EMPOWER

EUROPEAN METHANOL POWERED FUEL CELL CHP

Project ID:	875081
PRD 2023:	Panel 4 – H2 end uses – stationary applications
Call topic:	FCH-02-7-2019: Development of highly efficient and flexible mini CHP fuel cell system based on HTPEMFCs
Project total costs:	EUR 1 499 876.25
Clean H_2 JU max. contribution:	EUR 1 499 876.25
Project period:	1.1.2020–30.11.2023
Coordinator:	Teknologian tutkimuskeskus VTT Oy, Finland
Beneficiaries:	Blue World Technologies APS, Catator AB, THT Control Oy, Universidade do Porto

https://www.empower-euproject.eu/

PROJECT AND OBJECTIVES

The project will develop, manufacture and validate a methanol-fuelled 5 kWe combined heat and power (CHP) system based on high-temperature proton-exchange membrane fuel cell (HT-PEMFC) technology. The project will enhance the system's efficiency to target the mini-CHP market and provide a cost-competitive and low-carbon option. The developed CHP unit will be capable of fast start-up and fast dynamic response to help the integration of intermittent power production from renewable energy sources. Currently, the subsystems of the CHP system are being finalised by project partners. The integration of the final CHP system has started.

NON-QUANTITATIVE OBJECTIVES

- EMPOWER aims to increase the visibility and awareness of the potential of renewable methanol. The project results are being openly communicated and disseminated, for example through public deliverables and scientific publications. The project has also arranged an international summer school on hydrogen technologies.
- The project aims to conduct business analysis for the use of renewable methanol in CHP systems and other applications. Preliminary market analysis was performed in 2021, and this will be updated at the end of the project.
- EMPOWER aims to support knowledge exchange and production ramp-up through stakeholder identification, information sharing and linkages. An industry webinar was arranged for January 2021, a workshop was arranged to take place in Denmark in May 2022 and another is planned to take place in Finland in November 2023.
- The main goal of the project is to produce affordable and secure electricity with a low carbon footprint. The carbon footprint was analysed in December 2022.

PROGRESS AND MAIN ACHIEVEMENTS

- The HT-PEMFC stack has been designed for pressurised operation.
- The CHP system enclosure and system balance-of-plant components have been finalised.
- The automated quality control methods for stack components have been developed.
- The carbon footprint of the 5 kW HT-PEMFC CHP system has been analysed.
- Scientific studies on aqueous-phase-reforming catalysts have been finished and reported on.

FUTURE STEPS AND PLANS

- EMPOWER will demonstrate the project's 5 kW HT-PEMFC CHP system in the relevant end-user environment. The designed system will be demonstrated in summer/autumn 2023 in Finland to evaluate its performance and the project's key performance indicators.
- The HT-PEMFC subsystem will be integrated into the CHP system (planned for summer 2023).
- The system scale-up study (50–100 kW) and business analysis were expected to be performed in spring 2023.

QUANTITATIVE TARGETS AND STATUS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?
Project's own objectives	Stack electrical efficiency (LHV reformate gas)	%	55	N/A	⚙
	Fuel-processing efficiency	%	85	> 85	✓
MAWP addendum (2018–2020)	CHP electrical efficiency (LHV methanol)	%	37–67	N/A	⚙
	CAPEX	€/kWh	5 500	2 600	✓

Clean Hydrogen Partnership
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