K1-MET overview
H2Future project

Amaia Sasiain Conde
amaia.sasiain@k1-met.com

Coordinated by

Financially supported by

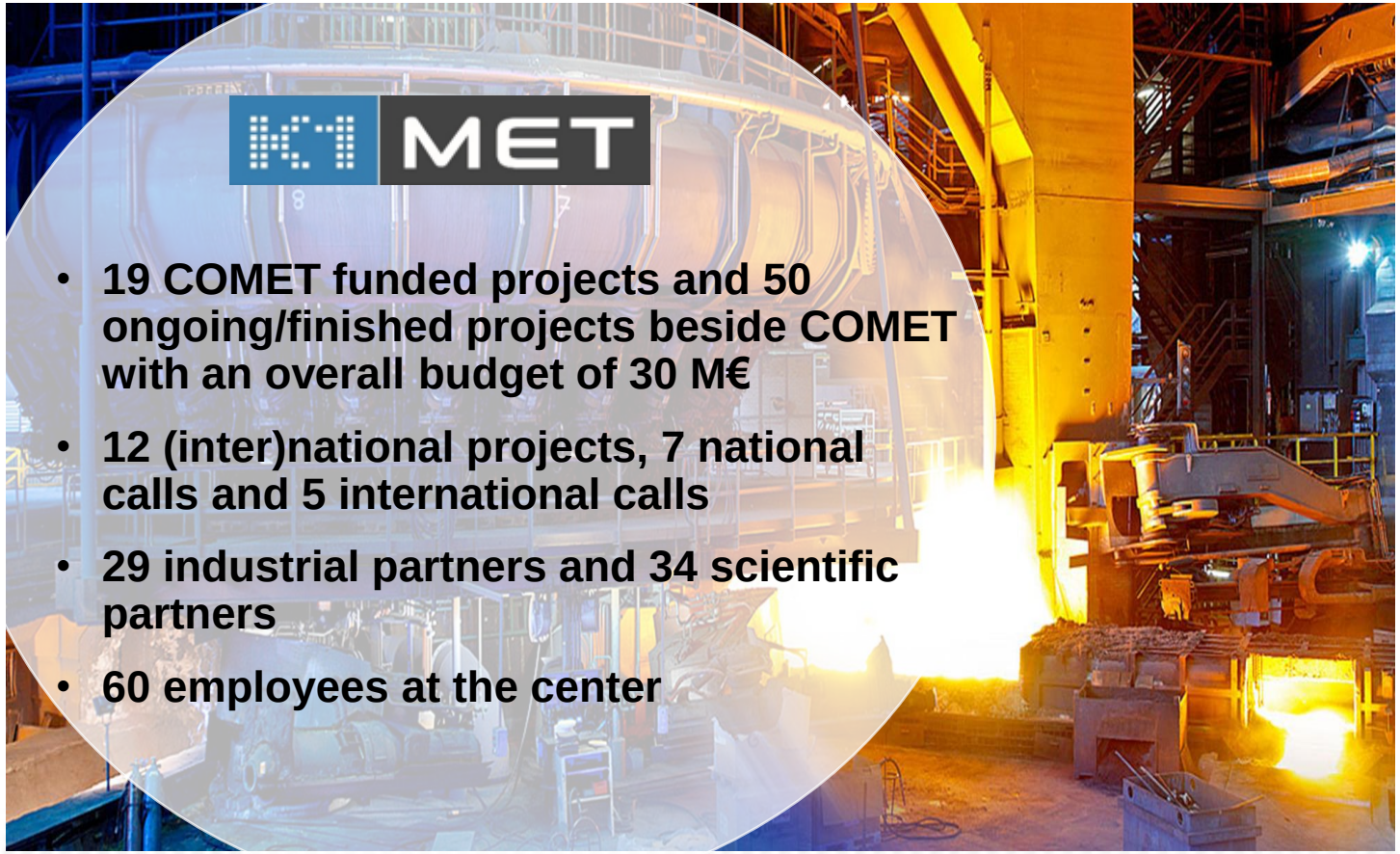
WORKSHOP: Electrolysis: Features, capabilities and projections

