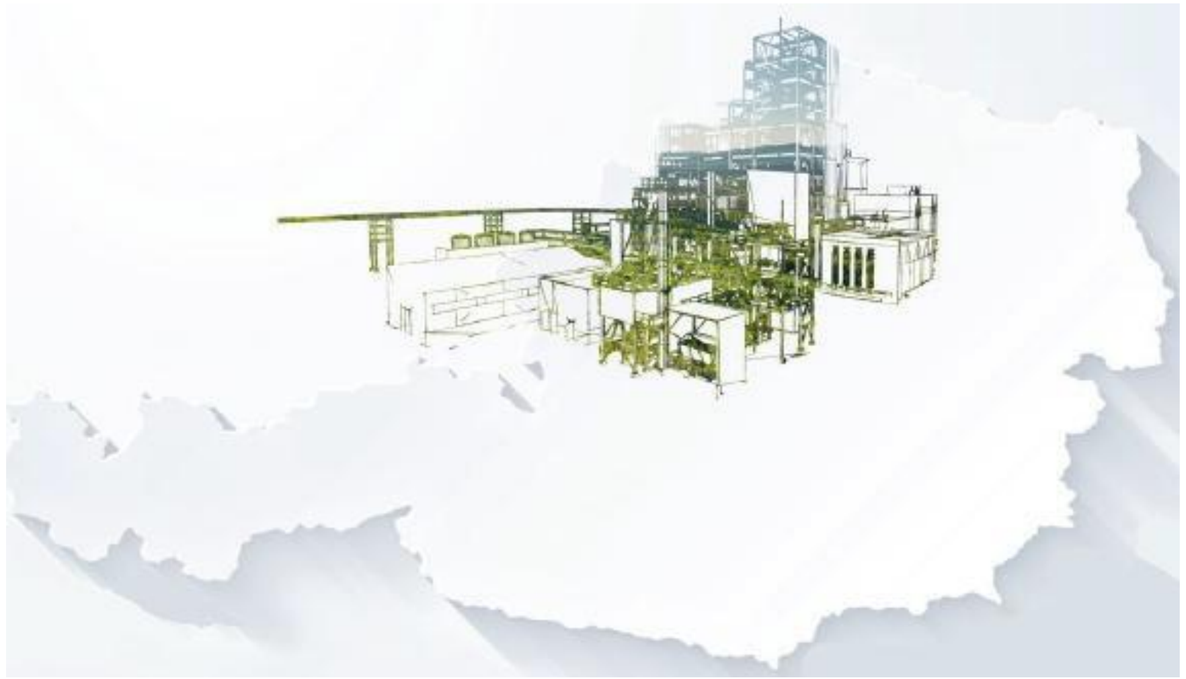
HY4SMELT – Status 2026

KOMMUNAL KREDIT PUBLIC CONSULTING
aws austria wirtschaftsservice
Co-funded by the European Union

