Making an impact on the clean energy transition

ENERGY

INNOVATIVE ELECTROLYSERS GREENING EUROPEAN INDUSTRY

More productive technology

Hydrogen is essential to processes in sectors such as refining, fertilisers and manufacturing. Yet over 90 % of the hydrogen that industry uses comes from CO_2-emitting natural gas – 'grey' hydrogen. Large-scale electrolysers that extract hydrogen from water using renewable energy – 'green' hydrogen – could significantly reduce industry CO_2 emissions as part of the EU goal of 40 GW of green electrolysers in Europe by 2030.

Four FCH JU projects have been scaling up electrolyser cells and adding cells to electrolyser stacks to boost capacity, building on the achievements of the HyBalance demo project. Demo4Grid and DJEWELS have produced 4-MW single stacks and 20-MW systems for alkaline electrolysis and increased current density three-fold, from 0.3 A/cm^2 to 1.0 A/cm^2. H2FUTURE and REFHYNE have produced 0.5-MW proton exchange membrane (PEM) stacks that deliver hydrogen at atmospheric pressure of 20 bar in scalable modular units of 6 and 10 MW, respectively.

Real-world viability

Demo4Grid and DJEWELS are installing their electrolysers in food and green fuel factories in Austria and the Netherlands to produce hydrogen for ovens, transport, methanol production and nearby industries. In addition, the projects demonstrate that the higher productivity of the alkaline electrolysers reduces their size and CAPEX requirements. H2FUTURE and REFHYNE are placing PEM electrolysers in steel and oil refineries in Austria and Germany. Although the equipment meets only a small percentage of current production demand, it demonstrates that the technology can reliably reduce steel plant or refinery emissions, in readiness for future PEM capacity increases.

FCH JU projects are scaling up electrolysers that generate hydrogen from renewables and installing them in large refineries and factories. The demonstrations aim to show that the technology is a reliable, viable alternative to hydrogen production from natural gas, decarbonising industries and connected businesses in emerging 'hydrogen valleys'.

FCH JU Success Stories >

INNOVATIVE ELECTROLYSERS GREENING EUROPEAN INDUSTRY

HYDROGEN FOR HARD-TO-ABATE INDUSTRIES

Refineries and factories use hydrogen for many processes, yet much of this is produced from natural gas, making it difficult to reduce industry CO_2 emissions.

CONFIDENCE TO GO GREEN

Refineries, large-scale manufacturers and public organisations are cooperating in FCH JU projects to develop and demonstrate electrolysers that produce low-carbon hydrogen for industry. **The goal?** Electrolysers which produce high-purity hydrogen on-site, creating confidence that the technology is suitable for other companies, industries and surrounding businesses. **Key results?** Alkaline and PEM electrolysers that generate green hydrogen in refineries and factories, demonstrating that the technology is a practical and viable way to reduce CO_2 emissions in many industries.

KEY ACHIEVEMENTS

H2FUTURE

>1 200 Nm³/h
hydrogen produced

99.9 %
hydrogen purity

77-82 % HHV
rated system electrical efficiency

10 m²/MW
electrolyser footprint

REFHYNE

< EUR 1 000/KW installed
target CAPEX

DEMO4GRID AND REFHYNE

2 s
from standby to full power

DJEWELS

TRL 7 TO TRL 8
with pilot stacks of 1 MW

0.72 %/year
target efficiency degradation

IMPACT

ADDS TO ELECTROLYSER CAPACITY
already 100-fold greater in FCH JU projects in eight years

CONTRIBUTES TO LOWER SUBSIDY PER KW
reduced by a factor of 50 in FCH JU initiatives since 2012

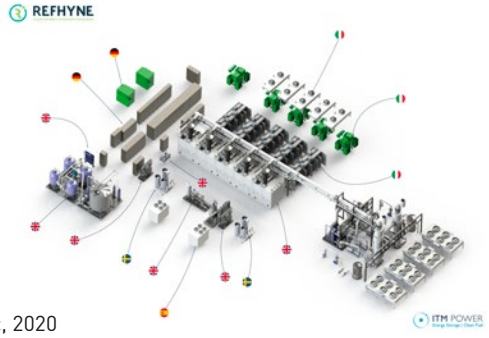
REDUCES ELECTROLYSIS POWER DEMAND
– approaching 52 kWh/kg H_2 in DJEWELS and REFHYNE

ADDRESSES A MAJOR BARRIER
to cutting industry emissions by enabling renewable energy to enter industrial facilities through hydrogen

BOOSTS 'HYDROGEN VALLEYS'
around industries, to extend hydrogen use to the wider business community

CREATES CONFIDENCE
in green electrolysis technology, driving adoption

INCREASES HYDROGEN SECURITY
by reducing dependence on natural gas imports



FIND OUT MORE

www.fch.europa.eu/page/fch-ju-projects
http://hybalance.eu/
https://www.h2future-project.eu/
https://refhyne.eu/
https://www.demo4grid.eu/
https://djewels.eu/

@fch_ju

FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

A partnership dedicated to clean energy and transport in Europe

PDF ISBN 978-92-9246-387-8 doi:10.2843/475675 EG-09-21-310-EN-N