



## NEWSLETTER 6/2020

1. Research during COVID-19
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## PROJECT FACTS

- European methanol powered fuel cell CHP (EMPOWER)
- Grant agreement number: 875081
- Call identifier: H2020-JTI-FCH-2019-1

## EMPOWER DURING COVID-19

**The COVID-19 pandemic has been challenging for most of people, changing day-to-day life in unprecedented ways. Like other human activities, such as industries, engineering and construction, the EU projects' research activities found their way to adapt to the new reality.**

Most of European research institutions and universities, not related to Covid-19 research activities, were essentially closed during the pandemic peak, where remote working and digital solutions helped to mitigate the impact. In similar way, the Empower project partners, took the opportunity to focus on activities that could be develop in the office, such as literature review, modelling and CAD design. With fewer limitations than research institutions, the industrial partners tried to maintain their normal activities.

Societies and businesses are racing to reopen, nevertheless it is expected that the pandemic imposes significant impact in the following months or even years.

## PROJECT DEVELOPMENTS

The EMPOWER project targets the manufacture of a methanol fuelled 5 kW combined heat and power (CHP) system based on high temperature PEM fuel cell technology.

Preliminary test on the new HT-PEM stack shows improved power density performance with pure hydrogen. Despite expected performance loss when fed with methanol reformat, the HT-PEM stack is on track to meet the  $>0.2 \text{ W/cm}^2$  targeted in the project. Nevertheless, new developments are being introduced on the stack such as new endplates and compression system, to provide uniform compression, improving performance and life-span. The bipolar plate mechanical strength is currently being enhanced by optimizing the compound composition, and new gasket system to improve the stack sealing is being studied.

The use of methanol on high-temperature PEM fuel cell CHP system has demonstrated important benefits; it reduces the greenhouse gas emissions, is cost-effective and high-density on-site energy storage, allows noise reduction and has low levelized cost. The Project consortium established for methanol processor an efficiency of at least 85 %. To achieve this target the methanol processor will consider a pre-reforming step using an aqueous phase reformer (APR) that will be thermally integrated with the fuel cell. The consortium made a detailed review on aqueous phase reforming catalyst, establishing the Ni-based catalysts as a starting point. For kinetic characterization of catalysts, new test benches for APR were designed and are being built at VTT and



UPorto. The gas-phase reformer system has also been further developed and optimized for size and weight.

A methanol-powered fuel cell CHP system can replace diesel generators in all off-grid and grid-parallel areas and is especially well suited for many applications where diesel is not a viable option. The consortium members have already defined the system diagram of heat and power outputs, as well as the layout. The first system will be built using 19 inch racks, vibration free, assembled into a small container for testing and protection in field tests. The parts for the “trailer container” have been designed and delivered, and are now being assembled.

**Contact persons for more information:**

Johan Tallgren  
Research Scientist, VTT Technical Research Centre of Finland Ltd  
Mobile: +358 406840646  
Email: johan.tallgren@vtt.fi

Thomas Leopold Berg  
Business Developer, Blue World Technologies ApS  
Mobile: +45 31139379  
E-mail: tlb@blue.world

Tommi Vahtera  
CEO, THT Control Oy  
Mobile: +358 505019190  
Email: tommi.vahtera@thtcontrol.com

Fredrik Silversand  
Executive Chairman, Catator AB  
Mobile: +46 462862291  
Email: fredrik.silversand@catator.se

Paulo Ribeirinha  
Research Scientist, Faculty of Engineering at the University of Porto  
Mobile: +351 918429805  
Email: paribeirinha@fe.up.pt