Demonstration plant

Austria‘s largest R&D-Project for climate protection

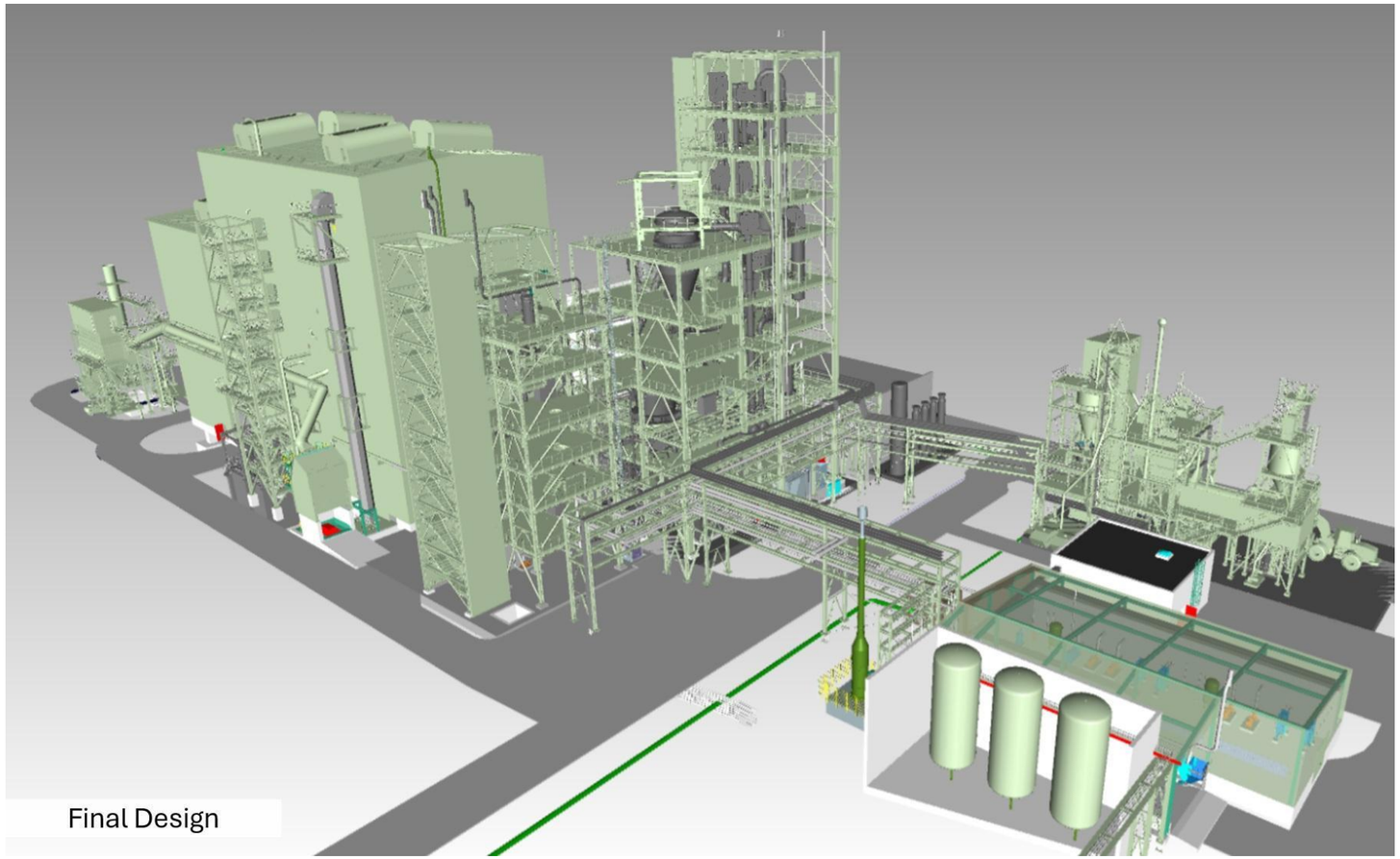


Construction Site Linz (AT)



Demonstration plant

Hydrogen-based fluidised bed direct reduction of ultra-fine iron ores and smelting to green hot metal



