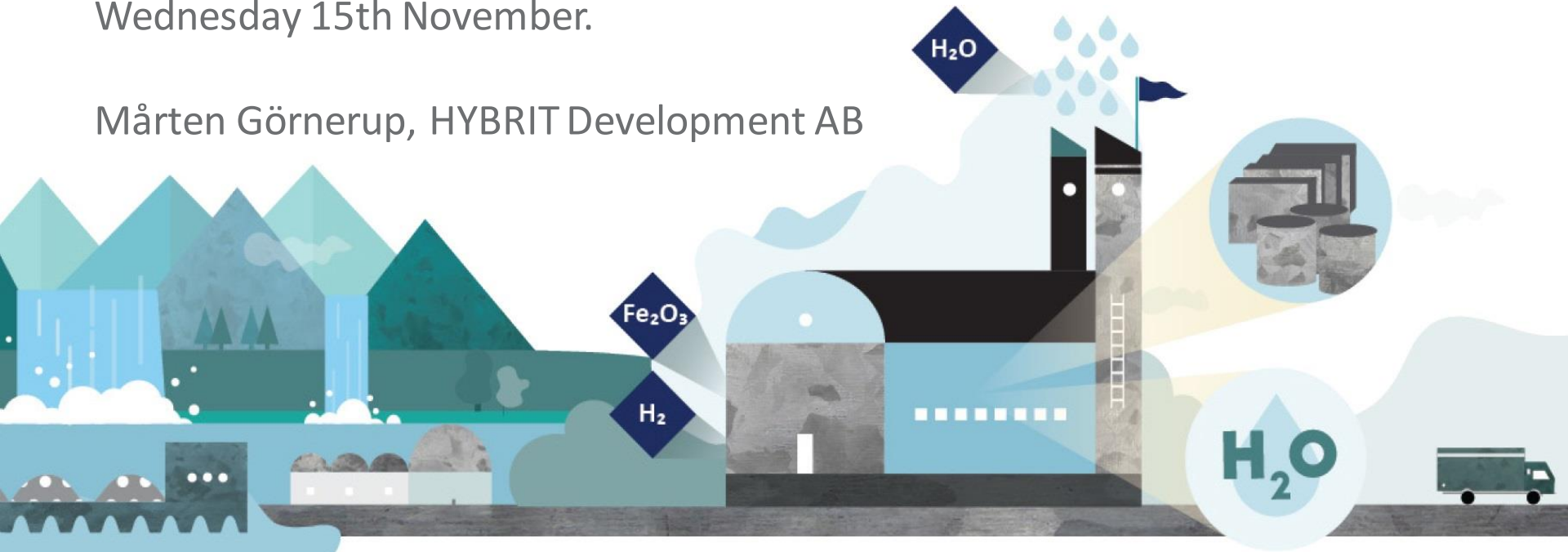


HYBRIT –Towards fossil free steel

Nordic Energy Research and IEA
Nordic Pavilion, COP 23, Bonn
Wednesday 15th November.

