Clean Hydrogen Partnership

Competitiveness and Start-ups

Scaling up innovation: An incubator for Europe's electrolyser industry

As the EU moves to build a resilient, self-sufficient clean hydrogen economy, industrial leadership in key technologies is becoming a strategic priority. Electrolysers - the core technology for producing renewable hydrogen - must become cheaper, more efficient, and scalable. And Europe must lead that charge. Thanks to a decade of coordinated investment through the Clean Hydrogen Partnership, Europe is now home to two global frontrunners in electrolyser technology - ITM Power and Sunfire - and a robust innovation ecosystem that spans from laboratory prototypes to megawatt-scale commercial deployment.

Scaling a strategic technology

To build a robust hydrogen economy, the EU needs electrolysers that can deliver low-cost, high-volume hydrogen using renewable electricity. However, European electrolyser manufacturers have historically faced high costs, limited scale, and technological risks. Bridging this gap requires a well-structured innovation pipeline that can fund early R&D, support demonstration projects, and de-risk the commercialisation journey.

A coordinated approach to building European champions

Six flagship projects - MEGASTACK, REFHYNE, REFHYNE 2, GrInHy, GrInHy2.0, and MULTIPLHY - have supported a staged approach to electrolyser innovation, enabling European companies to scale up from kilowatt-scale concepts to world-leading installations.

"By funding each step of the innovation pathway, we've helped turn promising technologies into bankable industrial solutions and European start-ups into global players."

Valérie Bouillon-Delporte, Executive Director of the Clean Hydrogen Partnership

ITM Power's journey reflects a textbook case of innovation nurtured by public support. Early involvement in Clean Hydrogen Partnership-supported projects led to MEGASTACK, where ITM scaled up its proton exchange membrane (PEM) electrolyser stack design to the megawatt level. This paved the way for the REFHYNE project, which deployed a 10 MW electrolyser at Shell's Rhineland refinery in Germany. Building on this success, REFHYNE 2, funded by the European Climate, Infrastructure and Environment Executive Agency (CINEA), is now scaling up to a 100 MW electrolyser system.

Sunfire's story mirrors this trajectory in the high-temperature electrolysis (HTE) space. Under the GrInHy project, Sunfire installed a 150 kW solid oxide electrolyser (SOEC) at the Salzgitter steelworks. In GrInHy2.0, this was scaled up to 720 kW, achieving an impressive 84.6% efficiency and high availability and laying the groundwork for MULTIPLHY, where Sunfire delivered a 2.4 MW SOEC system for Neste's biorefinery in Rotterdam, currently the largest high-temperature electrolysis system deployed in an industrial setting.

Next stop: Full deployment

With the technology proven and demand rising, the next step is full commercial deployment. REFHYNE 2 will demonstrate 100 MW-scale green hydrogen production at an operational refinery, setting new standards for industrial integration. Sunfire is working to scale up its SOEC technology beyond 2.4 MW, with upcoming pilot systems reaching 10 MW and beyond.

The goal To boost Europe's competitiveness in clean hydrogen by funding electrolyser technologies from lab-scale breakthroughs to commercial-scale deployments - building a robust European value chain.

Key results From PEM to high-temperature electrolysis, the Partnership has enabled major European players like ITM Power and Sunfire to lead on cost, scale and performance, paving the way for the EU to meet its renewable hydrogen production targets.

KEY ACHIEVEMENTS

10 MW ELECTROLYSER
deployed at Shell's Rhineland refinery

100 MW SCALE-UP
underway in REFHYNE 2, ten times larger than REFHYNE

2.4 MW SOLID OXIDE ELECTROLYSER
installed by Sunfire in MULTIPLHY for Neste's biorefinery

84.6% SYSTEM EFFICIENCY
demonstrated in GrInHy2.0 by Sunfire's SOEC technology

IMPACTS

EUROPEAN INDUSTRIAL LEADERSHIP
in both PEM and SOEC electrolyser technologies

TECHNOLOGY SCALE-UP
from 150 kW to 100 MW in successive Clean Hydrogen Partnership-supported projects

PRIVATE INVESTMENT LEVERAGED
through public support for early-stage innovation

INDUSTRIAL DECARBONISATION
enabled via integration in refineries and steelmaking

RESILIENT SUPPLY CHAIN
built on European technology and manufacturing capacity

FIND OUT MORE

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https://www.sintef.no/projectweb/megastack/
https://www.refhyne.eu/
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