

# Building the Nordic Hydrogen Value Chain

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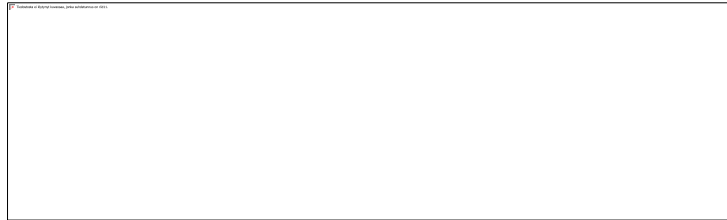


# Steel is one of the most important materials

- ▶ Critical for society and new infrastructure
- ▶ Unique material and available everywhere
- ▶ 100% recyclable, again and again
- ▶ Global steel consumption per capita is foreseen to further increase as more countries modernize
- ▶ Current production technology from iron ore emits large amounts of CO<sub>2</sub> into the atmosphere



# HYBRIT – a SSAB initiated joint venture with the target to develop the world's first fossil-free steel-making value chain



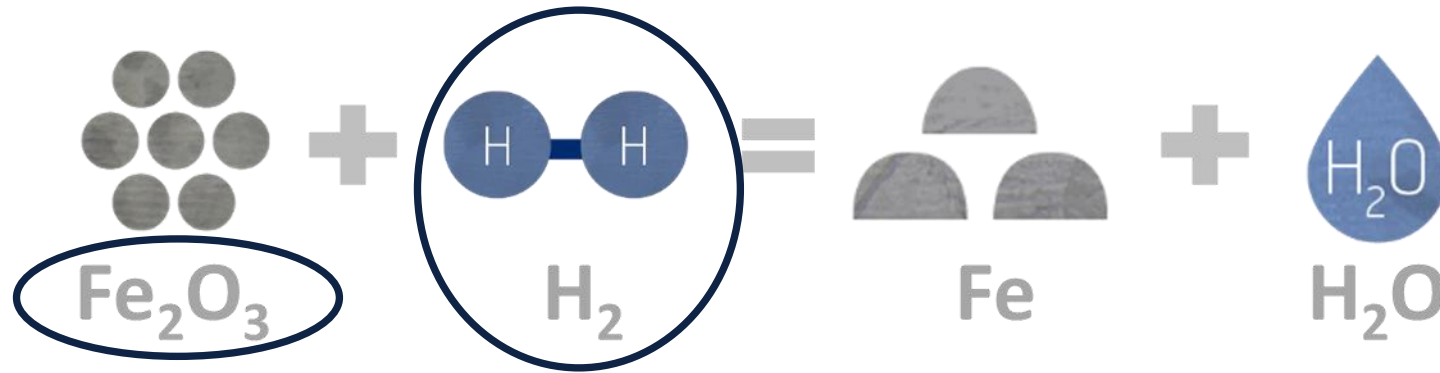
Research  
funding from:



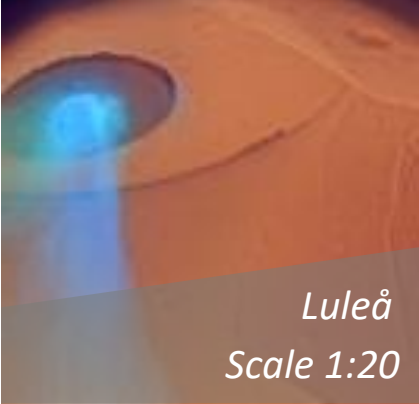




- ▶ HYBRIT is a joint venture between SSAB, LKAB and Vattenfall, formed to develop hydrogen-based production of fossil-free sponge iron
  - Initiated by SSAB in 2016, JV company founded 2017
  - Equal ownership stakes of the founding partners
- ▶ HYBRIT R&D supported by government
  - Funding support so far from Swedish Energy Agency
- ▶ In beginning of 2018, decision was made to invest in pilot plant projects based on the HYBRIT Pre-Feasibility Study conclusions

# The aim of the HYBRIT® Initiative

Eliminate CO<sub>2</sub> emissions in the value-chain for iron- and steelmaking by replacing coal with fossil-free electricity and hydrogen



# HYBRIT's pilot projects covering the whole value chain

Alternative heating technique for sintering of pellets	Pellets production with bio-oil	Energy storage LRC for hydrogen	Direct reduction with fossil free hydrogen	Melting of DRI/HBI in EAF
 <p>Luleå Scale 1:20</p>	 <p>Malmberget Full scale</p>	 <p>Luleå Volume 100 m<sup>3</sup></p>	 <p>Luleå Capacity 1 ton/h</p>	 <p>Luleå Capacity 10 ton</p>
Fossil free heating replacing coal & oil for sintering of iron ore pellets		Hydrogen storage important component for future electricity grid with more wind/solar	H <sub>2</sub> replacing C for iron ore reduction, resulting in H <sub>2</sub> O instead of CO <sub>2</sub>	Fossil free melting & refining from iron to steel



# HYBRIT – Successful pilot trial of 100% H<sub>2</sub>-reduced DRI/HBI

June 21, 2021



# Accelerated customer demand for fossil-free products

## Examples of partnerships



## Demand will exceed supply

- ▶ Demand from existing customers already exceeds currently planned supply of 1.3 million tonnes in 2026
- ▶ Demand for broader portfolio of premium products – e.g. towards the mobility segment
- ▶ New customers approaching SSAB

