



HYBRIT – A Swedish prefeasibility study project for hydrogen based CO₂-free ironmaking

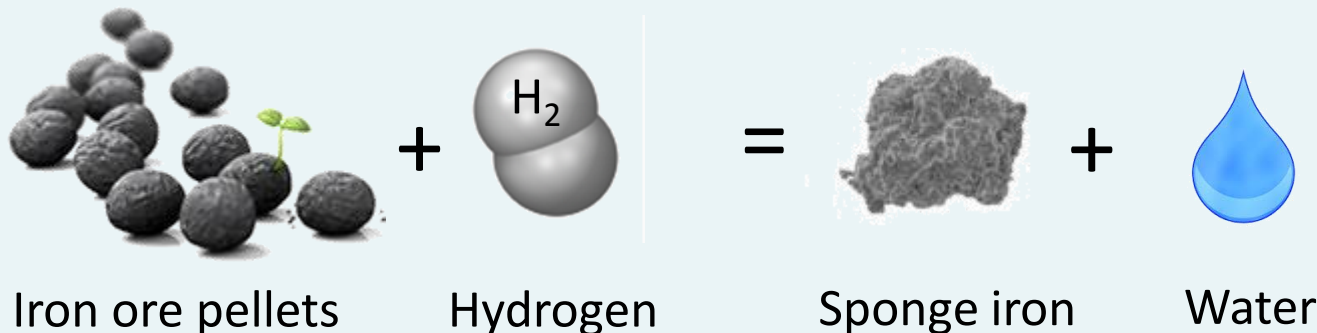
Enhancing the EU's industrial competitiveness through the EU ETS innovation fund

May 25, 2016

SSAB

CO₂-emission free ironmaking

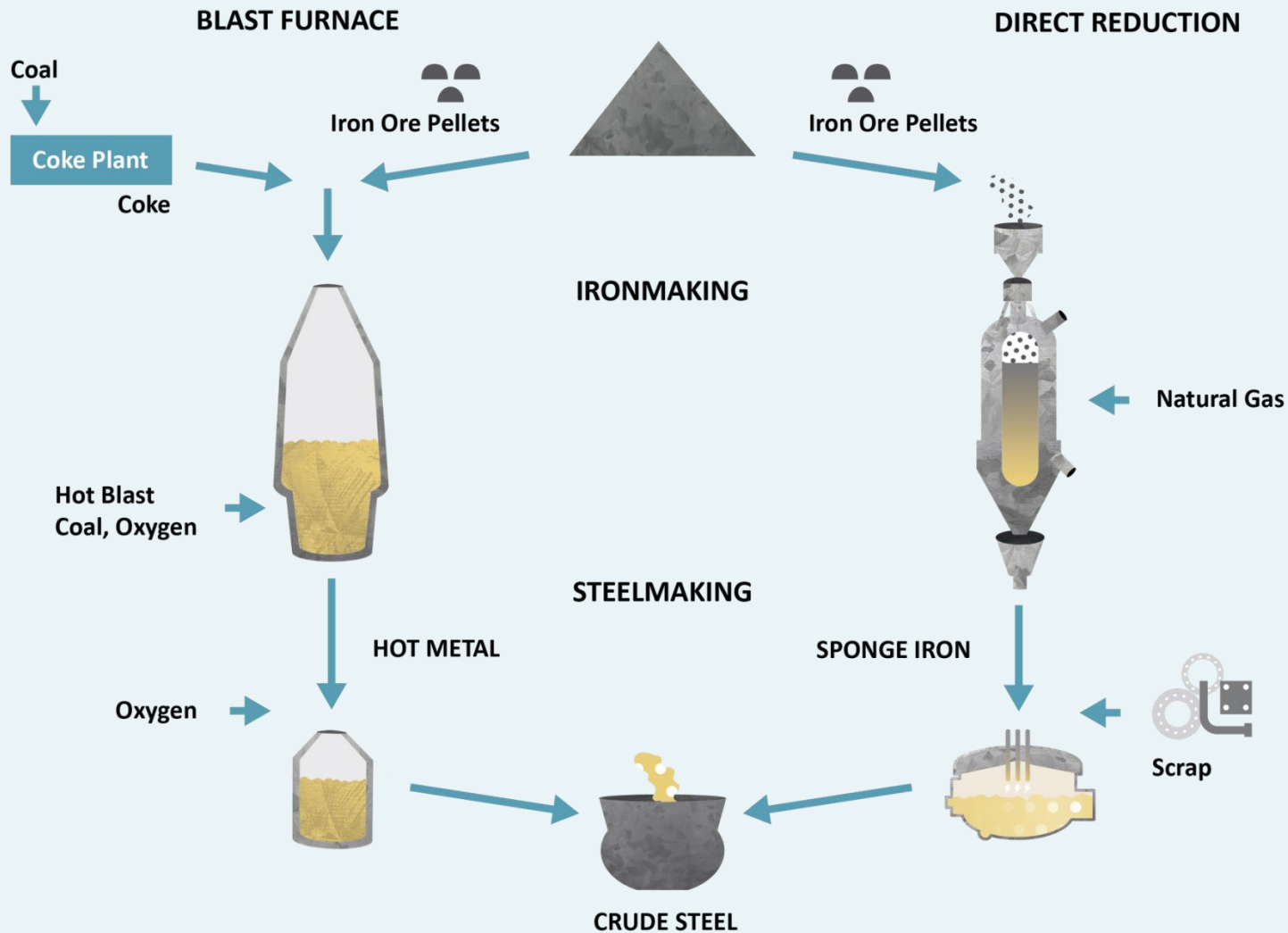
- ▶ SSAB, LKAB and Vattenfall announced on April 4, 2016, the launch of a project that, if proven feasible, can solve the steel industry's carbon dioxide challenge, HYBRIT (Hydrogen Breakthrough Ironmaking Technology).
- ▶ The aim is to reduce carbon dioxide emissions from ironmaking to zero by eliminating the need to use fossil fuel for iron ore reduction. The idea is to replace the blast furnaces with an alternative process, using hydrogen produced from “clean” electricity.
- ▶ This means that the by-product from ironmaking would be **water** not carbon dioxide.



