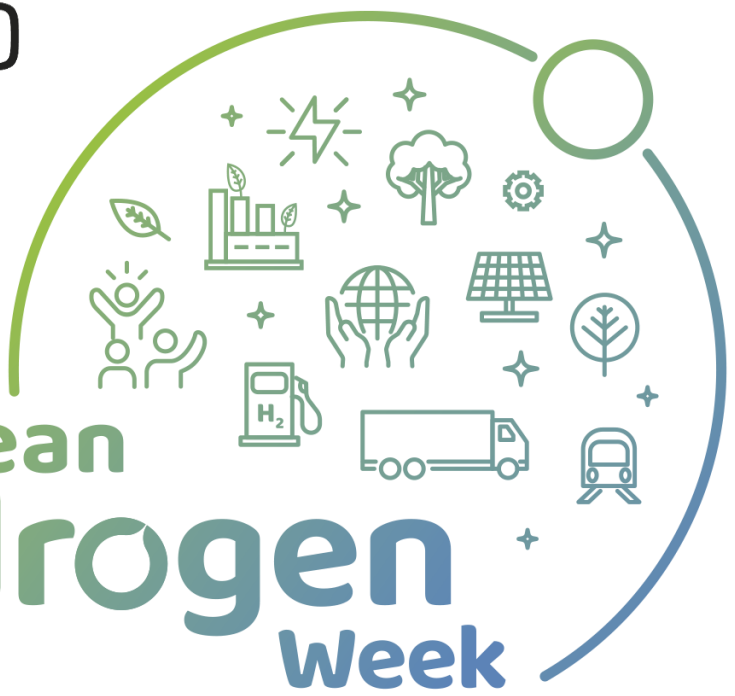
Green Industrial Hydrogen via steam electrolysis

GrInHy2.0
Green Industrial Hydrogen



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FCH

European Commission

Project Overview

- Call year: 2018
- Call topic: FCH-02-2-2018 - Demonstration of large-scale steam electrolyser system in industrial market
- Project dates: 01/2019 – 12/2022
- % stage of implementation 01/11/2019: 45.8 %
- Total project budget: 6 million €
- FCH JU max. contribution: 4 million €
- Other financial contribution: none
- Partners: Salzgitter AG, Sunfire GmbH, Paul Wurth S.A., Tenova SpA, CEA

European Hydrogen Week

Who is GrInHy2.0?

GrInHy2.0
Green Industrial Hydrogen

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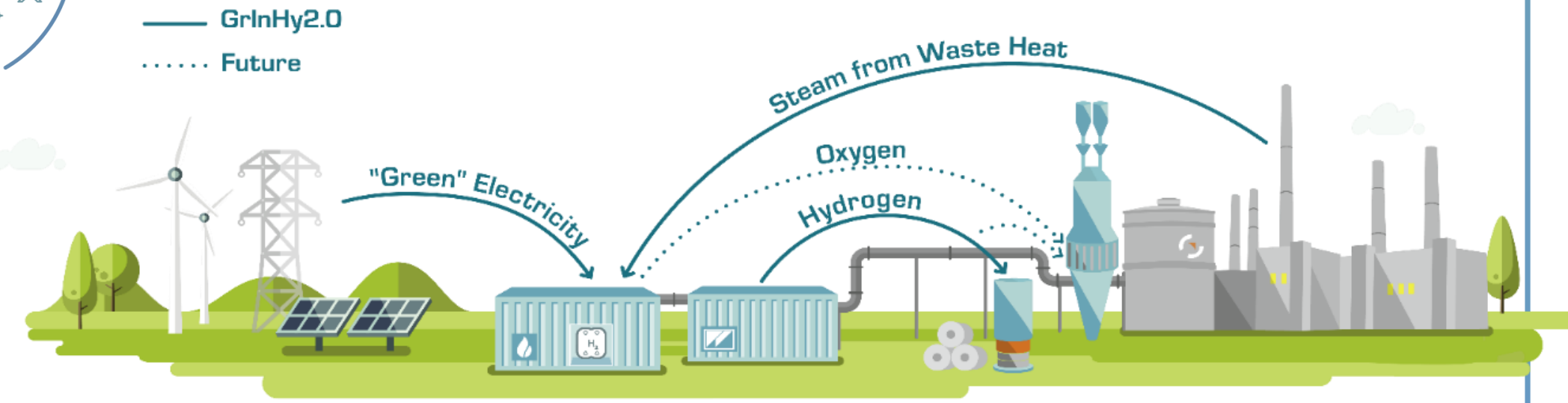
Project Summary - Mission



GrInHy2.0 is...

