



H2FUTURE
Green Hydrogen



H2FUTURE - Hydrogen from electrolysis for low carbon steelmaking

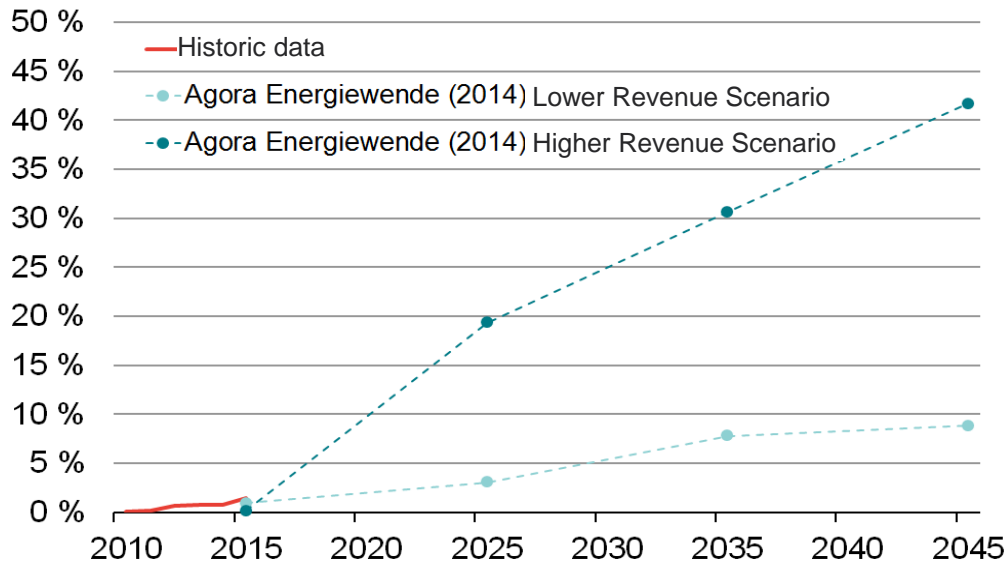
20th March 2018

Rudolf Zauner, VERBUND



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Challenge: Massive Growth in Surplus Electricity Leads to Ever-Increasing Curtailments