Final Design

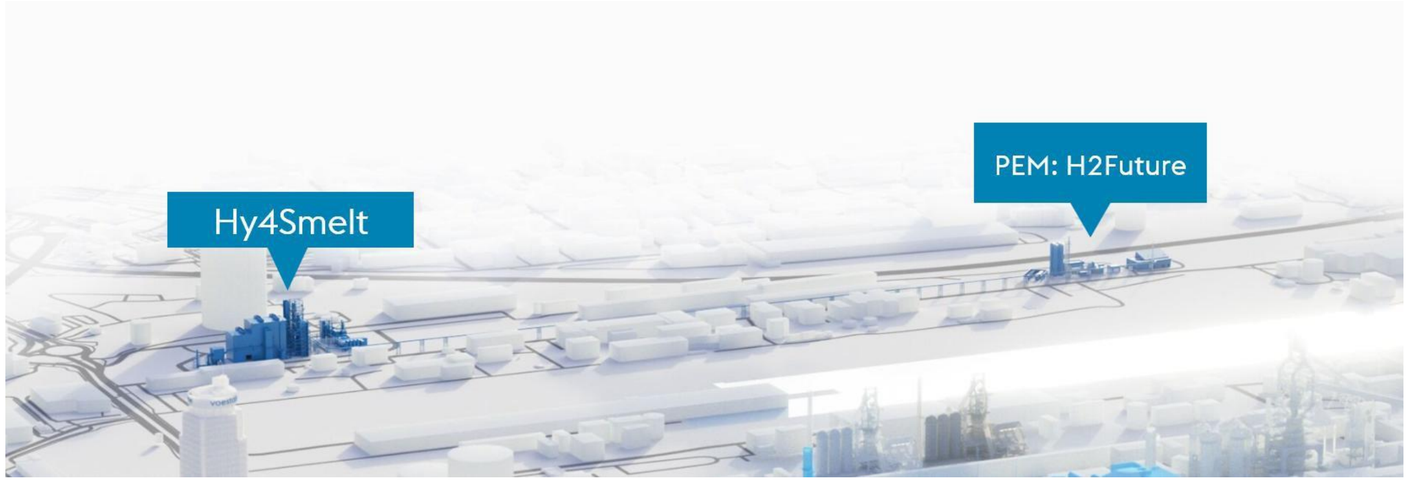
Fine Ores	2 – 3 t/h
Hot Metal	2 – 3 t/h

Hydrogen 1,200 (1,500) m^3/h from on-site electrolyzing

Operating time	4,000 h/a
TRL	8
Location	voestalpine Linz site
CAPEX	MEUR 130
OPEX	MEUR 40 (net)

Construction phase 2025 – 2027
Trial operation 2027 – 2030

Hydrogen supply & Project consortium RFCS



voestalpine ONE STEP AHEAD. — Operation & Infrastructure Trial operation

PRIMETALS TECHNOLOGIES / Mitsubishi Corporation — Engineering Hy4Smelt Trial operation

K1 MET metallurgical competence center — Process evaluation Trial operation

LOESCHE INNOVATIVE ENGINEERING — Slag treatment for cement and construction sector

Bauhaus-Universität Weimar — Grinding parameters slag

CEMEX — Hy4Smelt slag for replacement of granulated BF slag in cement

Sant'Anna School of Advanced Studies – Pisa — LCA modelling Hy4Smelt

UNIVERSITÀ DEL SALENTO — Reduction technology of iron ores

ESTEP European Steel Technology Platform — Dissemination

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Grant Agreement no. 101193416