Huesca, 23.05.2019

Competence in Sustainable Metal Production

metallurgical competence center

K1-MET - Competence Center for Excellent Technologies in Advanced Metallurgical and Environmental Process Development



- **19 COMET funded projects and 50 ongoing/finished projects beside COMET with an overall budget of 30 M€**
- **12 (inter)national projects, 7 national calls and 5 international calls**
- **29 industrial partners and 34 scientific partners**
- **60 employees at the center**

AREA 1
Raw Materials and Recycling

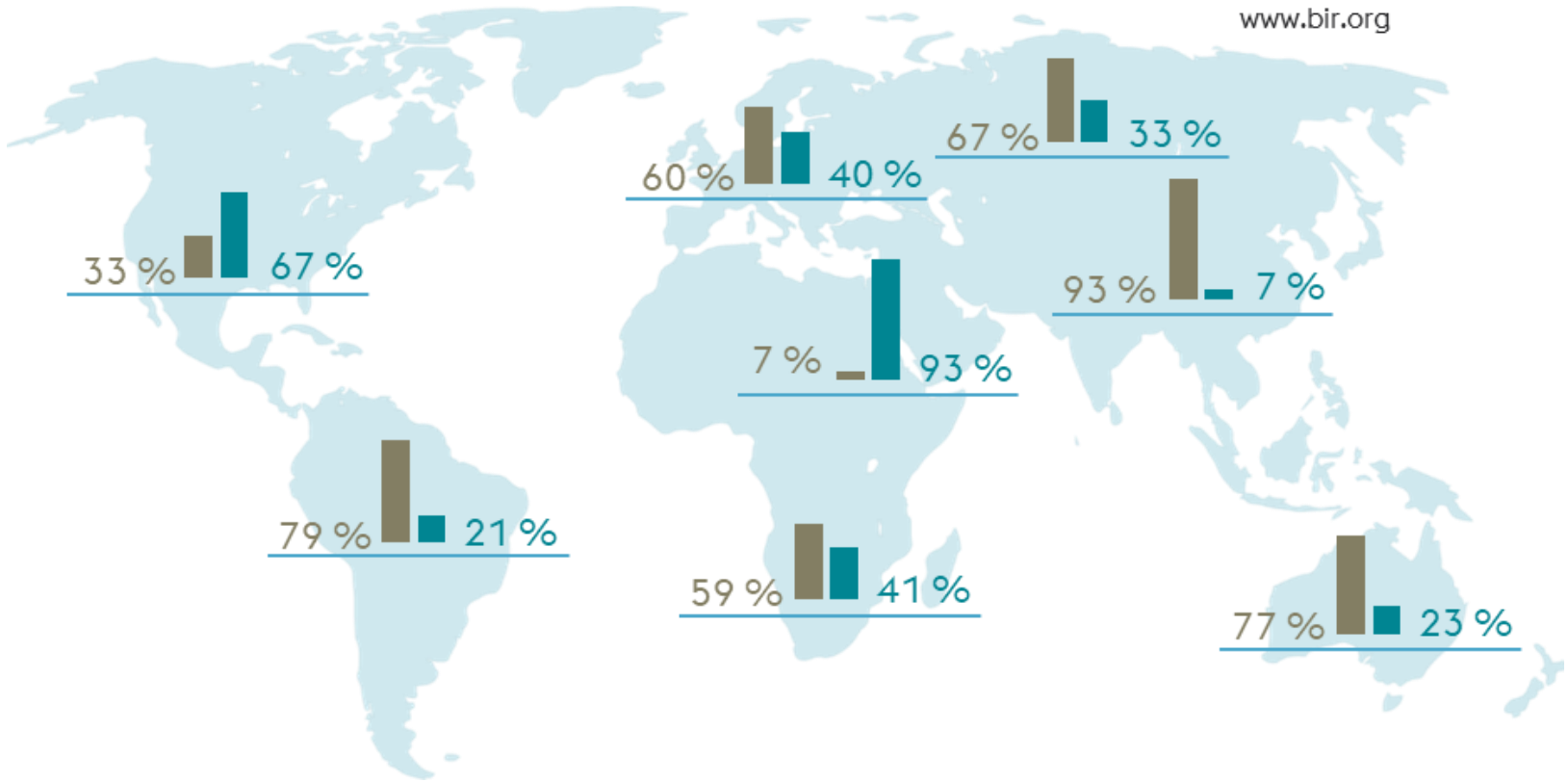
AREA 2
Metallurgical Processes

AREA 3
Low Carbon Energy Systems

AREA 4
Simulation and Analysis

Iron and steelmaking processes

Global steel production



Production share 2017:
73 % BF/BOF route
27 % EAF route (5 % DRI)

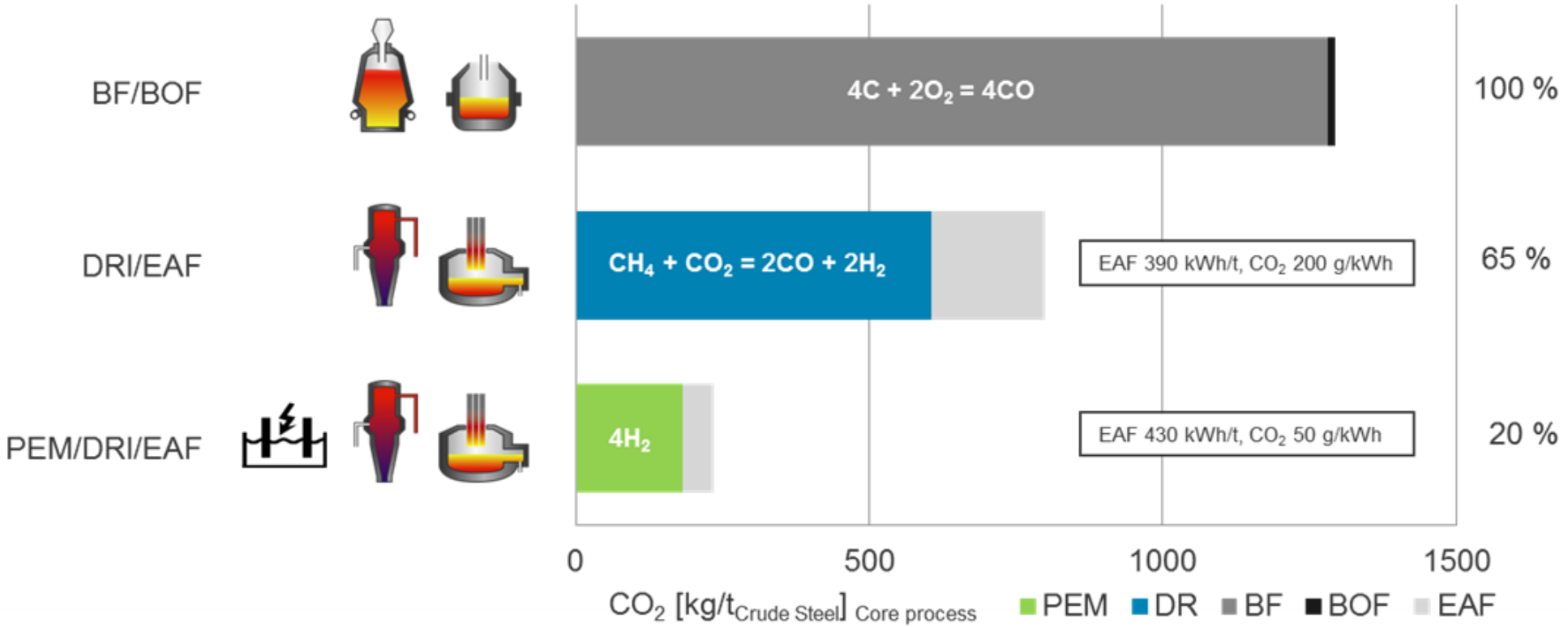
Global steel production: 1.7 billion tons in 2017 (EU 168 million tons)
Two main production routes: Primary steelmaking from iron oxides (BF/BOF* route)
Secondary steelmaking from scrap (EAF* route)

