



**H2FUTURE**

Green Hydrogen

**voestalpine**  
ONE STEP AHEAD.



# H2Future: Green hydrogen for steelmaking

10<sup>th</sup> FCH JU Stakeholder Forum in Brussels, 11/22/2017

Thomas Buergler

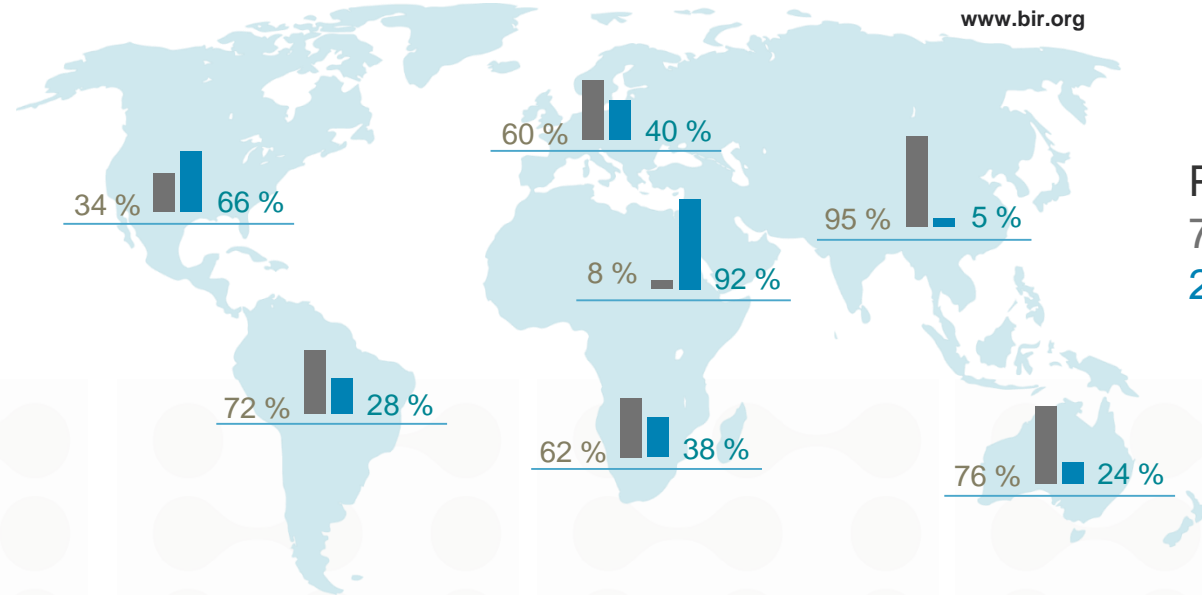


This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 735503. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme and Hydrogen Europe and N.ERGHY



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# Global steel production



Production share 2016:  
75 % BF/BOF route  
25 % EAF route (5 % DRI)

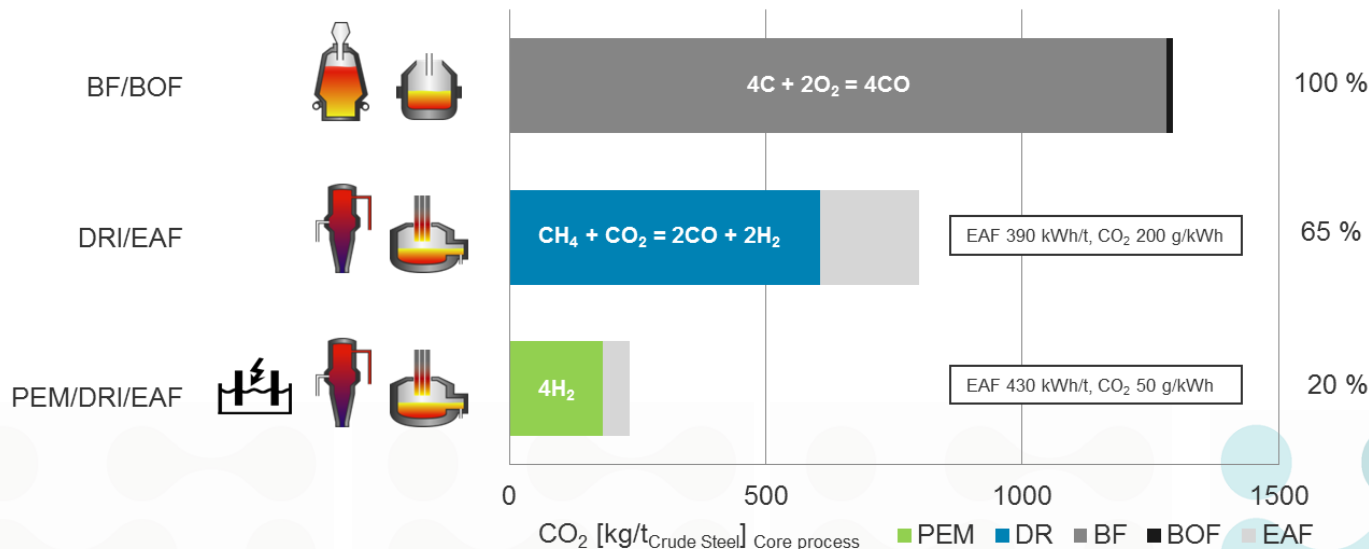
Global steel production:  
Two production routes:

**1.6 billion tons in 2016** (EU 160 million tons)  
Primary steelmaking from iron oxides (BF/BOF route)  
Secondary steelmaking from scrap (EAF route)



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# Carbon, NG and H<sub>2</sub> based steel production

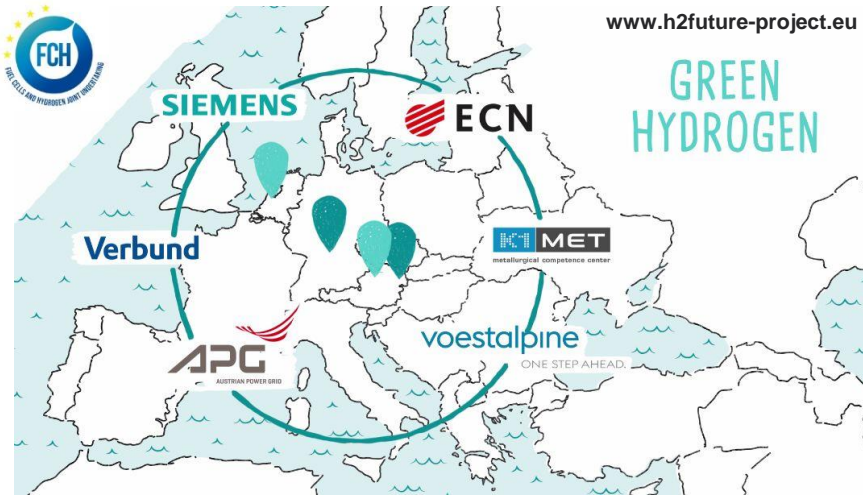


Iron and steel industry accounts for approx. **6,7 % of global anthropogenic and 31 % of industrial CO<sub>2</sub> emissions**. DR process with **NG is the first step** for primary steel production **to reduce CO<sub>2</sub> emissions**. The origin and availability of electric energy is essential for **renewable H<sub>2</sub> production** and use in the **DRI/EAF route**.



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# Technological development



Project Budget: **17,8 M€**  
Total EU Funding: **12,0 M€** (70% funding)  
Project Duration: **4,5 years** (2017-2021)

**One of the world largest PEM** electrolysis unit with 6 MW power and 1.200 m<sup>3</sup>/h H<sub>2</sub> production at voestalpine Linz for **full scale demonstration** of **H<sub>2</sub> production** and **grid balancing** funded by **FCH JU**.



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H<sub>2</sub> grade for primary steelmaking:  
Pressure max. 150 mbar  
Purity ≥ 98%  
Dew point ≤ 10 °C



