PROJECT OBJECTIVES

The aim of NEPTUNE is to realise breakthroughs in Proton Exchange Membrane water electrolysis in order to promote its large-scale application as it is the foremost technology for producing "green" hydrogen for fuel cell vehicles.

The ability to rapidly follow intermittent loads also makes it an ideal solution for grid balancing.

This project aims to achieve a reduction in capital costs together with increase in production rate and output pressure of hydrogen, while maintain high efficiency and safety standards.

TECHNICAL OBJECTIVES

The NEPTUNE project develops a set of breakthrough solution at materials, stack and system levels to increase hydrogen pressure to 100 bar and current density to 4 Acm^{-2} for the base load, while keeping the nominal energy consumption < 50 kWh per kg H_2. The novel solutions created in this project including Aquivion® polymers, and newly developed electro-catalysts will be validated by demonstrating a robust and rapid-response electrolyser with these characteristics.

PROJECT COORDINATOR

Catherine McDougall
ITM Power plc
22 Atlas Way
S4 7QQ Sheffield
United Kingdom

PROJECT CONSORTIUM

The NEPTUNE consortium involves 6 partners from 4 European countries. The consortium comprises an electrolyser manufacturer (**ITM Power,** United Kingdom), research institution(**CNR-ITAE**, Italy), suppliers of membranes, dispersions and MEAs **(Solvay**, Italy and **EWII**, Denmark) and an end-user (**ENGIE**, France). A partner will assist coordinator with project management and dissemination (**PRETEXO,** France).

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 779540, NEPTUNE.
This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme, Hydrogen Europe and Hydrogen Europe research.

NEPTUNE

Next Generation PEM Electrolysers under New Extremes

The NEPTUNE project will produce game changing results in PEM technology achieving a significant reduction of capital costs together with an increase in the production rate and output pressure of hydrogen while assuring high efficiency and safe operation.The project aims to develop solutions that enable large-scale application of PEM electrolysers so that water electrolysis supplied by renewable energy will be the foremost technology for producing "green" hydrogen.

www.neptune-pem.eu

WP1

Project coordination and management.

PROJECT STRUCTURE

WP2

Harmonisation of test protocols. Building on previous FCHJU projects and the Joint Research Council NEPTUNE will develop a set of protocols that can be used to test at MEA, stack and system level. A market analysis will also be carried out as part of this Work Package.

WP3

Development and production of enhanced membranes to improve conductivity, reduce ohmic drop during operation at high current, and enhanced mechanical and thermal resistance for use in extreme conditions.

WP4

Development and production of nanostructured electrocatalysts for hydrogen and oxygen evolution that are able to operate at low overpotential at high current densities.

WP5

MEA and stack engineering to validate the new materials from WP3 and WP4 under relevant conditions to target high temperature and high-pressure performance.

WP6

Investigation of the dynamic behaviour of an electrolysis system using materials developed in work packages 3 to 5 to address the market opportunity explored in work package 2.

WP7

Dissemination, exploitation and outreach activities