* BF (Blast Furnace) / BOF (Basic Oxygen Furnace) / EAF (Electric Arc Furnace)

Decarbonisation: Status and challenges

Iron and steelmaking processes

The **iron and steel industry** is one of the most energy and resource intensive sectors and responsible for around **7% of global anthropogenic CO_2 Emissions.** DR process with **NG is the first step** for primary steel production **to reduce CO_2 emissions**



* DR (Direct Reduction) / NG (Natural Gas)

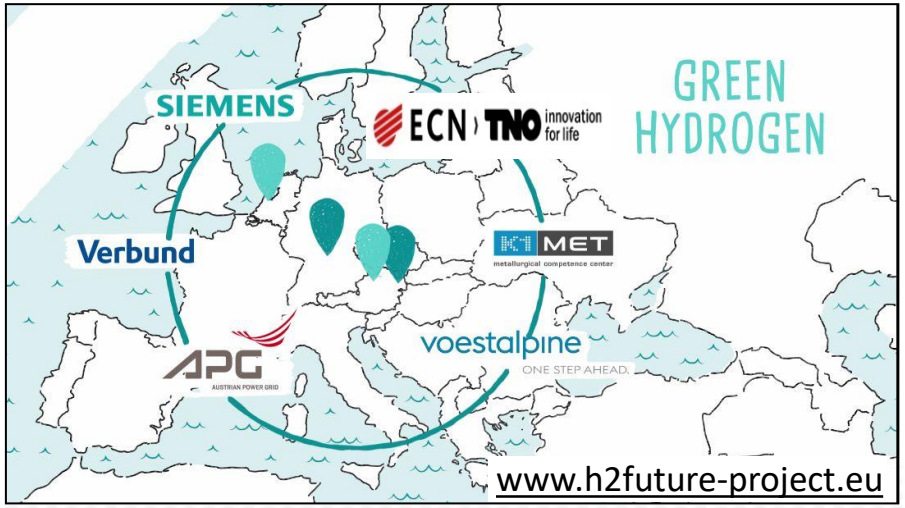
H2FUTURE:
Project overview

IDEA:

Generation of **green hydrogen** by electrolysis of water from **renewable electricity**

