High-Pressure Anion Exchange Membrane electrolyzers for large-scale applications

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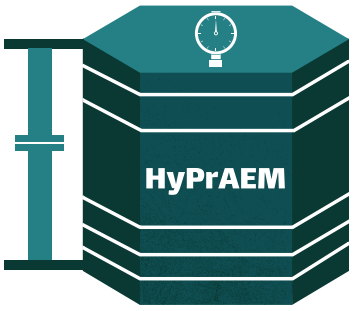
STARTING DATE: 01/01/2025
TOTAL BUDGET: 5 324 483.44€
DURATION: 48 Months

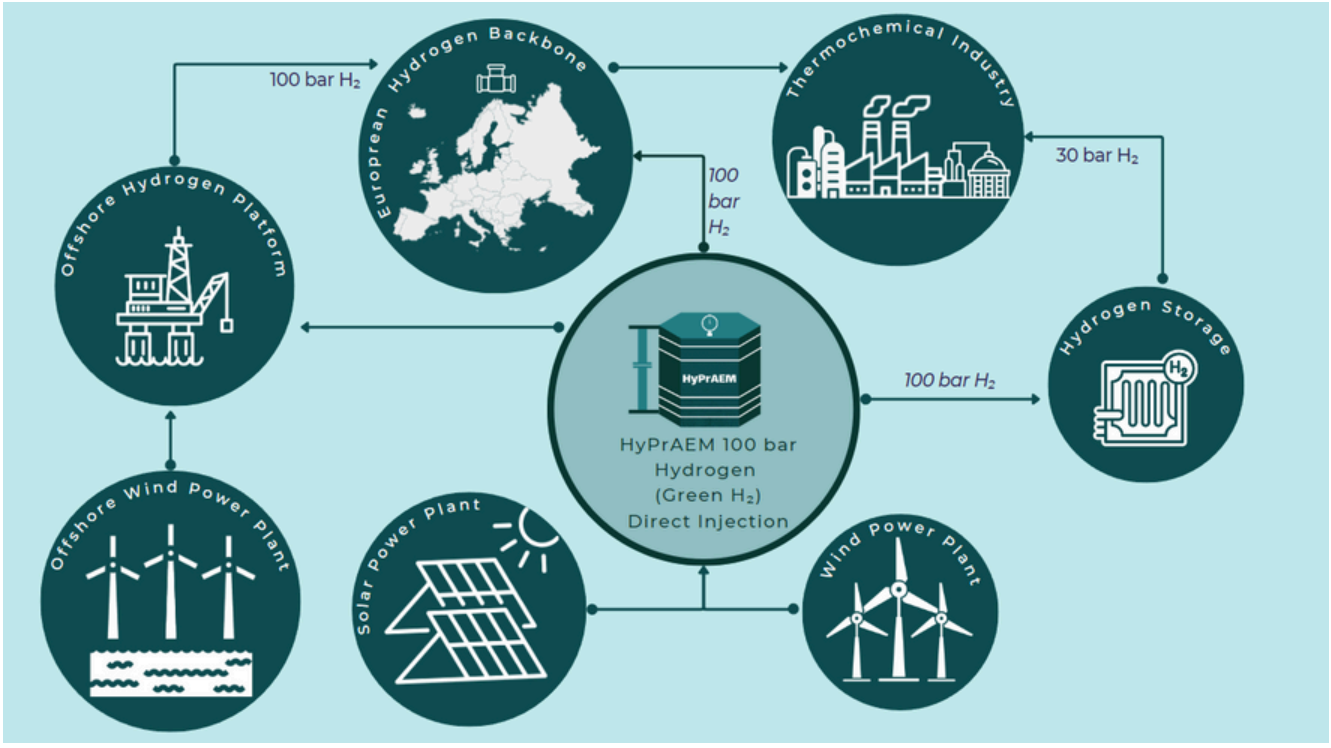


The Project

The HyPrAEM project aims to develop a disruptive Anion Exchange Membrane ELectrolysis (AEMEL) stack and balance of plant (BoP) layout capable of producing hydrogen directly at 100 bar, enabling direct integration into the chemical industry. The 100 kW/100 bar AEMEL stack, with an active area of 500 cm^2 will be demonstrated for >3000 h under industrially relevant conditions at the site of an end user.