Mårten Görnerup, HYBRIT Development AB



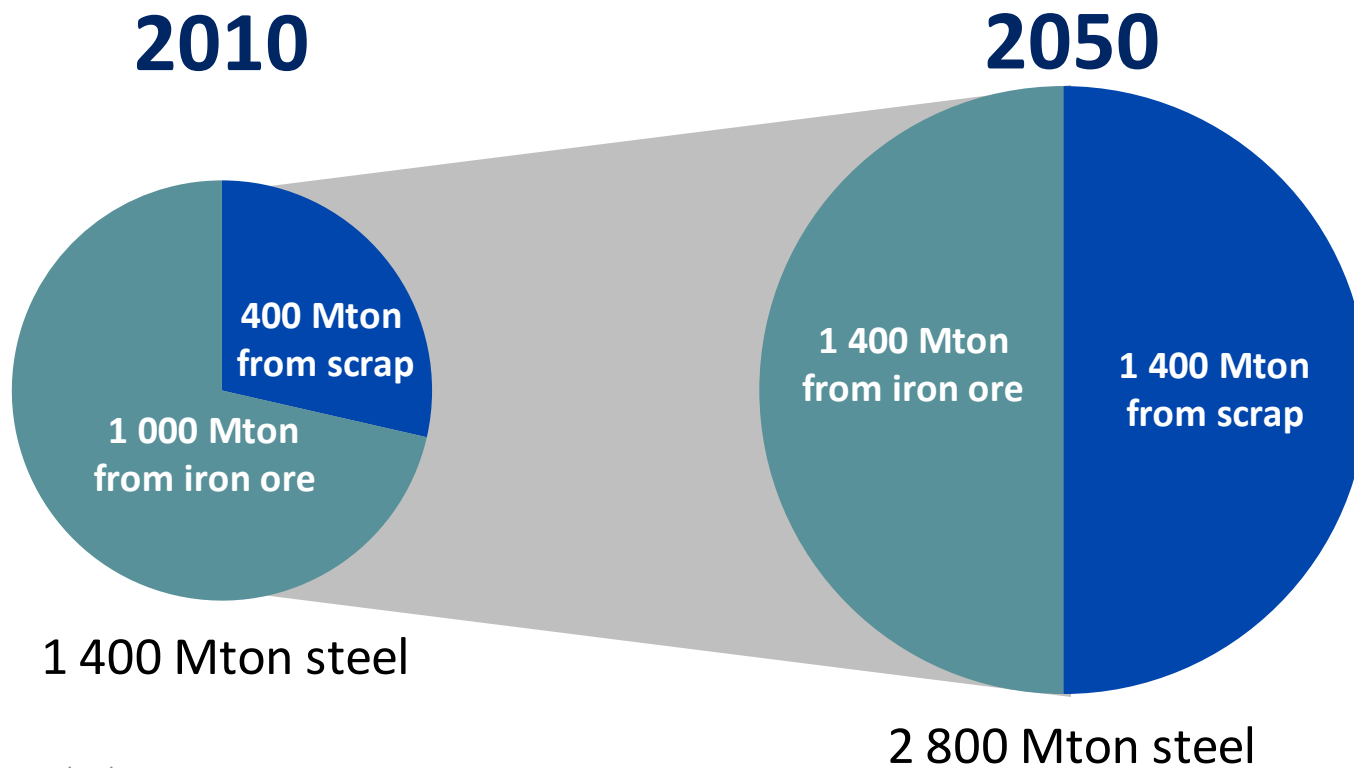
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▶▶▶ FOSSIL-FREE STEEL

A joint venture between SSAB, LKAB and Vattenfall

Steel builds societies

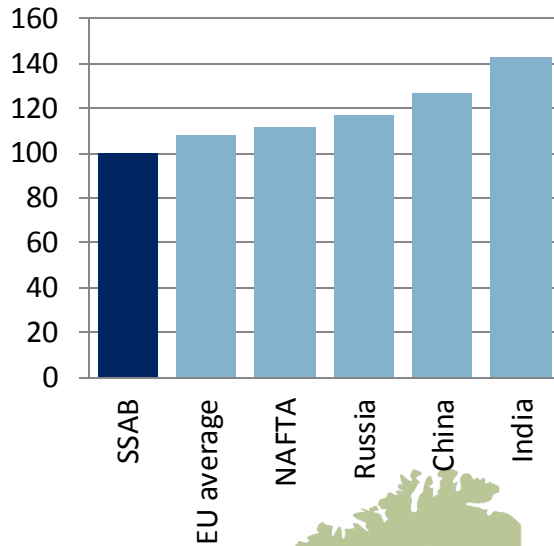
In year 2050, approximately 50% of the global steel demand needs to be made from iron ore



Source: Jernkontoret

The dilemma

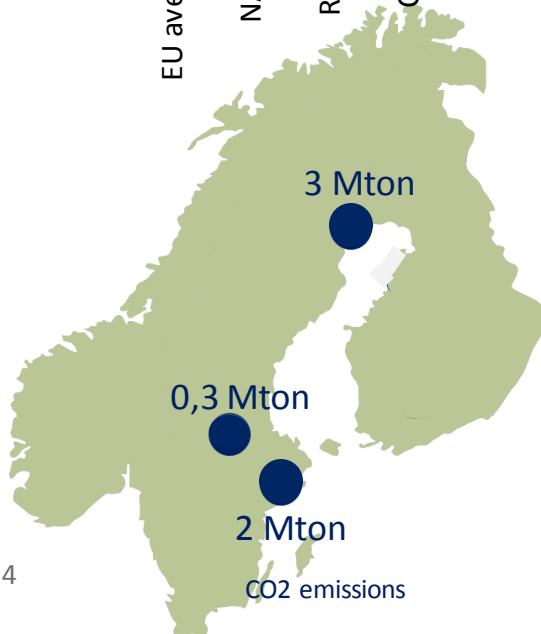
CO₂ effectiveness of blast furnaces*



- Close to theoretical minimum of CO₂-emission in today's blast furnace technology

- Considerable CO₂-emissions:

- Sweden's two single largest emission sites
- Ca 10% of Sweden's total emission
- Ca 30% of ETS system in Sweden



Source: Stahl-Zentrum. *The indexed carbon efficiency in ironmaking based on coal consumed 2012

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The opportunity

- Europe's largest iron-ore production site (LKAB)
- A leading high-strength steel producers (SSAB).
- Fossil free electricity – excess capacity (Vattenfall)
- Long tradition in co-developing new technology.