- the first Hight-Temperature Electrolyser of the Megawatt-class.
- most energy-efficient hydrogen production using green electricity and steam from waste heat.
- the full integration into the existing infrastructure of Salzgitter's steel plant.
- setting new standards in long-term stack validation of the Solid Oxide Electrolysis Cell technology.

Project Progress - World's biggest HTE

GrInHy2.0 Green Industrial Hydrogen

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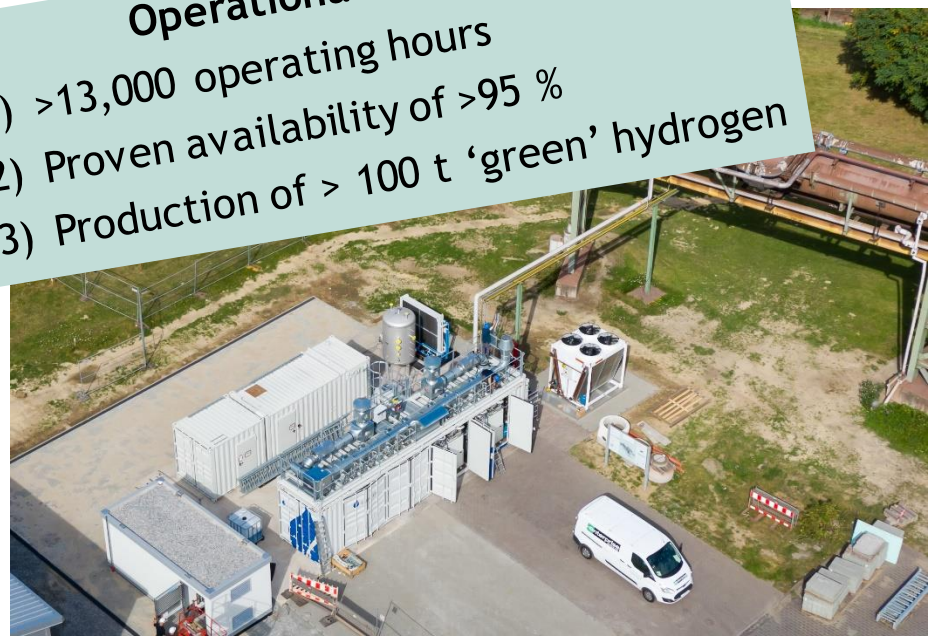
Achievement to-date 150 $kW_{el,AC}$

720 $kW_{el,AC}$

25% 50% 75%

Operational objectives

(1) >13,000 operating hours
(2) Proven availability of >95 %
(3) Production of > 100 t 'green' hydrogen



	GrInHy2.0	AWP
Nominal Power	720 $kW_{el,AC}$	-
Net H_2 Production Rate	18 kg_{H2}/h	>15 kg_{H2}/h
Electricity Consumption	39.7 kWh_{el}/kg	<40 kWh_{el}/kg
Part Load Ability	15…100 %	
Ramp-up Time	5 min	