Construction Progress

Hy4Smelt

Smelter building

HYFOR® tower



Drying and grinding plant

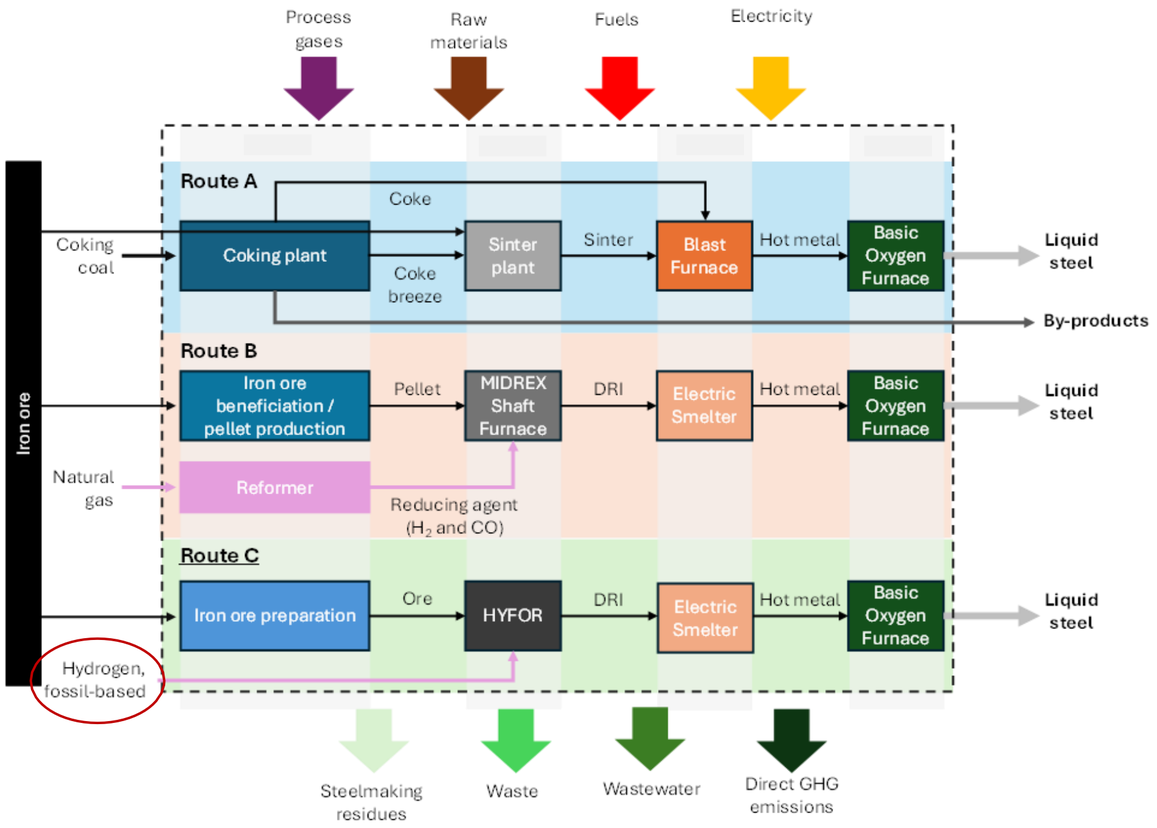