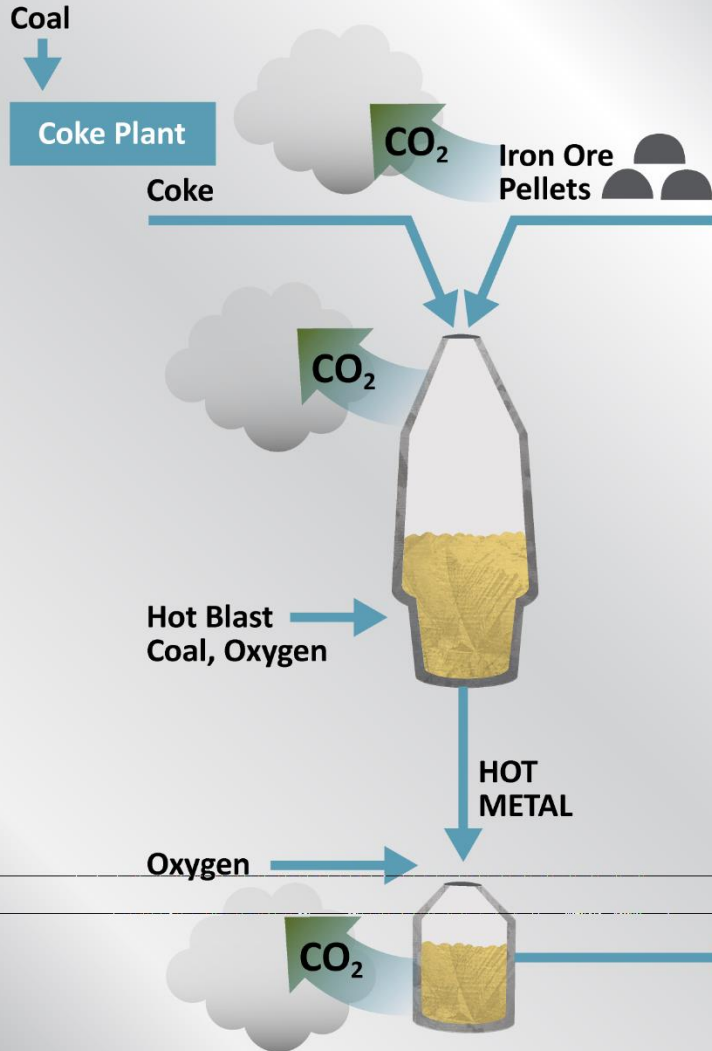
Our way forward

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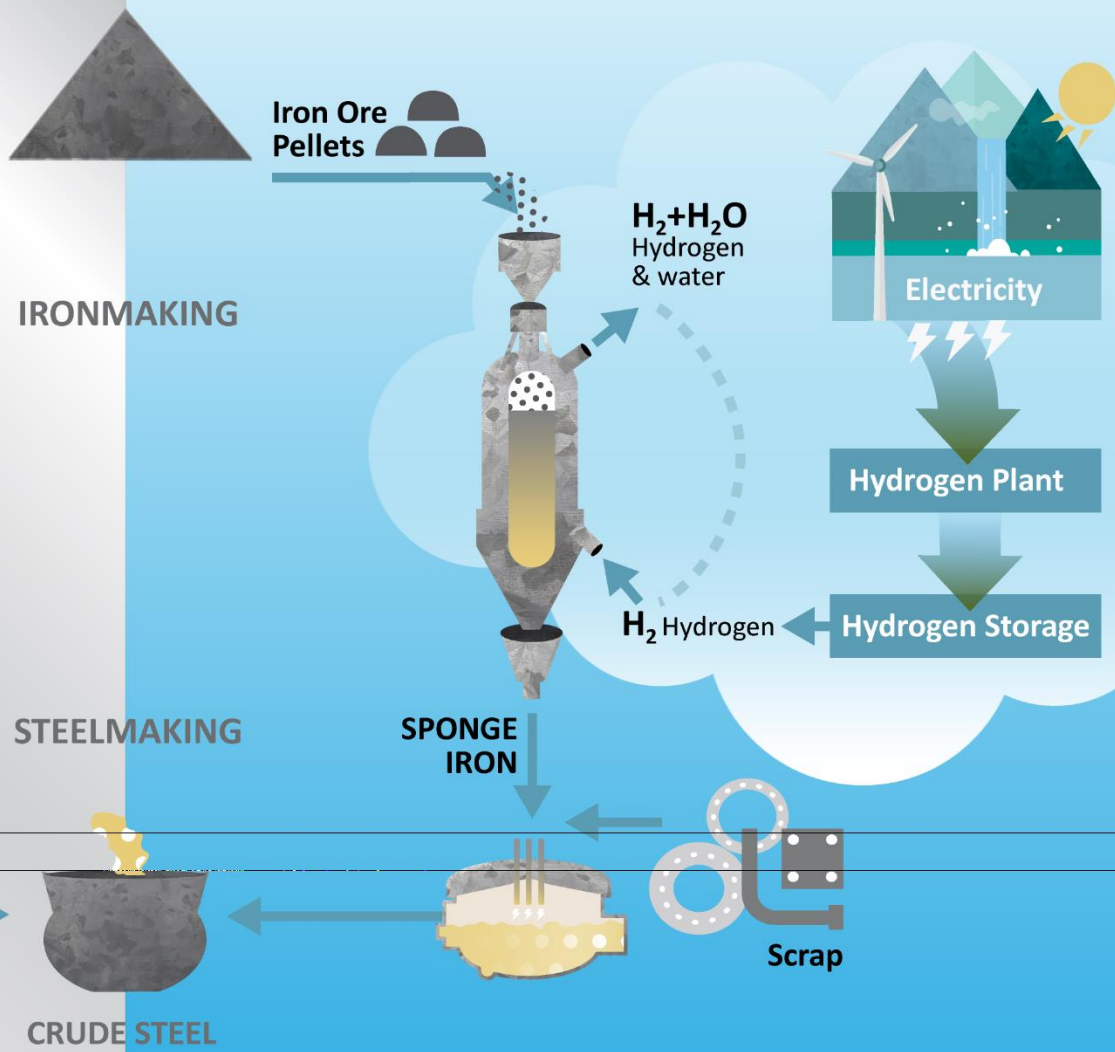
▶▶▶ FOSSIL-FREE STEEL



Blast furnace



Direct reduction



IRONMAKING

STEELMAKING

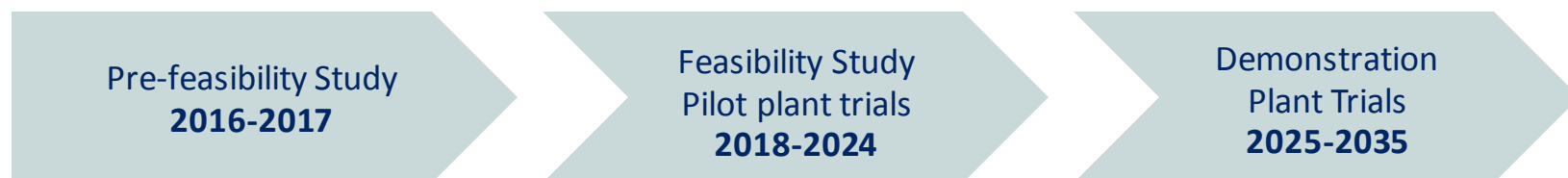
CRUDE STEEL

SPONGE IRON

Scrap

HYBRIT – transition phases

Main project phases



Supportive R&D and capacity building



Co-funded by



HYBRIT – upcoming challenges

- ▶ The risk of technical failure, mainly associated with the scale of the effort.

- ▶ The risk of market failure:
 - the relatively high price of HYBRIT’s investment
 - the long time line
 - future cost structure for steelmaking

- ▶ Making the transformation in-sync with Europe’s transitions.

- ▶ Ensuring and securing sufficient co-development and risk-sharing.

HYBRIT - a unique opportunity

- ▶ A unique opportunity for Europe, benefits from existing strategic assets.
- ▶ Addresses the root cause of the CO₂-emissions from the steelmaking process.
- ▶ Produces steel with European resources, with water as by-product, not CO₂.
- ▶ Builds European know-how within the field of fossil-free industrial production.

Thank you!

HYBRIT

 **FOSSIL-FREE STEEL**

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