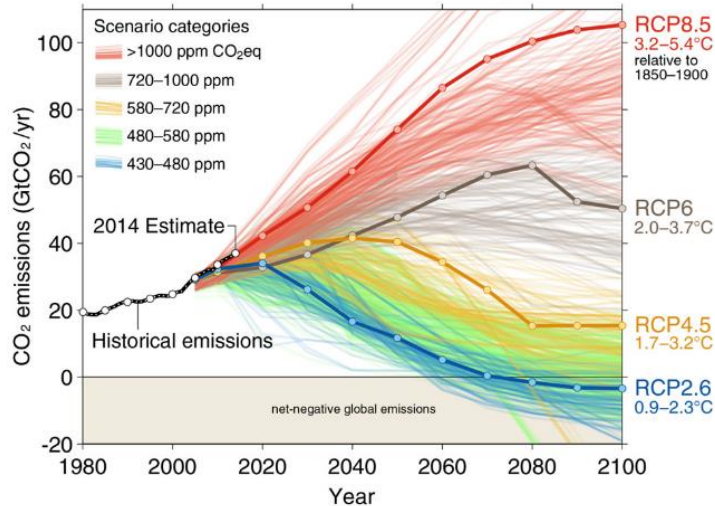
Source: Frontier Economics; Germany

Need for flexibility in the electricity grid



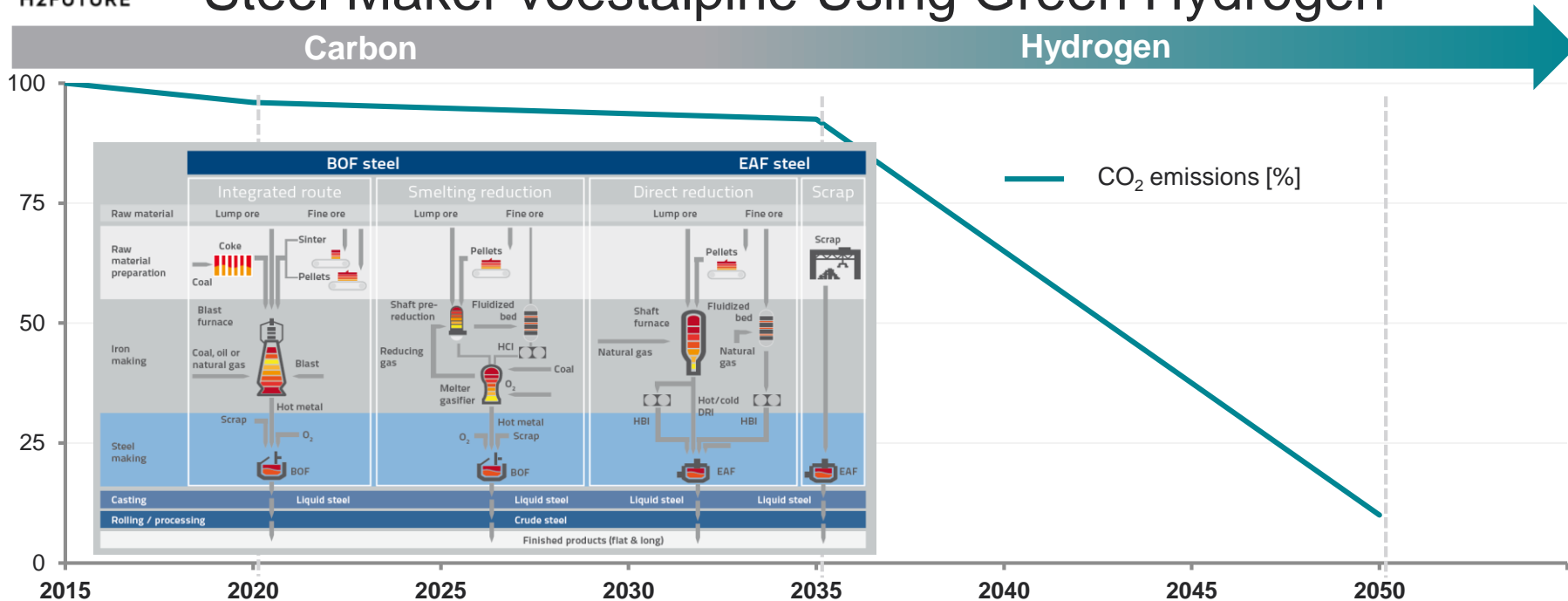
Challenge: All Sectors Need to Gear up Their Efforts for Decarbonisation to Meet Climate Targets

- **Transport sector**
- **Industry sector**
- **Heating/cooling sector**



Source: http://www.nature.com/nclimate/journal/v6/n1/fig_tab/nclimate2870_F2.html

Scenario for Transformation: Decarbonisation of Steel Maker voestalpine Using Green Hydrogen



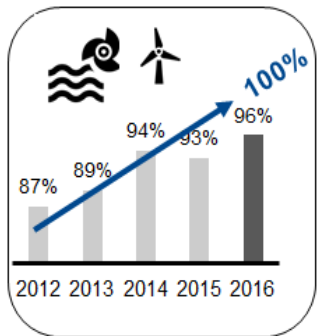
Iron and steel industry accounts for 6.7 % of global anthropogenic and 31 % of industrial CO₂ emissions.



