Hydrogen use in the steel industry in Europe

Dr. Irmela Kofler
K1-MET GmbH

ICEF 2025 Session 3: “Advancing Clean Hydrogen Technologies”

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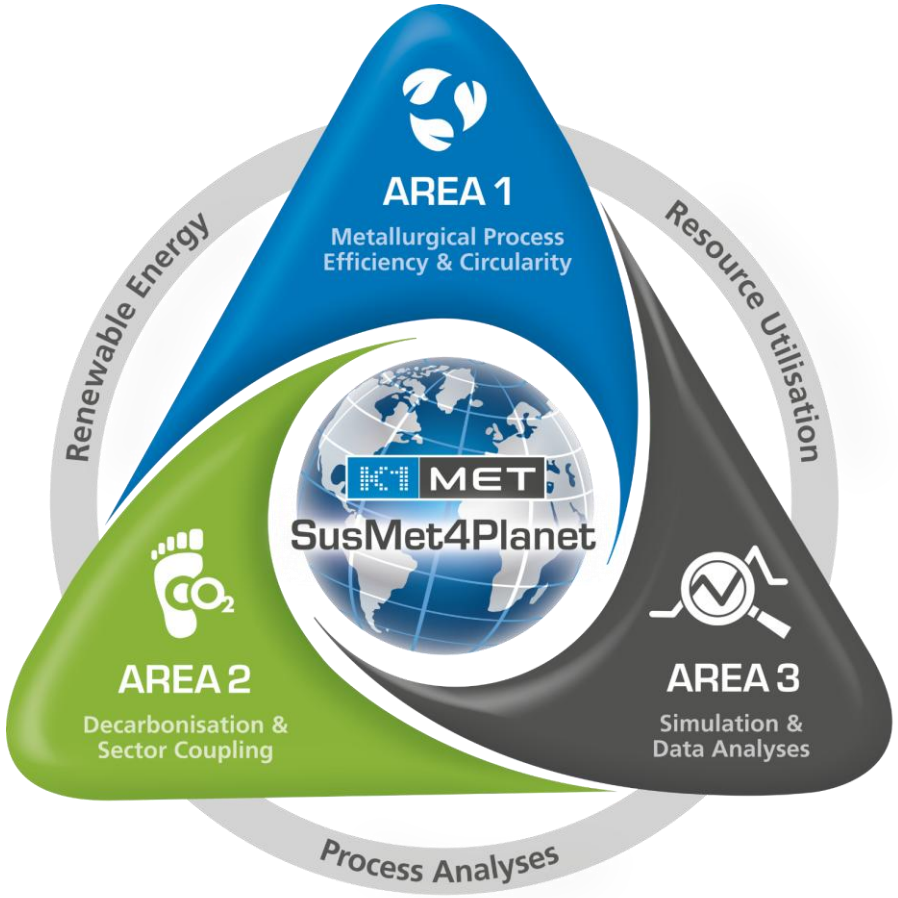
International metallurgical research competence center



"Sustainable digitalized Metallurgy for a climate neutral and resource efficient Planet"

K1-MET addresses the challenges of the metallurgical industry in staying competitive and reaching climate neutrality

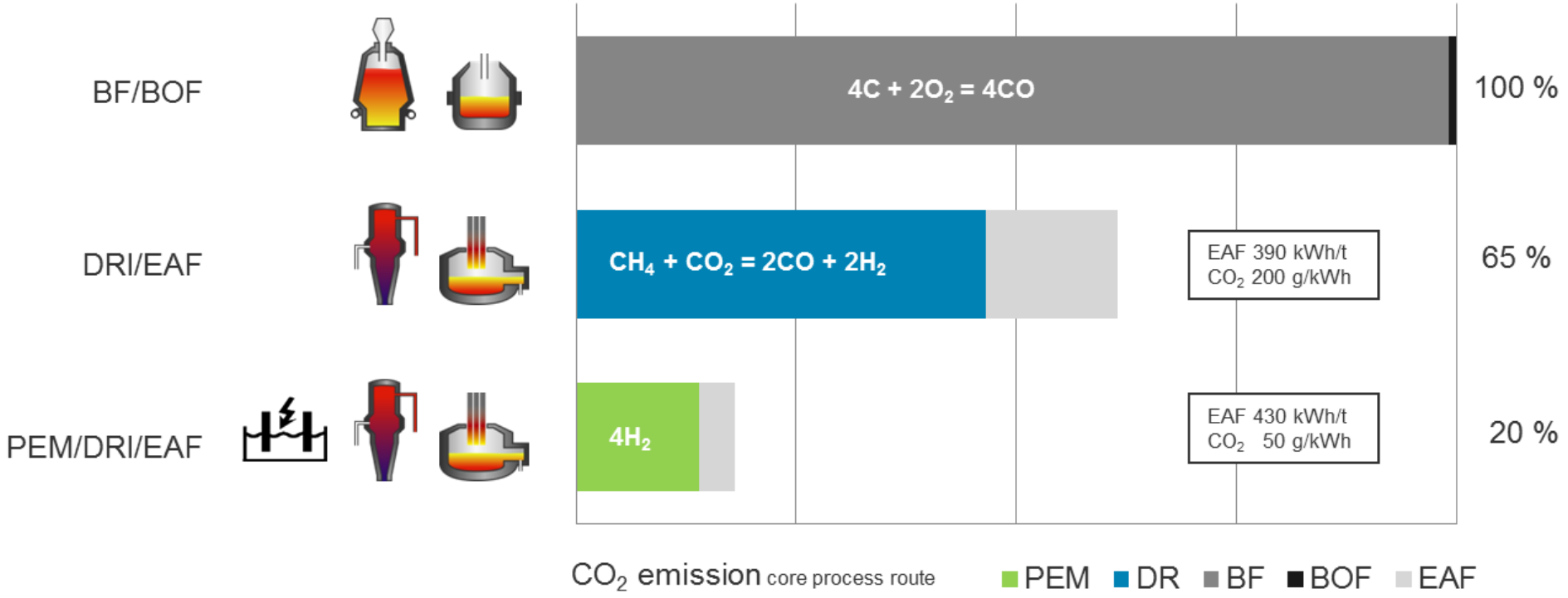
Area 1: Metallurgical Process Efficiency & Circularity
Enhancement of process efficiency and product quality through analytics and treatment of raw and secondary materials