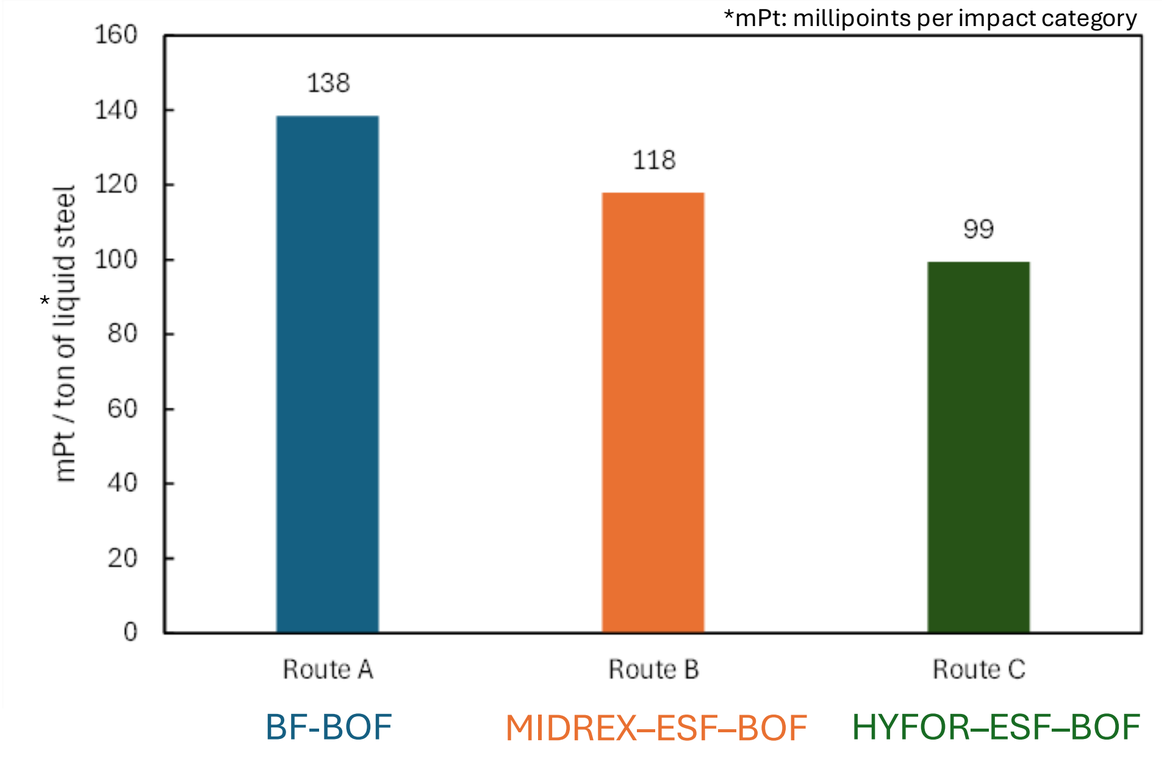
Media Supply



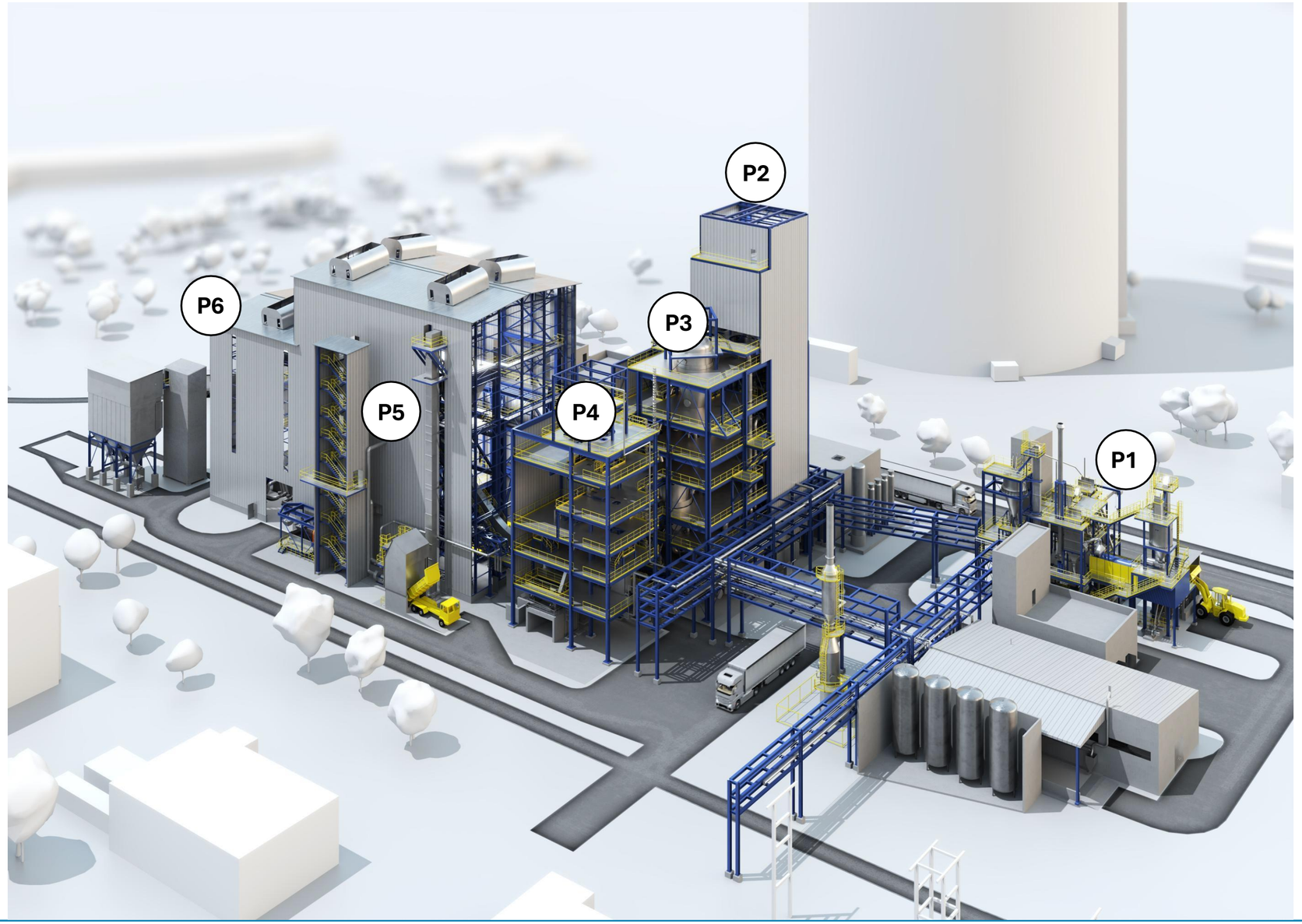
Progress R&D-Project and topics – Impact & Exploitation

