



Hydrogen  
Europe

Hybrid Steelmaking voestalpine

ONE STEP AHEAD.

# Hybrid Steelmaking – General project idea

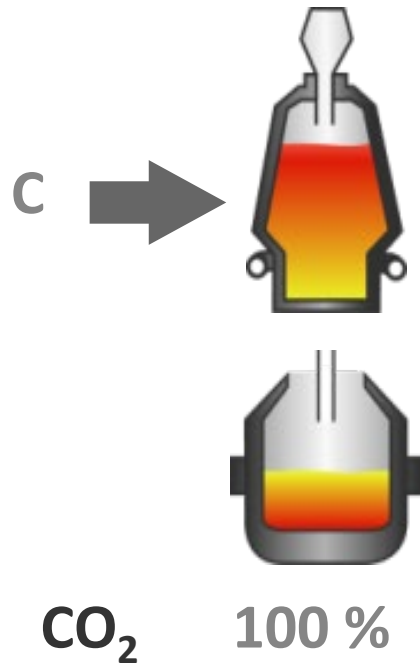


Please provide information about:

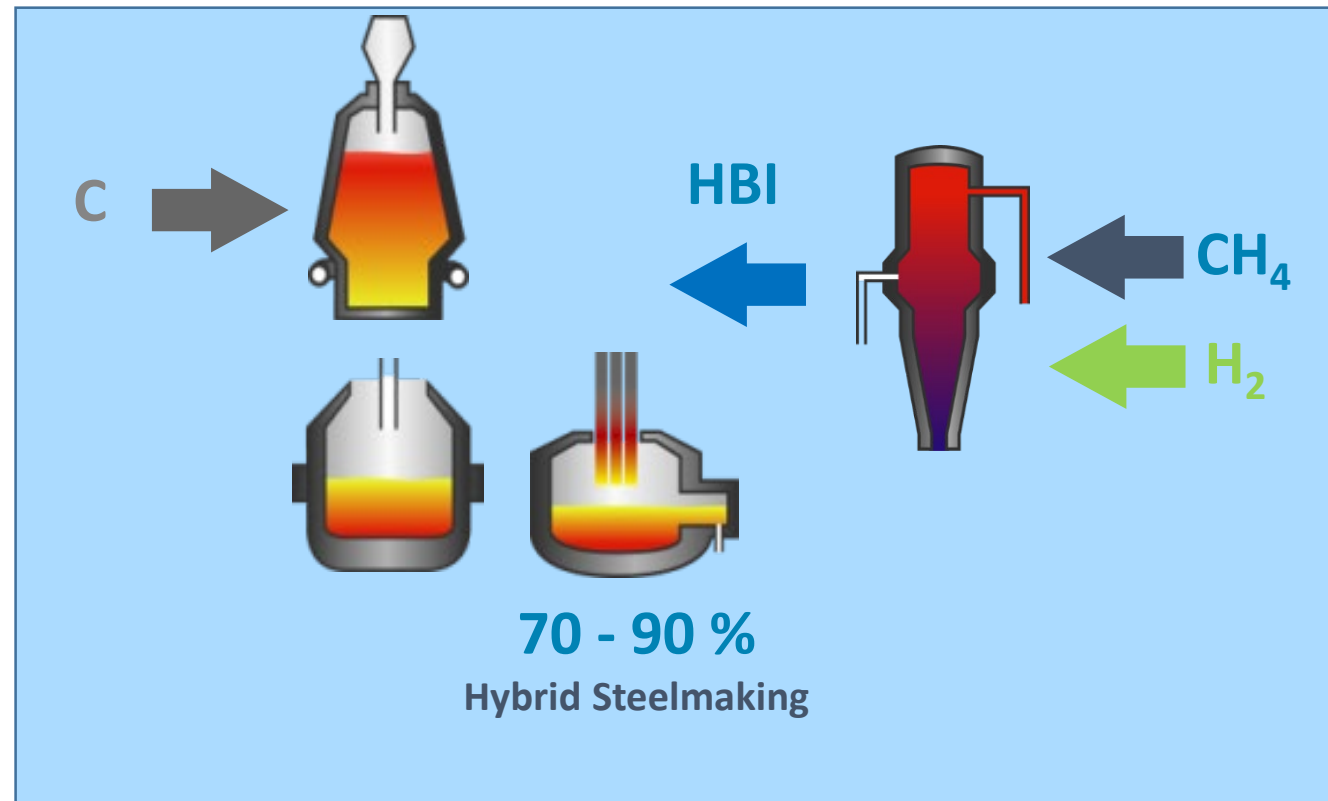
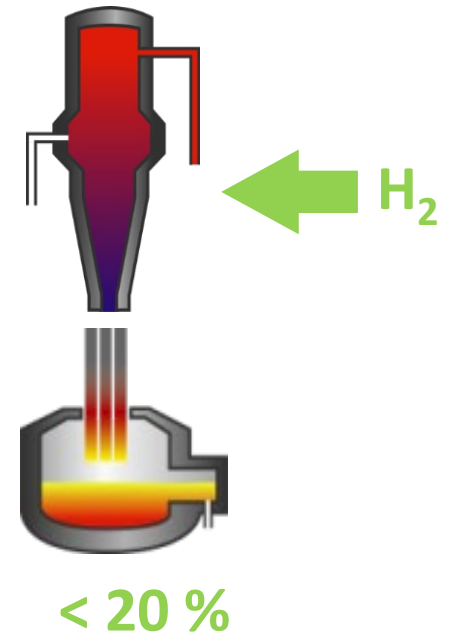
- What is the innovative technology and key elements that need demonstration before commercialization?
  - Production of high quality steel grades with low amount of gaseous impurities and tramp elements by utilizing low-carbon externally sourced iron input, eg. HBI, based on green hydrogen
  - Accordingly adapted charging and melting procedures, plant layout and (by-)product-treatment
  - Optimization of the transition of uniquely BOF production to low-carbon input in combination with EAF
- What are the products (final, intermediate or by-products)?
  - Products: High and highest quality steel grades typically produced in integrated steel plants nowadays
  - By-Products: New slags and dusts requiring adapted treatment for industrial symbiosis and circular economy
- TRL: 8
- How innovative is the project in comparison to the state-of-the-art?
  - Integration of low-carbon iron input sourced externally , eg. HBI, into a classical integrated steel plant
  - First step for the feasibility of decarbonization of integrated steel plants