Area 2: Decarbonisation & Sector Coupling
Solutions for climate neutral metallurgy and CO_2 as a source for the carbon cycle

Area 3: Simulation & Data Analyses
Application of modelling approaches to new and existing metallurgical processes and data analysis for an increase of process efficiency

Iron and steelmaking processes

Carbon, natural gas and hydrogen in steel production



- Iron and steel industry: 7 % of global anthropogenic and 31 % of industrial CO_2 emissions
- Availability of renewable electric energy is essential for H_2 production and use in the DRI/EAF route

H_2 based iron and steelmaking

Direct steelmaking from iron ores in one step

SuSteel – Sustainable Steel

- Hydrogen plasma smelting reduction (HPSR)
- Direct production of crude steel by reduction of fine ores with ionized H_2
- Breakthrough technology with a pilot plant at voestalpine Donawitz site (Austria)
- Upscaling from a previous installed reactor from 100 g to 100 kg batch operation with a max. power of 250 kW

HPSR pilot plant at voestalpine Donawitz site

H_2 based iron and steelmaking

Fluidized bed iron ore reduction

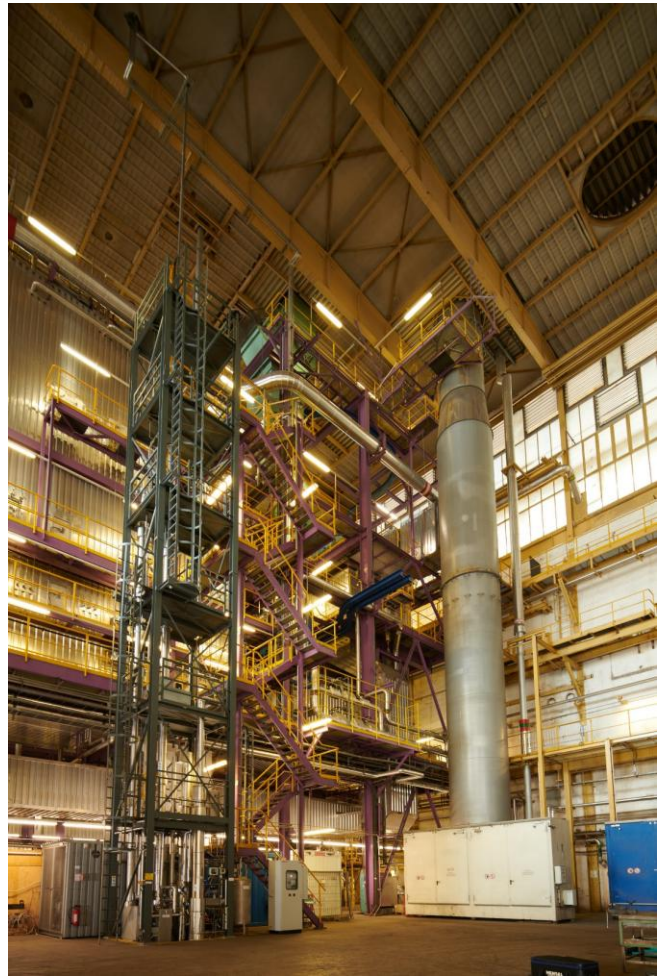
HYFOR – Hydrogen based fine ore reduction

- Direct reduction process utilizing iron ore concentrates in fluidized state without any material preprocessing
- Hot direct reduced iron leaves the reduction unit with about 600 °C and can subsequently be fed to an EAF
- Batch operation with 800 kg iron ore concentrate to produce sponge iron
- Creating design parameters for a further upscaling and continuous operation

HYFOR pilot plant at voestalpine Donawitz site

Transformation scenario energy intensive industry

Hydrogen and carbon management



Amine scrubber pilot plant at voestalpine Linz site

Carbon Cycle Economy Demonstration

- Demonstration of various CO_2 capture and CO_2 utilization technologies
- Injection of CO_2 from a steel plant and green H_2 from an electrolyser to form CH_4 by geo-methanation

Thank you! Questions??

www.k1-met-com

Dr. Irmela Kofler
Tel.: +43/ (0)732 75627;
irmela.kofler@k1-met.com

Visit us on LinkedIn:
https://at.linkedin.com/company/k1-met

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