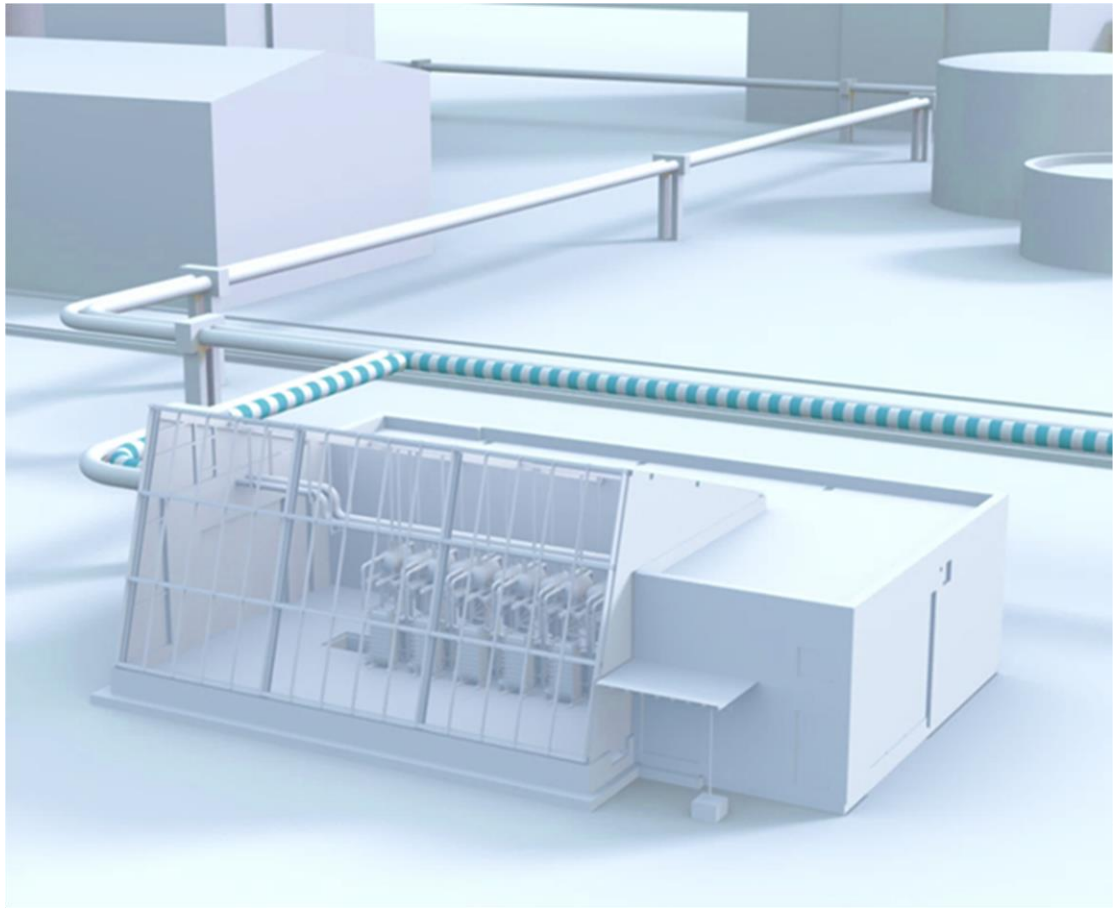
CO_2 = 0,0 kg/m³ H_2

Project Budget:	17,8 M€
EU-Funding:	12 M€ (70 % Funding)
Project Duration:	4,5 years (2017-2021)
Founded by:	Fuel Cells and Hydrogen Joint Undertaking