# Hybrid Steelmaking – General project idea

2010



2050



# Hybrid Steelmaking – Participants and location



- Please provide information about the geographical location (or area) of the project
  - Production and sourcing of low-carbon iron input, eg. HBI, on a worldwide basis
    - voestalpine already operates an HBI plant in Texas, US, which should be taken into account
  - Hybrid Steelmaking in Linz and Donawitz, Austria
    - Possibly all over Europe and the entire world
    - By finally utilizing low-carbon energy input, eg. green power and green hydrogen
  - According sustainable logistics from low-carbon iron processing to Hybrid Steelmaking plants
    - For example, from Texas, US, or the European Baltic Sea area to Linz and Donawitz, Austria
    - Ideally by using sustainable mobility, eg. green power and green hydrogen
- Partners involved in the project:



- Academia
- Energy and Logistics Providers
- Authorities
- Industrial Stakeholders
- Civil Society

# Hybrid Steelmaking – Budget



Please provide information about:

## **FINANCIAL ISSUES: (please note that the presentations will be made public)**

- CAPEX: ~ 600 Mio €
- OPEX: Increase of 20-30% compared to current BF/BOF steel production of comparable steel grades
- Benefit: Mainly lower Carbon Footprint as contribution to Paris Agreement and for low-carbon markets
- What is the level of certainty over envisaged costs and benefits and what are the key variables?
  - Local, regional and international politics which have to set a suitable and reliable regulatory framework
  - Technology development and financing of innovation enabling reliable and affordable input material supply
  - Low-carbon markets and international GHG-price / pricing of final products to maintain internat. competition
- What is the financing gap and how do you expect to address it?
  - CAPEX: specific design of Hybrid Steelmaking plant and infrastructure, depending on public funding
  - OPEX: energy- and raw material management, depending on according markets and regulatory framework

# Hybrid Steelmaking – Maturity



Please provide information about:

**FINANCIAL ISSUES: (please note that the presentations will be made public)**

**MATURITY:**

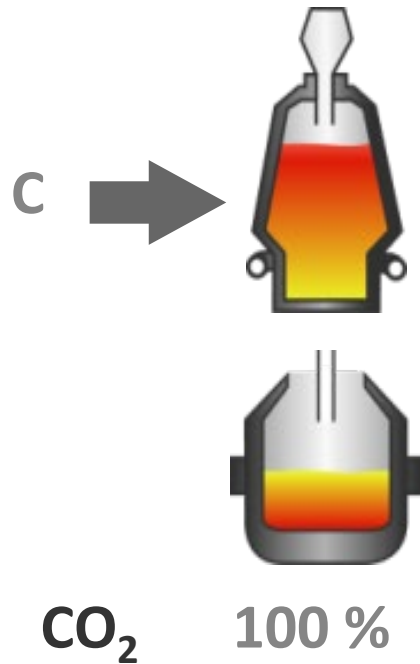
- What is the expected project development timeline?
  - Currently Feasibility study is ongoing, then followed by FEED (Front-End Engineering Design) study
- What steps need to be taken/conditions met before Final Investment Decision?
  - Certainty for access to public funding for additional CAPEX and OPEX
  - Secured competitive supply of sustainable energy and according raw materials
- Is the project dependent on other projects, development of infrastructure or adoption/amendment of certain EU or national regulation?
  - Esp. adaptation of power supply infrastructure incl. sustainable production and storage
    - Ideally also of gas (H<sub>2</sub>) and logistics

Please provide information about:

- What is the GHG emission reduction potential of the project in comparison to a conventional project of the same scale?
  - Hybrid Steelmaking (BF/BOF & new EAF-route) depending on production share of EAF vs. the classic BF/BOF
  - Pure EAF operation maintaining high quality steel production might reduce GHG by > 80 %  
(based on using renewable energy and low-carbon iron input)
- What is the size of the potential market of the products (final, intermediate and by-products)? (IE – is it scalable and replicable on a wider European scale, and if YES – what would the impacts of that be?)
  - Market is basically comparable to current high quality BF/BOF steel production
    - If additional cost can be avoided or neutralized, e.g. by a truly global CO<sub>2</sub>-pricing system or cost-pass-through scheme
  - Successful demonstration may spur the advent of markets for CO<sub>2</sub>-lean steel at a low Carbon Footprint

# Hybrid Steelmaking – Low-Carbon-Steel

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