Delivery of the world's largest High-Temperature Electrolyser

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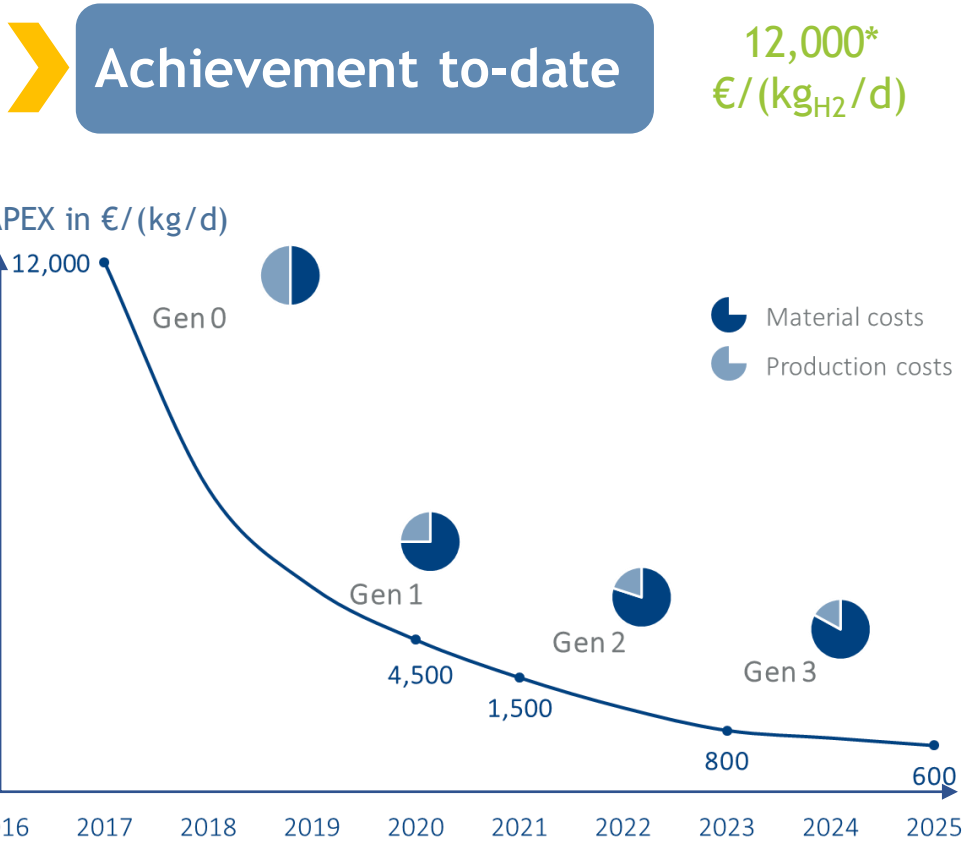
Project Progress - Project Progress - Reduction of CAPEX

Achievement to-date

12,000* €/(kg$_{H2}$/d)



4,500 €/(kg$_{H2}$/d)

	GrInHy2.0	AWP
CAPEX target	4,500 €/(kg/d)	4,500 €/(kg/d)

Cost reduction drivers

(1) Integration of multiple stacks into one system.

(2) Reduction of material costs: Increase of purchase volume and using cost-optimized materials.

(3) Reduction of production costs by reducing cycle times via automation.

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*GrInHy: Costs includes RSOC BoP

Exploitation Plan/Expected Impact

Impact

(1) Increase energy efficiency by using 20 % less electricity compared to low-temperature electrolyser

(2) Reduce operating and capital costs

(3) Prove the reliability of HTE in a full industrial integration

(4) Improve the TRL from 5 to 7 at end of the project

Exploitation

(1) Exploitation of project results in cross-cutting activities such as standardization, regulatory aspects, etc.

(2) Outcome of long-term stack testing will be used for improvement of stack development

(3) Engineering experience and operational results will directly be exploited in MultiPHLY[1)] project

(4) Potential benefits of coupling the HTE with the future hydrogen-based low carbon steelmaking will be applied in Salzgitter's SALCOS project

[1)] GA No. 875123

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The iron and steel sector is responsible for 7 % of the world's CO_2 emissions.

But we have the unique chance to directly avoid those emissions by the use of hydrogen.

