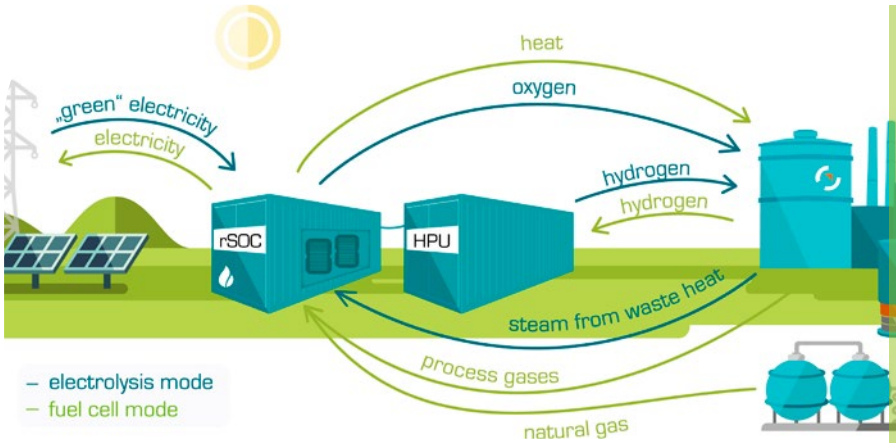
Making an impact on the clean energy transition

ENERGY

MAKING STEEL GREEN THROUGH HYDROGEN



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Hydrogen in action

With global steel demand set to increase by around 6 % by 2030, greening the steel industry is essential for the energy transition. This will require the integration of highly volatile renewable energy resources, through the use of hydrogen technologies. For this reason, the European Hydrogen Roadmap identifies steel as the leading sector for new feedstock applications of hydrogen.

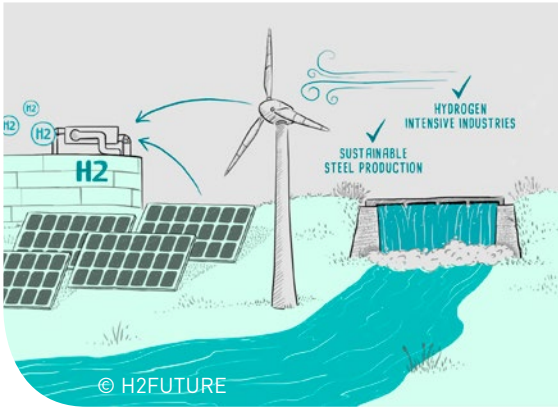
The FCH JU-funded GrInHy project spent three years developing the largest reversible solid oxide electrolyser in the world, and demonstrating its use for producing hydrogen for the surface treatment of steel. Additionally, project H2FUTURE has developed the largest low-temperature proton exchange membrane (PEM) electrolyser of 6 MW, and is using the resulting hydrogen for direct iron-ore reduction.

Greening steel production will mean replacing fossil-based energy cycles with green hydrogen. By supporting technological advancements and demonstrating how hydrogen applications can be used for cleaner steel production and processing, the FCH JU is playing a pivotal role in decarbonising the industry.

Changing the landscape

The FCH JU is establishing the prerequisites for market uptake by creating reference sites, proving the feasibility of large-scale green hydrogen, and upscaling important technologies like high-temperature electrolysis.

By demonstrating the capacity of solid oxide electrolysers to produce high-efficiency hydrogen, the GrInHy2 project is paving the way for European industries to exploit waste industrial heat. H2FUTURE is assessing barriers to deployment with a view to discussing solutions with national and EU level policymakers. The long-term goal is to enable green electrolytic hydrogen to completely replace coke oven gas, making hydrogen a cost-effective solution for the steel industry.



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MAKING STEEL GREEN THROUGH HYDROGEN

TIME TO CHANGE

The steel industry accounts for 7% of global CO_2 emissions, making it an urgent target for decarbonisation.

LET HYDROGEN HELP

The complex nature of steel production makes green hydrogen the most fitting solution for decarbonising the industry. The FCH JU is developing scaling and replication scenarios for environmentally friendly steel production using new electrolyser concepts. **The goal**? Facilitating broad-based and intense cooperation between steel and energy sectors, scientific and industrial partners, and national and European stakeholders, to demonstrate and upscale green hydrogen solutions for the steel industry. **Key results?** Proof that environmentally friendly steel production is possible using innovative hydrogen technologies.

KEY ACHIEVEMENTS

GrInHy

FIRST HIGH-TEMPERATURE ELECTROLYSER (HTE)
implemented in an industrial environment

84 %
electrical efficiency based on LHV of hydrogen for HT electrolysis system utilising steam from waste heat

10000+ HOURS
of operation for HT electrolysis system

90 000 Nm3
of hydrogen produced

10 MINUTES
time to switch from electrolysis to fuel cell (reversible) operation, showing the dynamic operation capabilities of solid oxide cell technologies.

VERY LOW DEGRADATION RATE
less than 1 % degradation per thousand hours of operation

H2FUTURE

6 MW
largest atmospheric pressure PEM electrolyser to be developed and demonstrated

1 200 CUBIC METRES
of green hydrogen to be produced per hour

26-MONTH-LONG TRIALS
of the 6 MW electrolysis power plant

80 % STACK EFFICIENCY
reached for converting electricity into hydrogen

IMPACT

GrInHy

10 % OF CURRENT HYDROGEN CONSUMPTION DISPLACED
4 million m3 required per year for the annealing process on-site in the GrInHy project

FIVE-FOLD SCALE-UP
of electrolyser capacity in GrInHy2.0 planned

LESS THAN 1 000 EUR / kW COST
within five years based on comprehensive scale-up study

150 MILLION TONNES OF CO_2 ABATEMENT PER YEAR IN THE EU
now possible when using green hydrogen in the reduction process during steel production

NOMINATED FOR 'BEST PROJECT INNOVATION'
FCH JU Awards 2018

H2FUTURE

WINNER
at FCH JU Awards 2018

REPLICABILITY
A 1 GW electrolyser would be required to provide the amounts of hydrogen necessary to fully convert a steel plant for direct iron ore reduction through hydrogen

REINFORCED PLAUSIBILITY
of the Hydrogen Roadmap

FIND OUT MORE

www.fch.europa.eu/page/fch-ju-projects
www.green-industrial-hydrogen.com
www.h2future-project.eu

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FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

A partnership dedicated to clean energy and transport in Europe