H2FUTURE

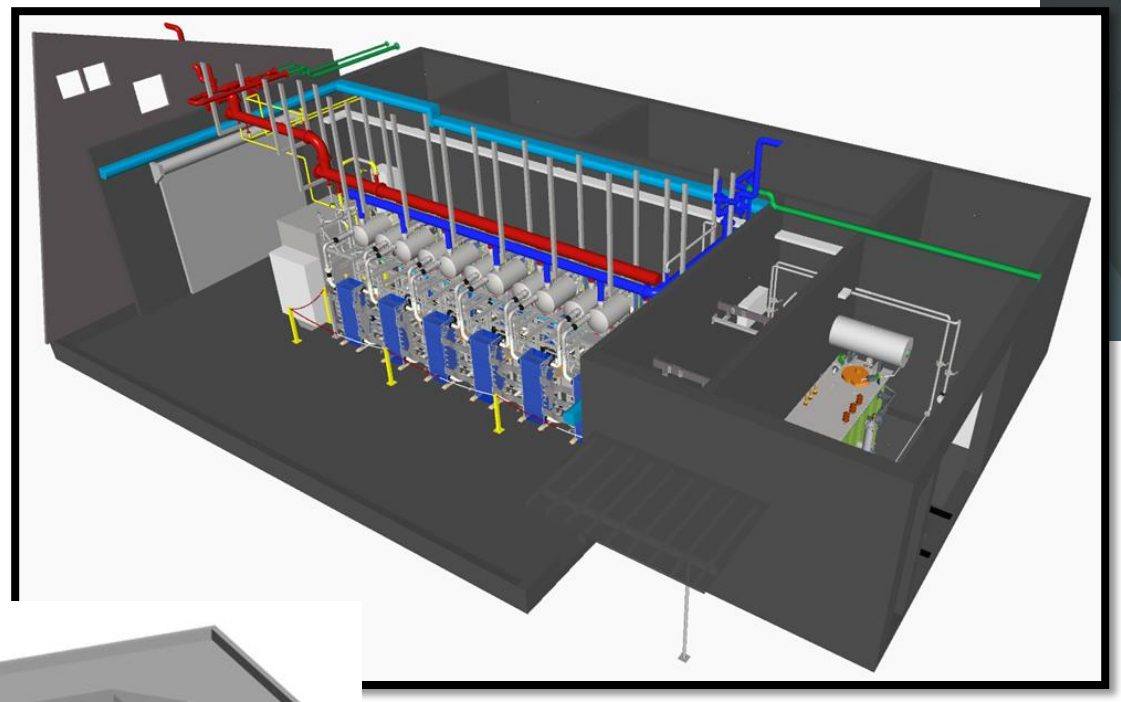
Scope and objectives

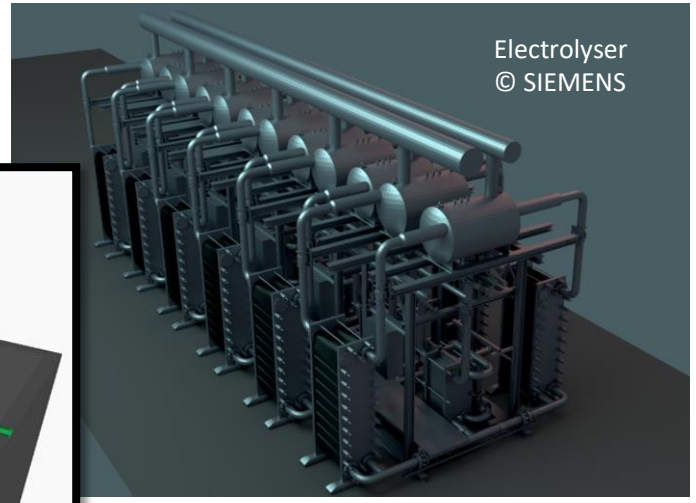


- Design and Installation of a **6 MW PEM Electrolysis plant (1200 m^3/h)** at the voestalpine steel works in Linz
- Provision of network services for **grid balancing**
- **Full-sacale hydrogen production**
- **26-months demonstration** of the electrolyser system
- **Roll-out Scenarios** to replace coal and coke with green hydrogen

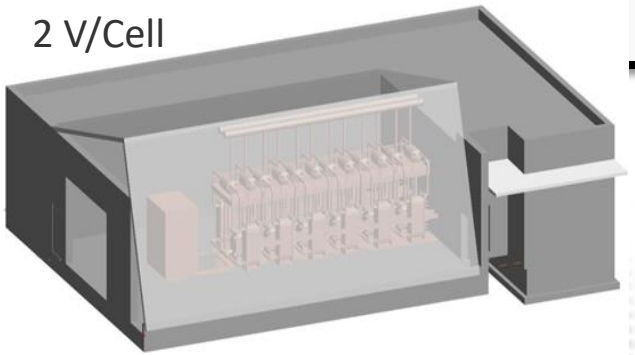
Layout PEM-Elektrolyser system

Technical characteristics





Stacks:	12
Cells:	50 / Stack
Membrane:	0.5 m²/cell
Current density:	1 A/cm²
Voltage up to:	2 V/Cell



At least 170 comparable units for supplying a DR-plant like Texas

Rated Power	6 MW
Hydrogen	1200 $m^3_{(STP)}/h$
Oxygen	600 $m^3_{(STP)}/h$
Cells	600 (12 x 50)
Pressure	max. 150 mbar
Purity	> 98 % H_2