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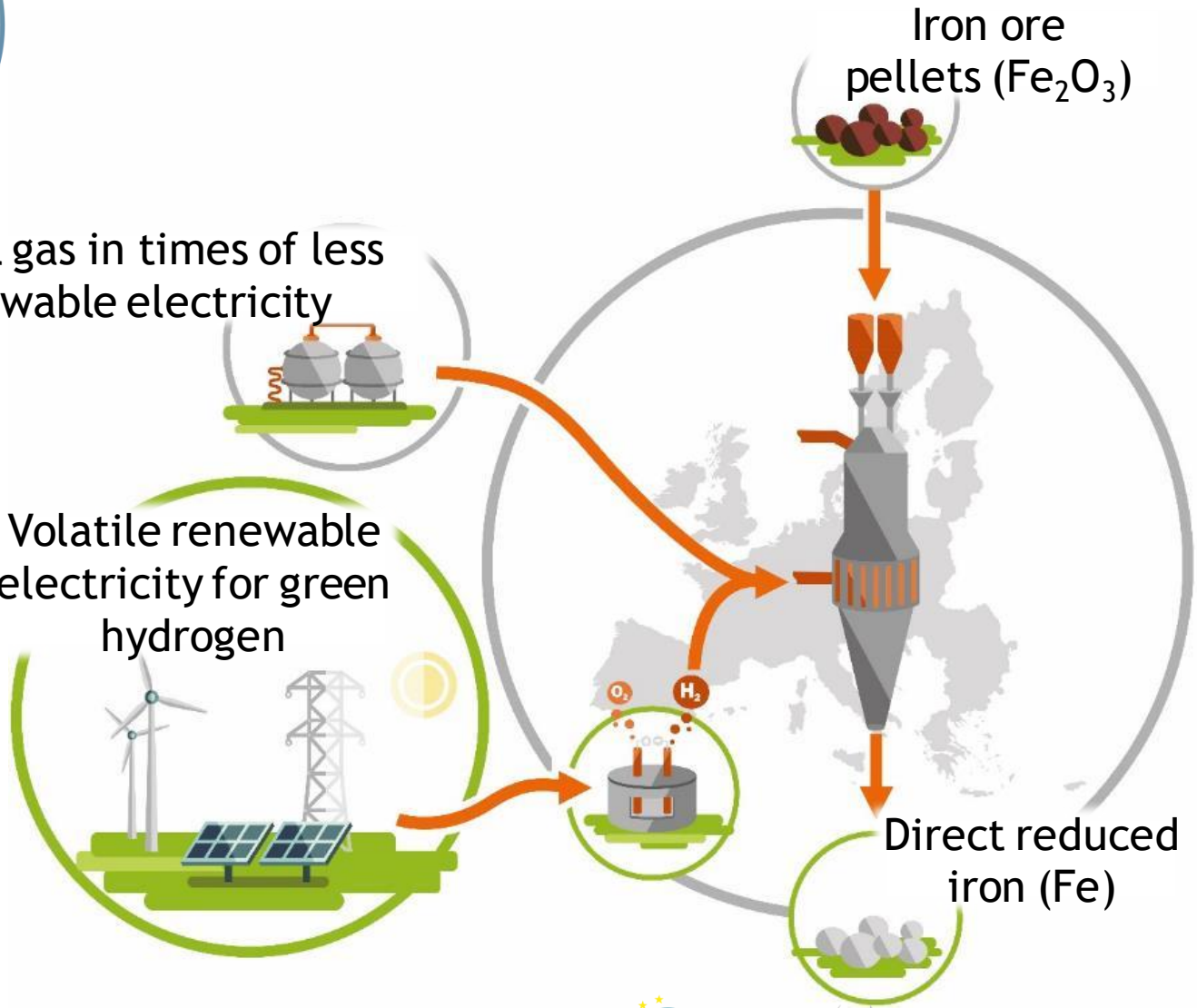
IEA, 2019