# Eliminate CO<sub>2</sub> emissions 15 years earlier than planned

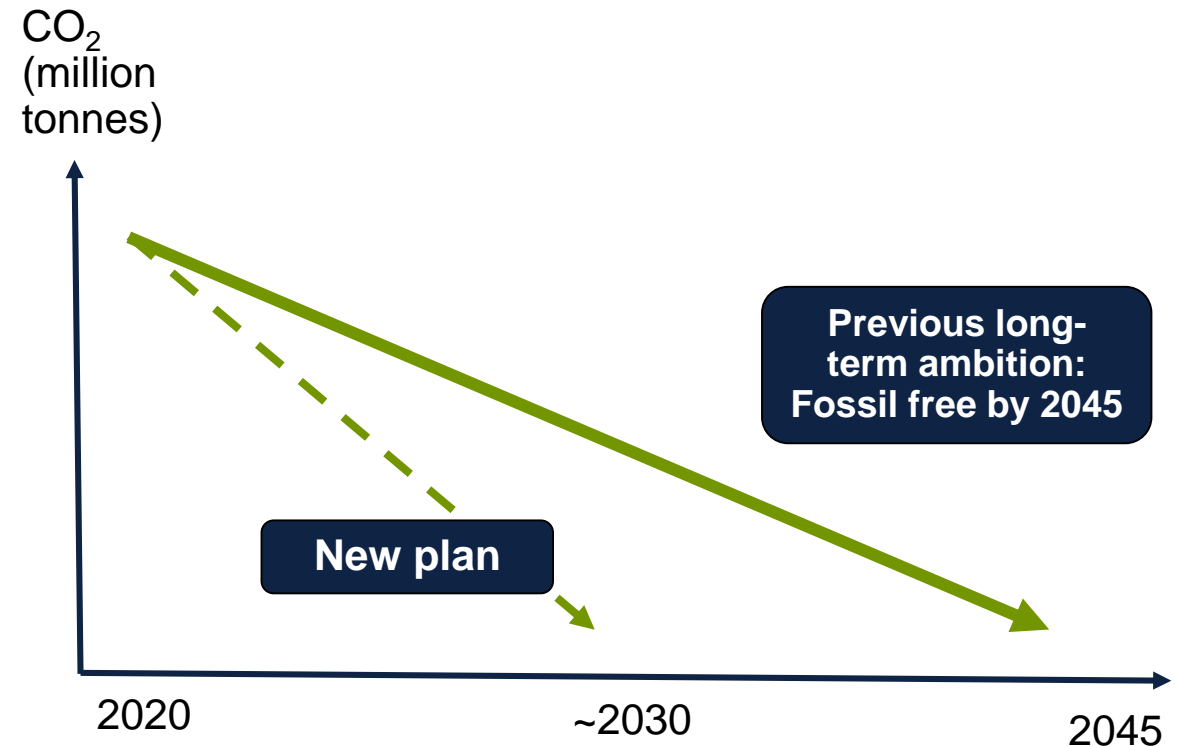
## ► Mitigating climate change

- Major contribution to climate targets in Sweden and Finland – around 8 million tonnes reduced CO<sub>2</sub> emissions per year

## ► Potential of CO<sub>2</sub> cost avoidance of ~SEK 7 bn/year in the beginning of next decade

- Assuming removal of free allocations and a price for emission allowances of EUR 90/t

## ► Strengthens SSAB's ESG position



\*Graph for illustrative purposes



# Challenges and obstacles

Electricity transmission on time

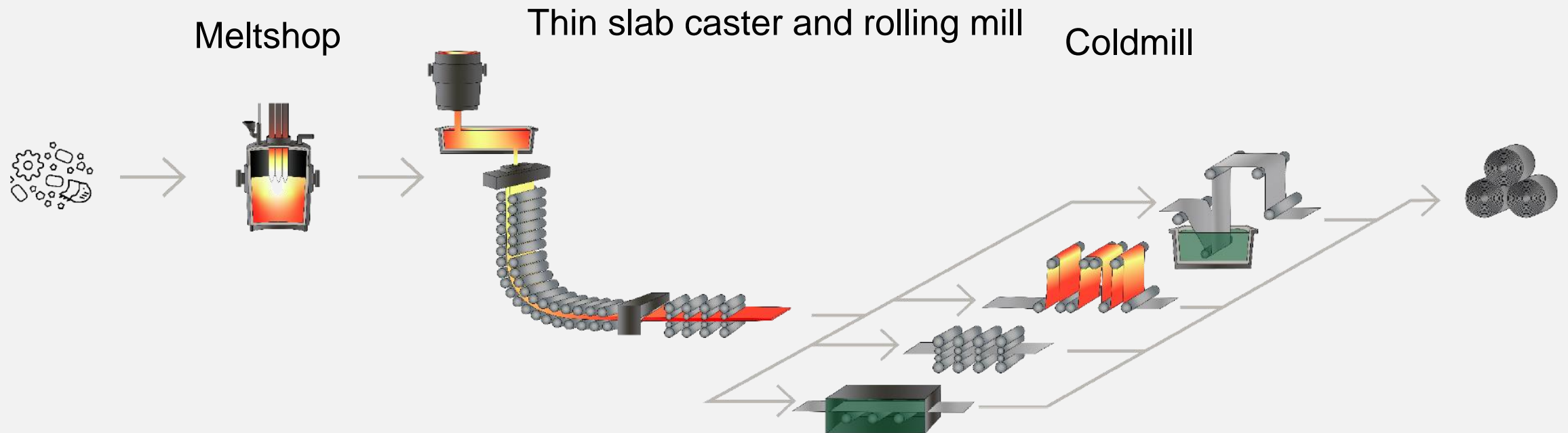
More fossil free electricity production

Efficient permit processes

Cooperation between authorities and us



# Planning for future integrated steelmill in Luleå and Raahe



SSAB