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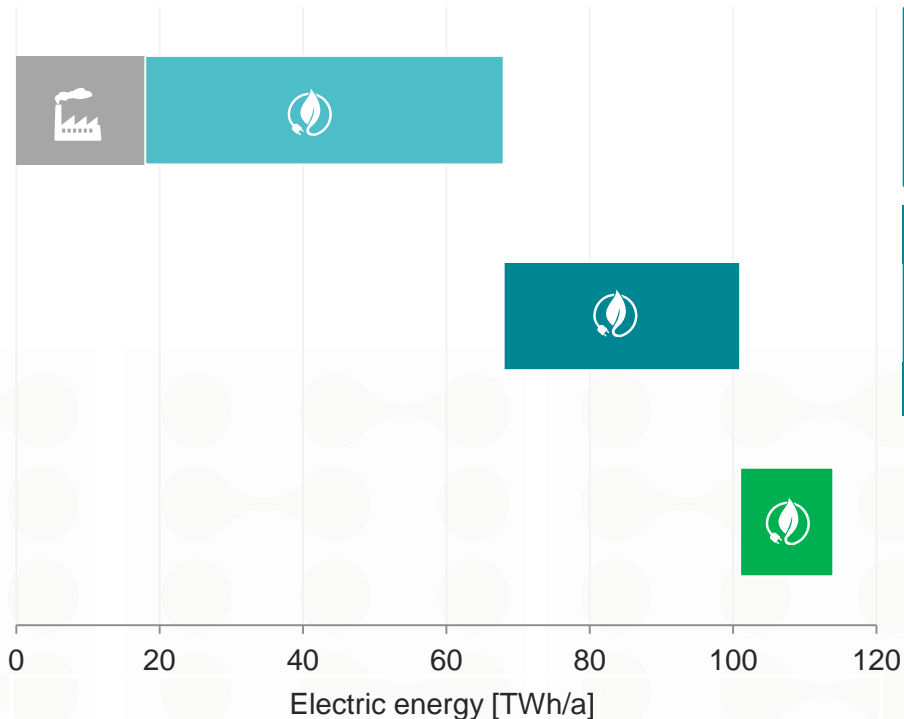
# Transformation scenarios of different sectors



fossil



renewable



## Starting point for transformation in Austria

Actual electric energy production: 68 TWh per year.  
voestalpine Linz and Donawitz almost self sufficient.

## Future scenario voestalpine H<sub>2</sub> based steelmaking

Additional demand for electric energy from renewable  
sources: min. 33 TWh per year, 8760 h available

Approx. 50 % of Austria's electric energy production

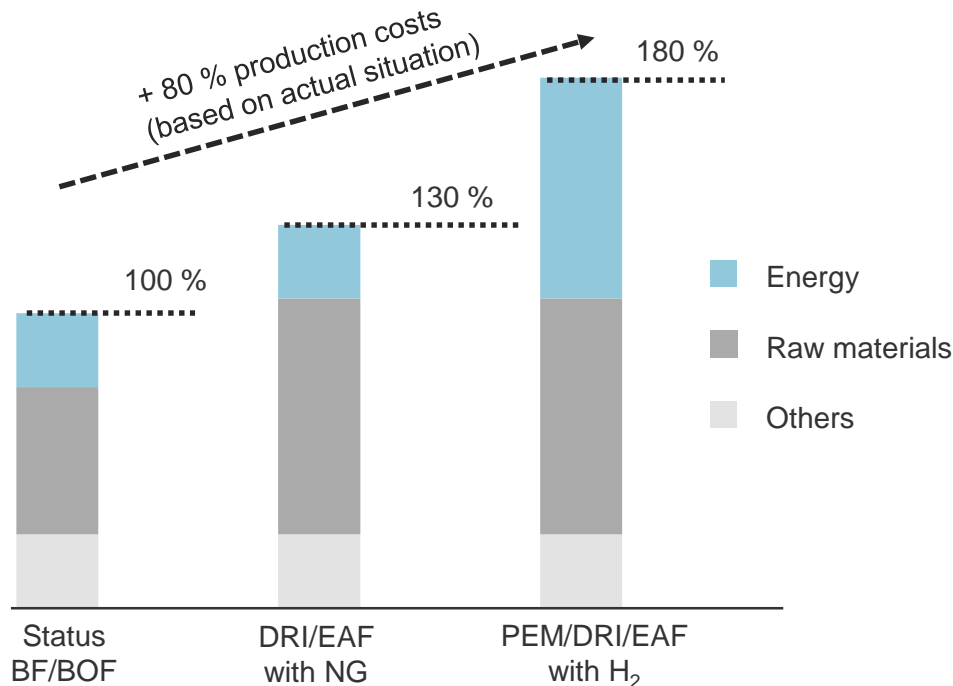
## Competition with other sectors e.g. traffic

Transfer of the car fleet to e-mobility in Austria requires  
additional min. 13 TWh per year. Further pressure on the  
national energy system.



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# Conditions for a transfer to renewable H<sub>2</sub>



- Iron and steelmaking: H<sub>2</sub> is in direct **competition with C and NG** as reducing agent.
- **H<sub>2</sub> grade** for iron and steelmaking is not comparable with use in e.g. fuel cells.
- Complete **replacement of carbon** by renewable energy results in a significant increase in **production costs**.
- But: Replacement of carbon by **hydrogen** as reducing agent is the most promising way to fulfill the **CO<sub>2</sub> reduction targets in 2050**.



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# Thank you! Questions?

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