Milestone for hydrogen-based steelmaking



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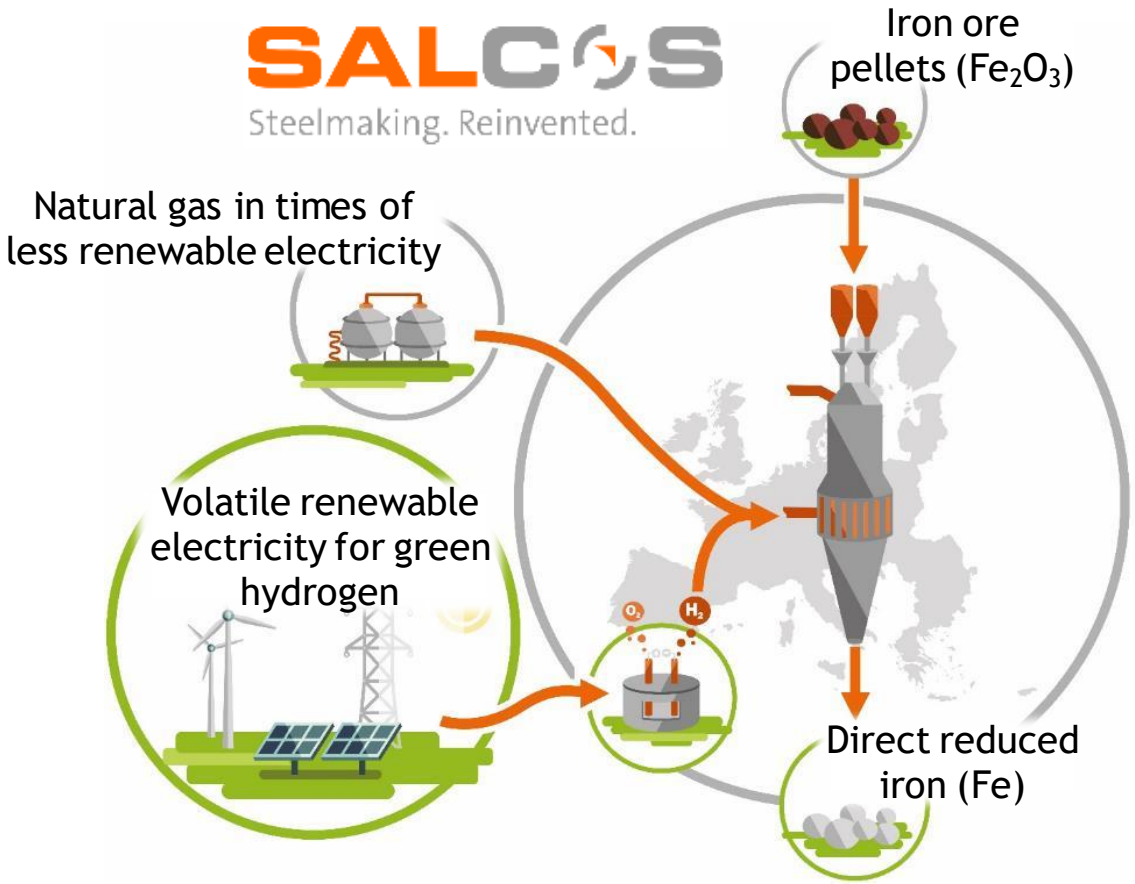
Milestone for hydrogen-based steelmaking



Main technological advantages

- Established Direct Reduction technology
  → technical maturity
- Flexibility in using volatile hydrogen shares
  → supports the transition of the energy system
- Avoiding today's CO_2 emissions by more than 95% instead of recycling
  → reduction potential of >150 Mt of CO_2 in Europe

First study on H_2 steelmaking available soon @CORDIS

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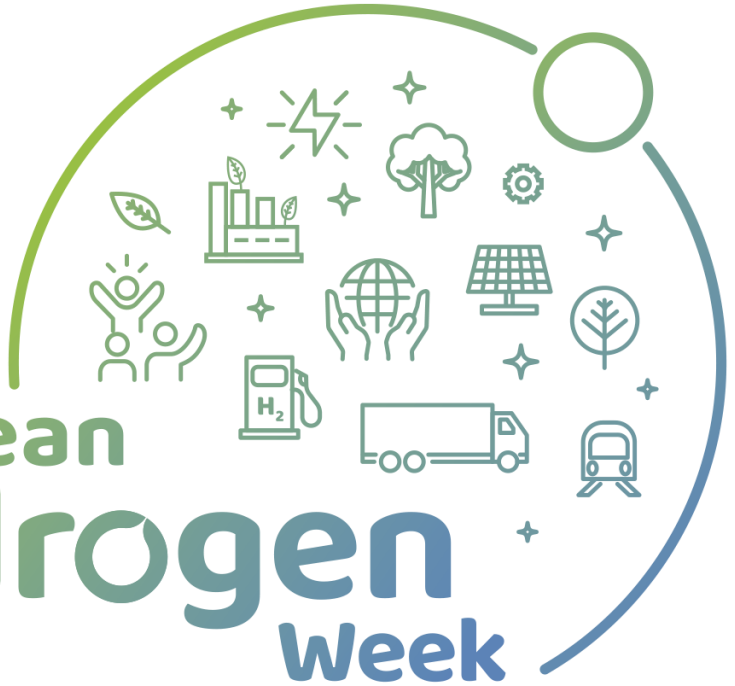

SALZGITTER MANNESMANN FORSCHUNG
A Member of the Salzgitter Group

SALZGITTER FLACHSTAHL
A Member of the Salzgitter Group

sunfire

PAUL WURTH
SMS group

tenova

cea

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