Preliminary Life Cycle Assessment (LCA) according EF 3.1 LCIA method with 16 midpoint impact categories





Process Description



P1 Drying & Grinding
2–3 t/h Iron ore feed 10mm -> 500 µm

P2 Oxidation/ Pre-Heating
4 cyclones in series, up to 900 °C

P3 Reduction
2 reactors in series, up to 700 °C
HDRI metal-grade 85%, 1.5–2 t/h

P4 Compacting
HDRI < 500 µm -> HBI/HCI < 40 mm

P5 Smelting
Endreduction up to 1480 °C
Hot metal 2–3 t/h, slag 1 t/h

P6 Granulation
Water graulation (Granshot)
GPI appr. 10mm, 2–3 t/h

Key Development Areas for Hyfor



HYFOR Pilot Plant

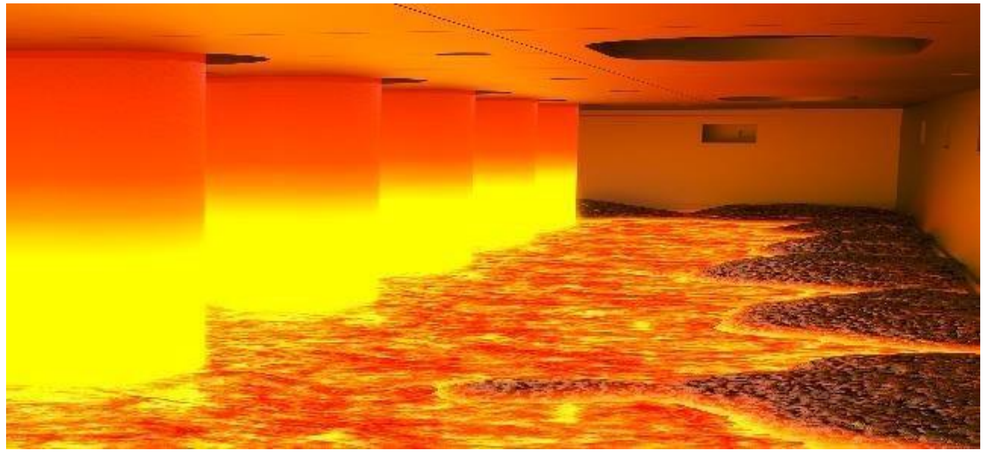
Key development topics

- Fine ore material handling
- Hydrogen
- Sparger grid- gas distribution
- Dedusting at high temperatures/ hydrogen
- E-Heater (direct vs. Indirect heating)
- Capacity (acc. to H_2-availability from electrolysis
- Briquetting- higher load

