM technology that will produce hydrogen through electrolysis, Bright Renewables (Enschede) is developing the methanol reactor technology, and the University of Twente (Enschede) is researching heat exchange, vital for the process, and the most optimal way for scaling up the project using a twin-test reactor. Of the total €4 million subsidy provided, €600,000 is allocated specifically for the university's research.

The project's total funding comes from a 'GroenVermogenNL' subsidy, underpinned by the 'Nationaal Groeifonds'.

Preventing grid congestion effectively

The system with a capacity of 500 tons per year of grade AA E-methanol will be constructed at the site of HyGear in Arnhem, the Netherlands. Here, it will utilize electricity sourced from unsubsidized solar and wind power produced within the country. This e-methanol system is for medium-scale use and can be set up near local solar or wind farms. It can capture electricity directly, helping to reduce grid congestion. Annually, it can produce enough sustainable fuel for a large inland ship to travel 30,000 km with 10,000 containers.

Wim Brilman, professor at the University of Twente, on the importance of dynamic operation: *"We want to investigate how predictable the reactor performs under the varying availability of sustainable energy. Being able to store excess renewable electricity in the form of methanol, helps to minimize grid congestion, maximizes the potential of solar and wind farms, and provides a CO_2 neutral fuel."*

CO2-negative fuel

Methanol, the simplest form of alcohol, is produced by combining hydrogen (H2) with carbon dioxide (CO2) or carbon monoxide (CO) in a reactor, also known as synthesis. As a liquid at room temperature and pressure, it serves as an efficient energy carrier or storage medium. In this E-methanol system, the CO2 will be sourced from biogenic CO2 captured from biogas plants or biomass- or waste-fired boiler plants, with hydrogen supplied through electrolysis.

Designed for decentralized operation, this system produces CO2-negative fuel using biogenic CO2. With legislative and regulatory momentum increasingly supporting CO2 capture to achieve national goals, there is a push towards these sustainable practices. By 2030, it is projected that 2.1 Megatons of biogenic CO2 will be available for use. Additionally, decentralizing production directly at end-user sites cuts down on transportation, further enhancing the system's efficiency and sustainability.