Making an impact on the clean energy transition

ENERGY

GATHERING STEAM: GREEN HYDROGEN FOR ENERGY-INTENSIVE INDUSTRIES

Demonstrating the case ...

Using solid oxide electrolysers, hydrogen can be produced from steam rather than from water in liquid form. Although this has the potential to boost the efficiency of the process, until recently, this technology had only been demonstrated on a small scale. Just a few years on, it is already being used for a concrete application in steelmaking.

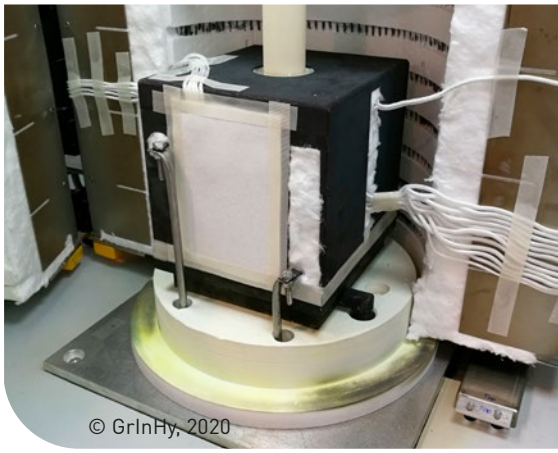
This demonstrator, a 150-kW reversible electrolyser developed by the FCH JU project GrInHy, was set up at a plant in Germany. It uses waste heat from the plant to produce hydrogen for annealing processes carried out on-site. The unit can be used in reverse mode, as a 30-kW solid oxide fuel cell operating on hydrogen or natural gas. Follow-on project GrInHy2.0 is about to replace this with a 720-kW prototype. The new demonstrator, which will not be reversible to further boost efficiency, is due to go into operation in September 2020.

... for high-temperature electrolysis

The advances already achieved rely on the broad collaborations mobilised in these successive projects, which have led to a number of strategic partnerships. One such partnership involves application in a different sector: the new FCH JU project MultiPLHY is developing a solution on an even larger scale for a biorefinery in Rotterdam, the Netherlands.

This system will be the world's first HTE demonstrator in the megawatt range. Significant reductions in capital cost are achievable at this scale, according to insights from GrInHy and GrInHy2.0, which also explored the business case.

High-temperature electrolysis (HTE) is a compelling proposition for the efficient production of green hydrogen and subsequent decarbonisation of many industrial processes. Research backed by the Fuel Cells and Hydrogen Joint Undertaking has been scaling up this technology in view of the capacities required by industry. Work is now under way on the world's first demonstrator of an HTE system in the multi-megawatt class.



FCH JU Success Stories >

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POWERING AHEAD

To enable high-temperature electrolysis (HTE) to play a key role in the decarbonisation of industry, the technology must be scaled up quickly.

FROM HYDROGEN DREAM TO HYDROGEN STREAM

R&I supported by the FCH JU is harnessing the power of HTE for concrete applications in real-life industrial settings. **The goal?** Unlocking the potential of HTE and, in the process, helping to build strong partnerships to take the technology forward. **Key results?** Rapid scale-up reflected in the construction of the world's largest reversible solid oxide electrolyser, which is already showing impressive performances, with two even bigger demonstrators to follow soon; and consolidation of European leadership in the field.

KEY ACHIEVEMENTS

GRINHY

150-kW HTE CAPABLE OF OPERATING IN REVERSE MODE AS 30-kW FUEL CELL
a world first!

DIRECT UTILISATION OF WASTE HEAT
from energy-intensive industrial processes
78 % efficiency
a 25 % improvement on electrolysis at lower temperatures

~10 000 HOURS OF OPERATION
in electrolysis, fuel cell or hot-standby mode

LOW DEGRADATION RATES
less than 1 % per 1 000 hours of operation

GRINHY2.0

720-kW HTE DEMONSTRATOR

MULTIPLHY

2.4-MW HTE DEMONSTRATOR PLANNED

IMPACT

STRATEGIC PARTNERSHIPS FORMED
to exploit the projects' results

FEASIBILITY DEMONSTRATED
at industrial scale

GRINHY

HIGH SYSTEM EFFICIENCIES ACHIEVED

GRINHY2.0

NEXT-LEVEL OBJECTIVES TARGETED
e.g. efficiency increase to 84 % and production of >100 t of hydrogen at <7 €/kg

FURTHER CONTRIBUTION TO LOW-CARBON STEELMAKING EXPLORED
more specifically, use of green hydrogen as a reducing agent

MULTIPLHY

REDUCTIONS IN MANUFACTURING COST EXPECTED
to advance the technology's market readiness

FIND OUT MORE

www.fch.europa.eu/page/fch-ju-projects
https://www.green-industrial-hydrogen.com
http://multiplhy-project.eu.

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FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

A partnership dedicated to clean energy and transport in Europe

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