Key Development Areas for Smelter



Cross section of a Smelter model



Inside of a Smelter

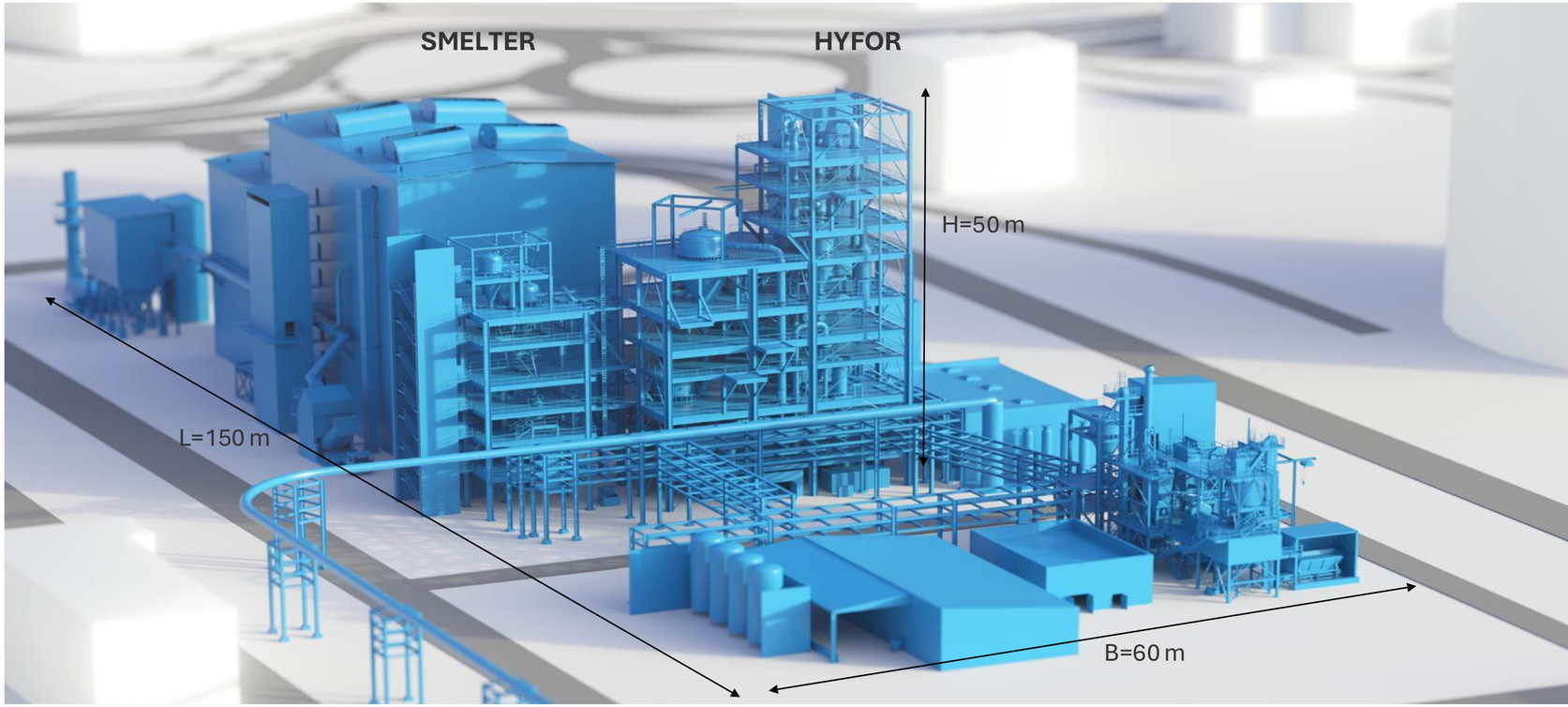
Key development topics

- Refractory material (suitable for slag basicity)
- Level measurement in bath (Fe, Slag)
- Max. Output of Fe (<1% Fe in slag)
- Continuous material intake
- Renewable biocarbon (biochar): fossil coal for carburization replaced- research on reactivity, chemistry, density

Upscaling to Industrial scale plant

Upscaling

- **Material handling:** due to flow regime of material – no enlargement necessary
- **Reactor design:** enhanced pressure may allow higher throughput (volume/ton metal produced
- **Dedusting:** large filter surface area necessary
- **Smelter:** similar design – more electrodes (vessel layout)



Model of Hy4Smelt at voestalpine Linz site

Environmental impact

Key decarbonization measures

- **Hydrogen:** Green hydrogen from water electrolysis used as the reducing agent
- **E-heater:** Electrically generated process heat replaces fossil fuel combustion
- **Biochar:** Fossil coal for carburization replaced by renewable biocarbon (biochar)

Towards a Net-Zero-CO_2 Ironmaking Process

- No direct CO_2 emissions from the Hyfor reduction and smelting processes
- Carbon emissions avoided when supplied with renewable electricity, green hydrogen, and sustainable biochar

