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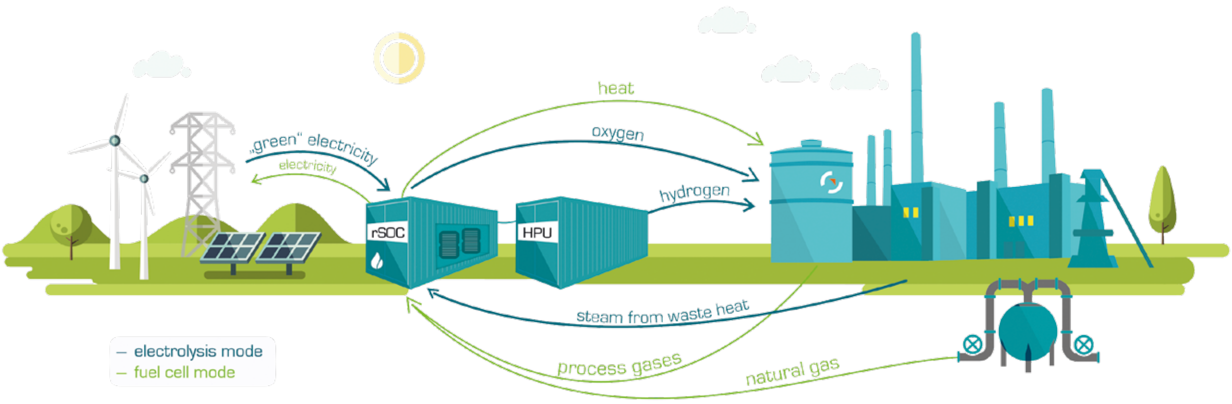
FUEL CELLS AND HYDROGEN JOINT UNDERTAKING FUNDING PROJECT

GRINHY – GREEN INDUSTRIAL HYDROGEN

GrInHy Green Industrial Hydrogen



PROJECT OVERVIEW

The GrInHy project demonstrates the integration and operation of a steam electrolyser called **Sunfire-HyLink** at the industrial site of Salzgitter Flachstahl GmbH for hydrogen production.

The electrolyser based on solide oxide cell technology has a power input capacity of 150 kW_{AC} to provide 40 Nm^3/h hydrogen. Designed as a scalable module, it is also made for large scale applications with container units up to megawatt power input capacity. In GrInHy, the system is configurated for reversible operation. It produces hydrogen in the electrolyser mode, whereas in the fuel cell mode, it generates electricity and heat from gas to provide power in times of low renewable electricity supply.

The project started in March 2016 with a project period of three years.

OBJECTIVES

+ Efficiency – Verification of electrolyser electrical efficiency ≥ 80 $\%_{LHV}$
+ Upscaling – Reaching electrolyser AC power input of 150 kW_{AC}
+ Operation – System operation for a minimum of 7,000 h
+ Lifetime – Degradation rate below 1 %/ 1,000 h for more than 10,000 h
+ Reversible Operation – Increase of capacity factor for stronger business case
+ Costs – Developement of reliable data on cost and cost reductions
+ Exploitation Roadmap – Strategy for Sunfire-HyLink market roll-out, optional configurated for reversible operation

MISSION

+ Integration of a steam electrolyser into an existing industrial energy and media supply infrastructure
+ Meeting the quality standards of the steel industry for hydrogen supply
+ Assessing the potential of integrating volatile renewable electricity sources
+ Utilisation of waste heat from high-temperature industrial processes
+ Examination of process gases from iron and steel production as fuel for the operation in fuel cell mode to produce electricity and heat
+ Assessment of the techno-economic feasibility based on the steel industry as well as other industrial sectors

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RESEARCH AND INNOVATION

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PROJECT SPECIFIC RESEARCH

Solide Oxide Cell and Stack Development

+ Improvement of cell materials, esp. glass sealings and interconnectors
+ Enhancement of corrosion properties by improved protective coatings
+ Long-term stability and degradation testing on stack level (at least 10,000 h operation; degradation target < 1 % / 1,000 h)
+ Raise of power level per stack
+ Utilisation of process gases on stack level for fuel cell operation mode for power production with efficiencies of approx. 50 %

Research on System Level

+ Stack unit modification for increased power input
+ Proof of ability to produce high quality hydrogen from renewable electricity for industrial onsite use

Natural Gas Processing

+ Improvement of natural gas processing via catalytic reforming under various conditions without catalyst coking

GRINHY INNOVATION

+ Waste heat utilisation (steam) to reach overall electrolysis efficiency of more than $80\,\%_{LHV}$
+ Installation and operation in an industrial environment including direct connections to the local hydrogen grid of the steel factory and their monitoring systems
+ Fuel cell mode with poly generation of power and heat to maximise overall system efficiency
+ Flexible operation in electrolysis mode according to fluctuating electricity supply (e.g. from wind)
+ Flexible operation in fuel cell mode to provide power in times of low renewable electricity supply

PROJECT PARTNERS

Salzgitter Mannesmann Forschung GmbH | Salzgitter Flachstahl GmbH | Sunfire GmbH | Boeing Research & Technology Europe S.L.U. | Politecnico di Torino | EIFER - European Institute for Energy Research | VTT Technical Research Centre of Finland | IPM - Institute of Physics of Materials (Academy of Sciences of the Czech Republic)

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