Challenge

Global warming presents a critical threat to life on Earth, driving the urgent need to shift from fossil fuels to sustainable energy sources. Electrification and green hydrogen are key to decarbonization, with green hydrogen being vital for sectors like heavy industry and long-duration energy storage that are difficult to decarbonize. However, the current high cost of green hydrogen limits its feasibility, demanding innovation in electrolyser efficiency and hydrogen transport.



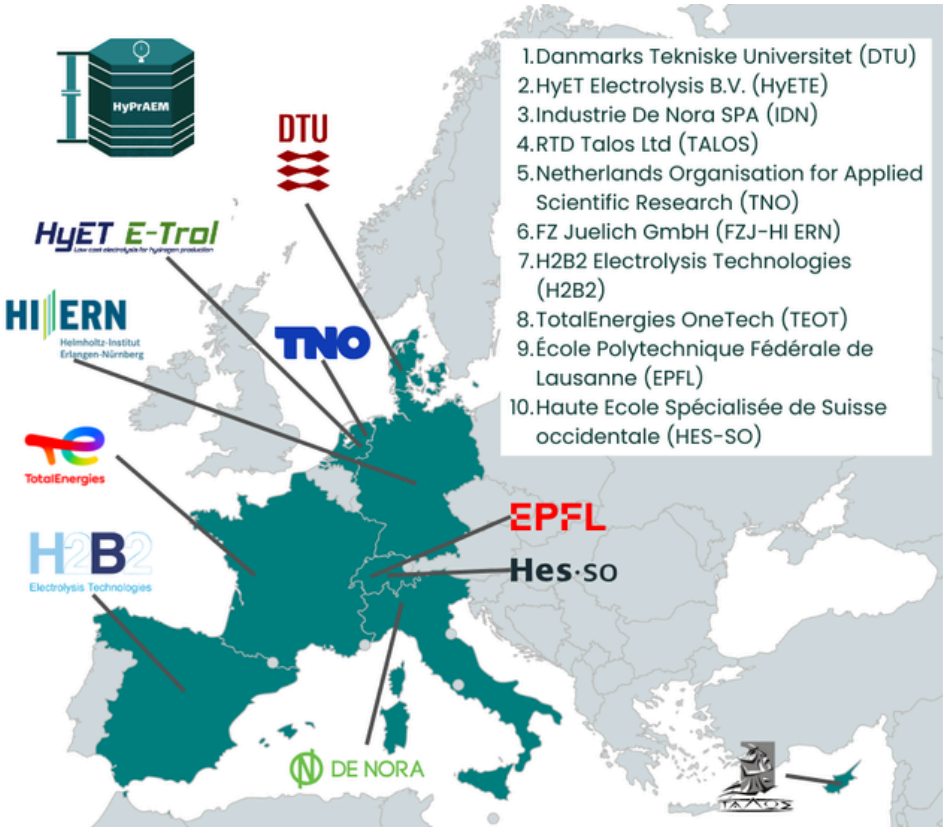
Objectives

The key objectives of HyPrAEM are to:

- Develop a 100 kW AEM stack with a nominal current density of 2 A/cm^2 at 1.75 V cell voltage at ~ 70 °C, corresponding to an energy consumption of ~ 46.9 kWh/kg.
- Develop high-performance critical raw materials (CRM)-free/lean catalysts, and reinforced AEM membranes and ionomers for high pressure operation.
- Optimize the design of porous transport layers, membrane electrode assembly, stack and BoP for high pressure operation.
- Improve existing component, cell, and stack level EU-harmonised Accelerated Stress Test (AST) protocols, emphasizing their validation in relation to Real-World Degradation (RWD).
- Develop a digital twin for the 100 kW AEM electrolyser and validate it against the on-field demonstration of the final 100 kW AEMEL system.
- Carry out an integrated sustainability analysis on components and technologies developed in the project and in depth techno-economic analysis (TEA) on a use case relevant to the thermochemical industry.

Consortium

Comprising 10 partners across 8 European countries, HyPrAEM is an intersectoral consortium that draws on expertise from research institutions, manufacturing and energy companies as well as universities. Our team includes experienced researchers, technology developers, SME's and large organization with extensive experience within the electrolysis sector, as well as experts dedicated to skill development, communication, and exploitation, working together to drive innovation within this technology space.



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Clean Hydrogen Partnership
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