H2FUTURE

Project Status (2017-2021)

metallurgical competence center

February 2018

September 2018

March 2018

October 2018

January 2019

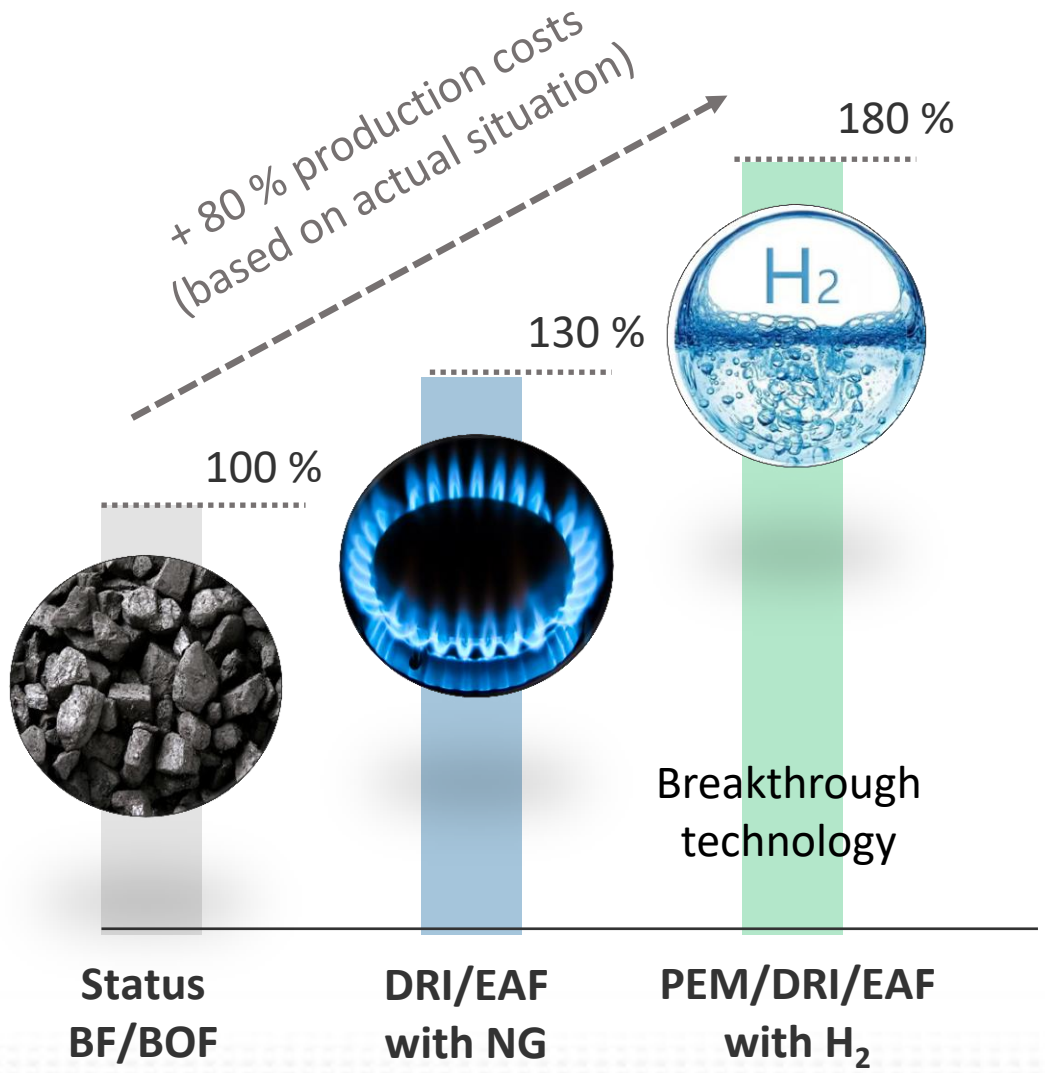
March2019

August 2018

November 2018

Transformation scenario steel industry

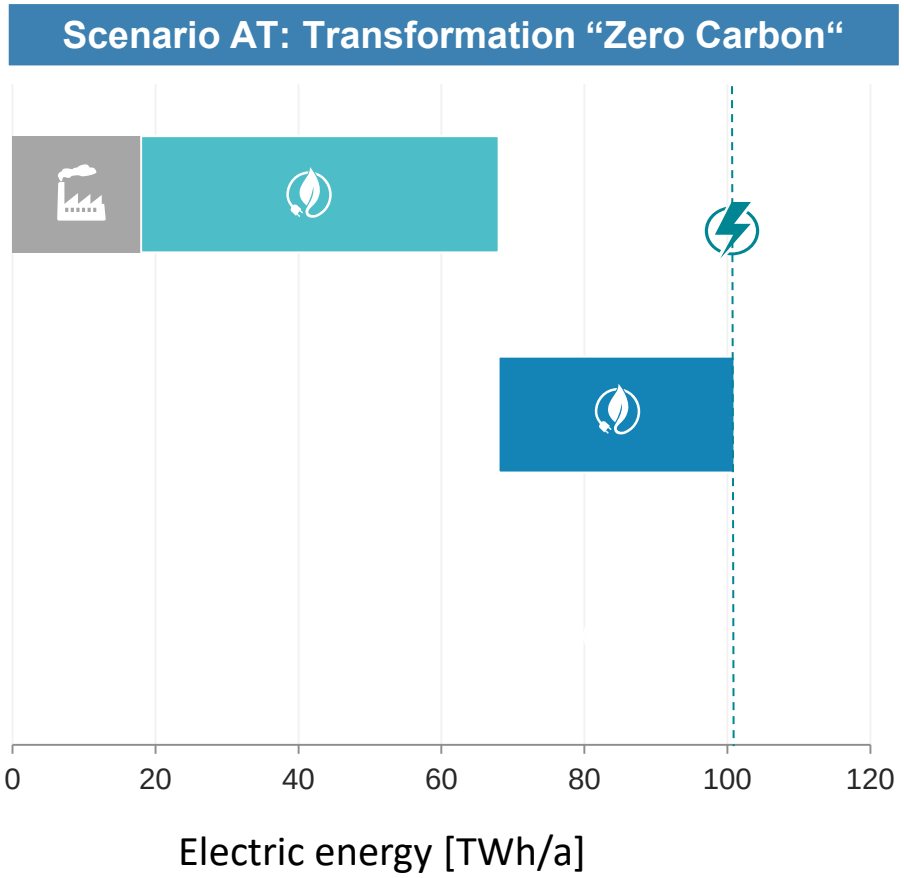
Production costs



- From today's perspective, fully replacement of carbon by renewable hydrogen would nearly result in doubling production costs
- But: Replacement of carbon by hydrogen as reducing agent is the only realistic way to fulfill the CO_2 reduction targets for 2050.

Transformation scenario steel industry

Energy requirements



fossil renewable total

Starting point AT

Electricity production in Austria: 68 TWh/a

Future scenario AT

Additional demand on renewable energy ~ 33 TWh
Available 8760 h/a from external grid

~ 50 % of Austria´s production

~ 4 000 Wind turbines

Future scenario EU

Additional demand renewable energy ~ 500 TWh
Available 8760 h/a from external grid

~ 50 000 Wind turbines

= 1,000 wind turbines (à 4 MW capacity)

Hydrogen steelmaking

Status and challenges

metallurgical competence center

EU **steel industry** committed to **substantial reduction of CO_2** emissions. **CO_2 reduction potential** of the current **crude steel production** routes is **low**

The transition to a competitive low-carbon Europe requires the development of **breakthrough technologies**

Additional **electricity from renewable sources** must be available **and** supportive renewable **infrastructure is required**

Thank you! Questions?

Amaia Sasiain Conde

T. +43/ 732 6989 - 75623

amaia.sasiain@k1-met.com

Coordinated by

Financially supported by