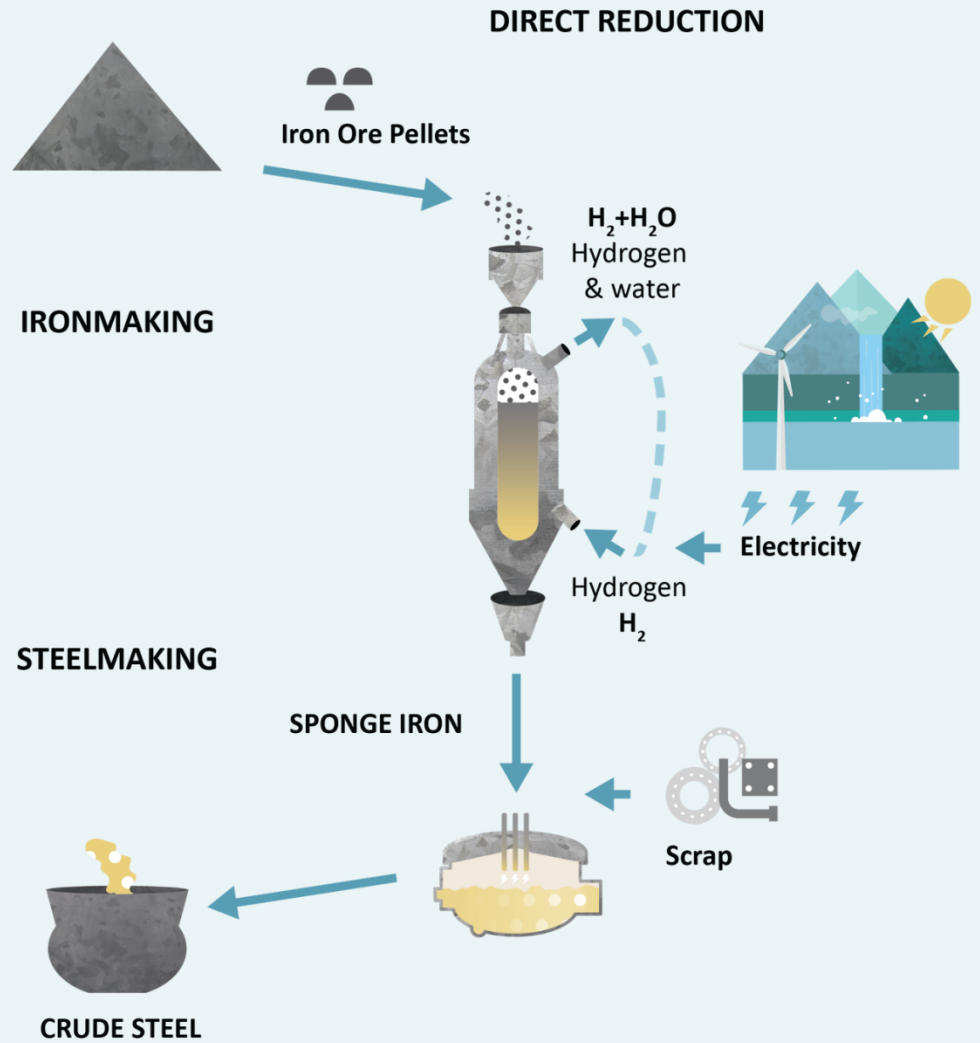
Why SSAB, LKAB and Vattenfall?

- ▶ Sustainability and performance are integrated into our business models
- ▶ SSAB has one of the most CO₂-efficient ironmaking processes in the world today, but is still the largest source of CO₂ emissions in Sweden
- ▶ LKAB is already today a world-leading producer of world class direct reduction pellets
- ▶ Vattenfall has extensive knowledge about the Swedish, Nordic and European energy systems and markets
- ▶ Swedish iron ore is rich and energy efficient
- ▶ Sweden's electricity generation has among the lowest CO₂ emissions in the world
- ▶ We have a history of technical advances in production and outstanding research and development capabilities

Two main ways to make steel from iron ore today



CO₂-emission free ironmaking



The project

- ▶ Pre-feasibility study 2016-2017
- ▶ Feasibility study-pilot plant trials 2018-2024
- ▶ Demonstration plant trials 2025-2035



Political involvement is needed to succeed

- ▶ Long term engagement from the state is needed in all phases of development work, as well as in enabling competitive conditions and labor policy during the time period
- ▶ The following are required from a political perspective:
 - Conditions for a green industrial research program to enable test facilities for hydrogen gas-based ironmaking
 - Ensuring competitive conditions in emission trading system to enable investments in long term innovation
 - Link energy policy with industrial and environmental issues. Fossil free electricity can replace fossil fuel in base industry.

SSAB



*A stronger,
lighter and more
sustainable world*