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VERBUND: Sector Coupling Using Green Hydrogen

Green Electricity



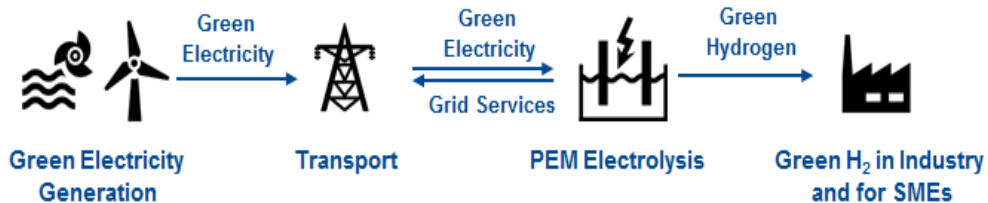
- **21 pumped storage plants** (3,260 MW)
- **693 million m³ storage volume** (1,800 GWh)



- **Trading** in 12 countries (24/7), electricity / gas → 100 TWh per year



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H2FUTURE Project Overview

- Project Partners:
 - VERBUND Solutions GmbH (project coordinator)
 - voestalpine Stahl GmbH
 - Siemens AG
 - K1-MET GmbH
 - Austrian Power Grid AG
 - Energy research centre of the Netherlands (ECN)

- Project Budget: **18 million EUR**
- Total Funding: **12 million EUR** by FCH JU
- Project Duration: **4.5 years, starting 1st January 2017**

Verbund

voestalpine

ONE STEP AHEAD.

SIEMENS

K1 MET
metallurgical competence center

APG
AUSTRIAN POWER GRID

ECN

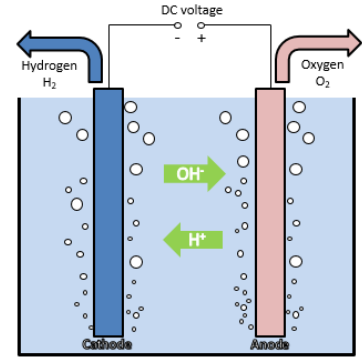
Installation & Operation of an Electrolysis System at the voestalpine Production Site in Linz, Austria



Source: voestalpine

Key Data

- **6 MW PEM electrolyser**
- **Pilot plant commissioning** end of 2018
- From 2019: **26-month demonstration and quasi-commercial operation**



Source: Siemens AG

Hydrogen for steel making:
Max. pressure 150 mbar
Quality $\geq 98\%$
Dew point $\leq 10\text{ }^{\circ}\text{C}$



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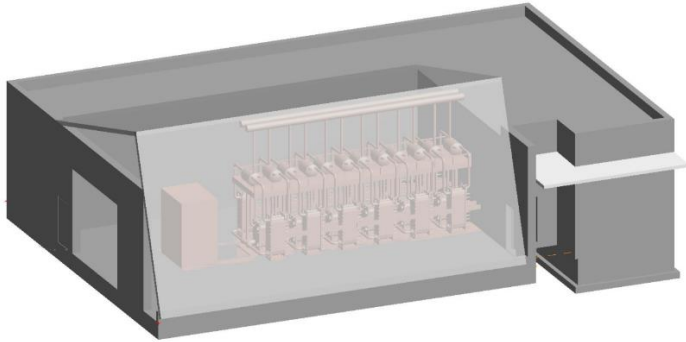
Project Objectives with 6 MW Pilot Plant

- **Design and installation of a 6 MW Siemens PEM electrolyser system** at the voestalpine steel plant in Linz, Austria
- **Industrial integration of renewable hydrogen production** in the steelmaking process
- **26-month demonstration** of the electrolyser system
 - Stress tests / continuous operation 24/7
 - Prequalification for power reserve markets (primary, secondary and tertiary control)
 - Integration of the electrolyser system into the steelworks operation
 - Quasi-commercial operation with revenue streams from both hydrogen and power
- **Accompanying analysis** of different operation modes and monitoring of KPIs
- **Continued operation** of the electrolyser after the end of the project



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Current Status of H2FUTURE



Manufacturing of 6 MW PEM electrolyser (Silyzer 300)

- Already in production

Permitting process

- Permit received at the end of 2017

Engineering documentation and KPIs

- Detail engineering and KPIs have been defined

Start of construction

- Beginning of 2018



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<http://www.h2future-project.eu>