

ELIMINATING CARBON EMISSIONS FROM INDUSTRIAL HEAT: OVAKO'S EXPERIENCE

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IEA on Industrial Heat, February 2024

- ”Industrial heat makes up **two-thirds** of industrial energy demand
  - and almost **one-fifth** of global energy consumption.
- It also constitutes **most** of the direct industrial CO2 emitted each year,
  - as most industrial heat originates from **fossil-fuel combustion**.
- Despite these impressive figures, industrial heat was, until recently, **often missing** analyses of clean energy solutions.”

This is OVAKO

8
Production Sites

2600
Employees

0.4 LTIFR
(Jan-25)
Safety at Work

1000 kton
Capacity

1.1 EURbn
Revenue

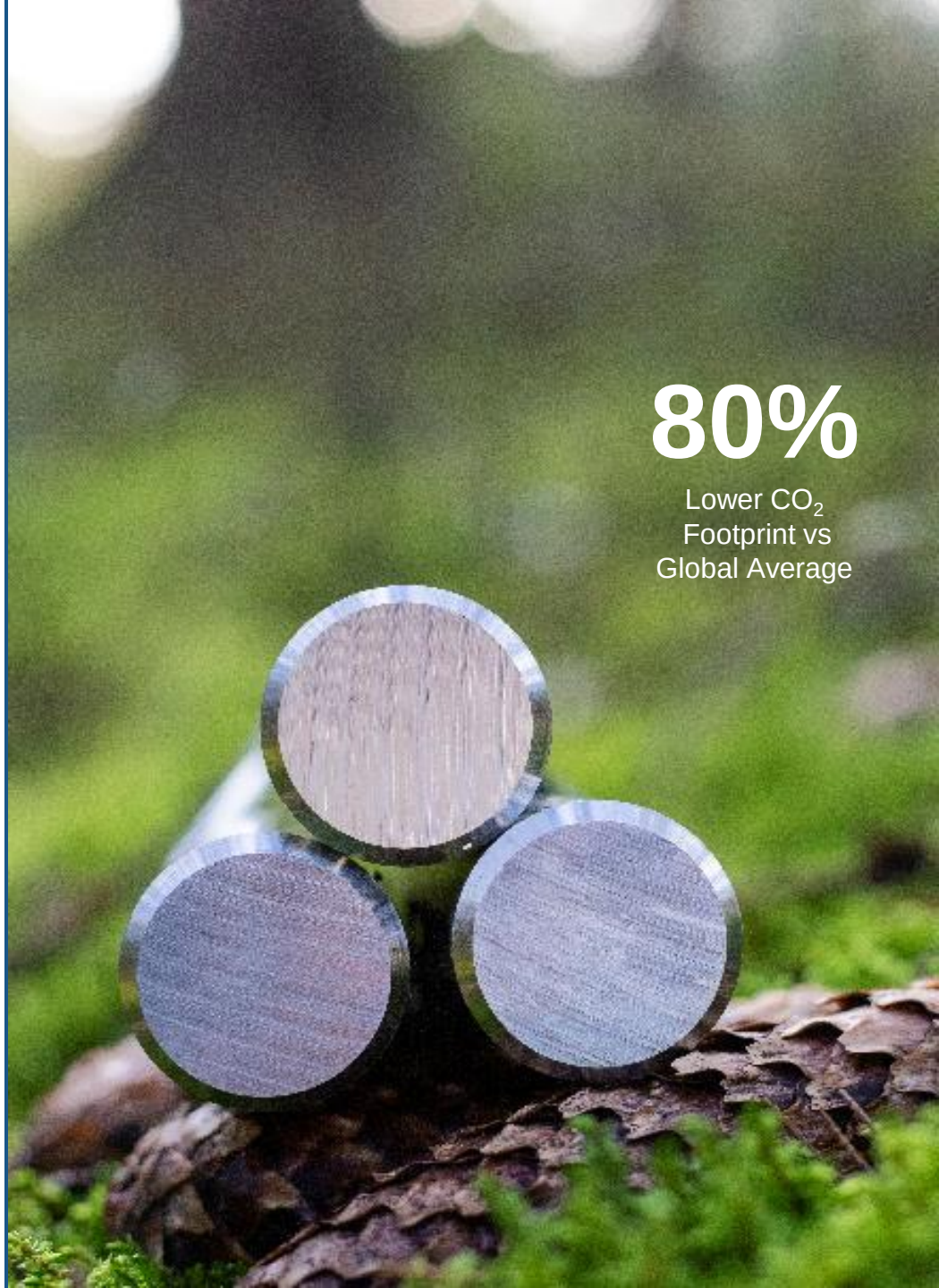
30
Countries

-56 %
CO2e* per tonne since 2015

1st
In the world to re-heat steel with fossil-free hydrogen

97 %
Recycled content

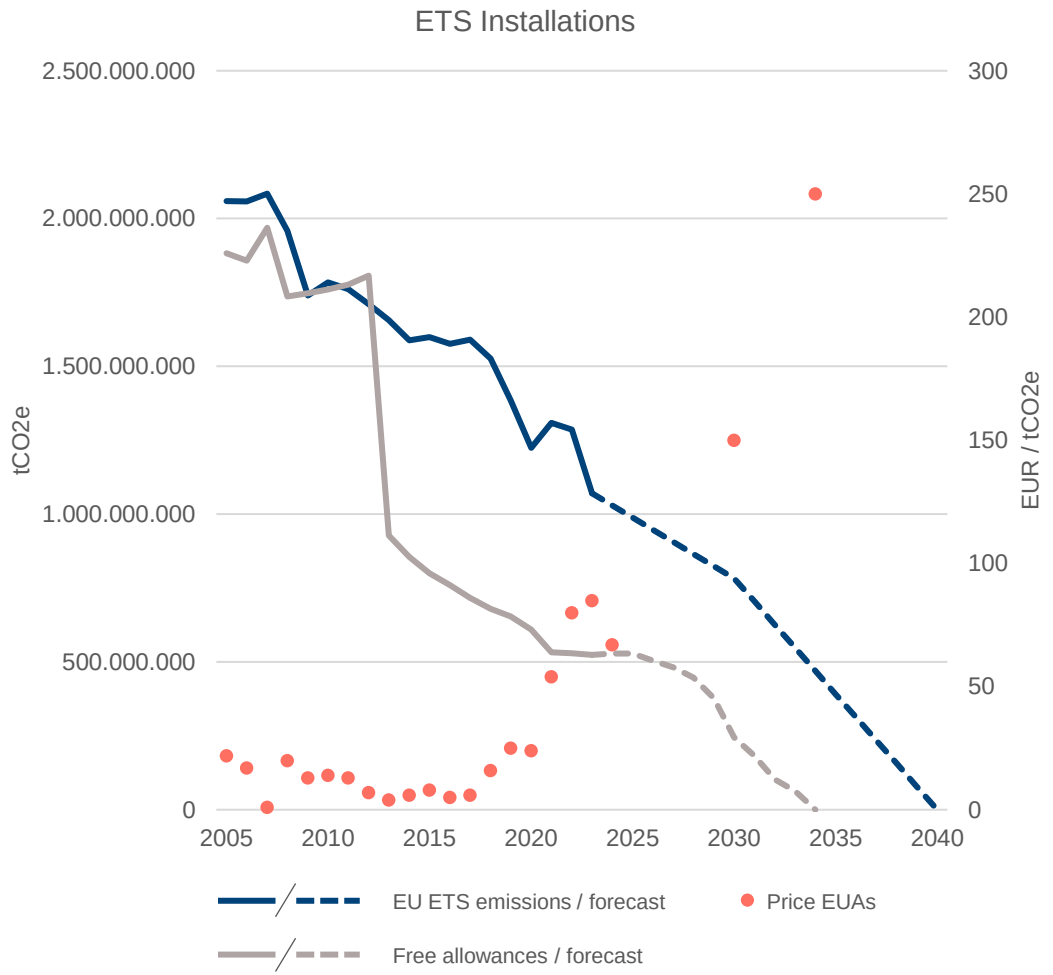
OVAKO — SANYO SPECIAL STEEL — NIPPON STEEL



*Scope 1 & 2 emissions per tonne delivered goods

Regulations pushing for low CO2e solutions

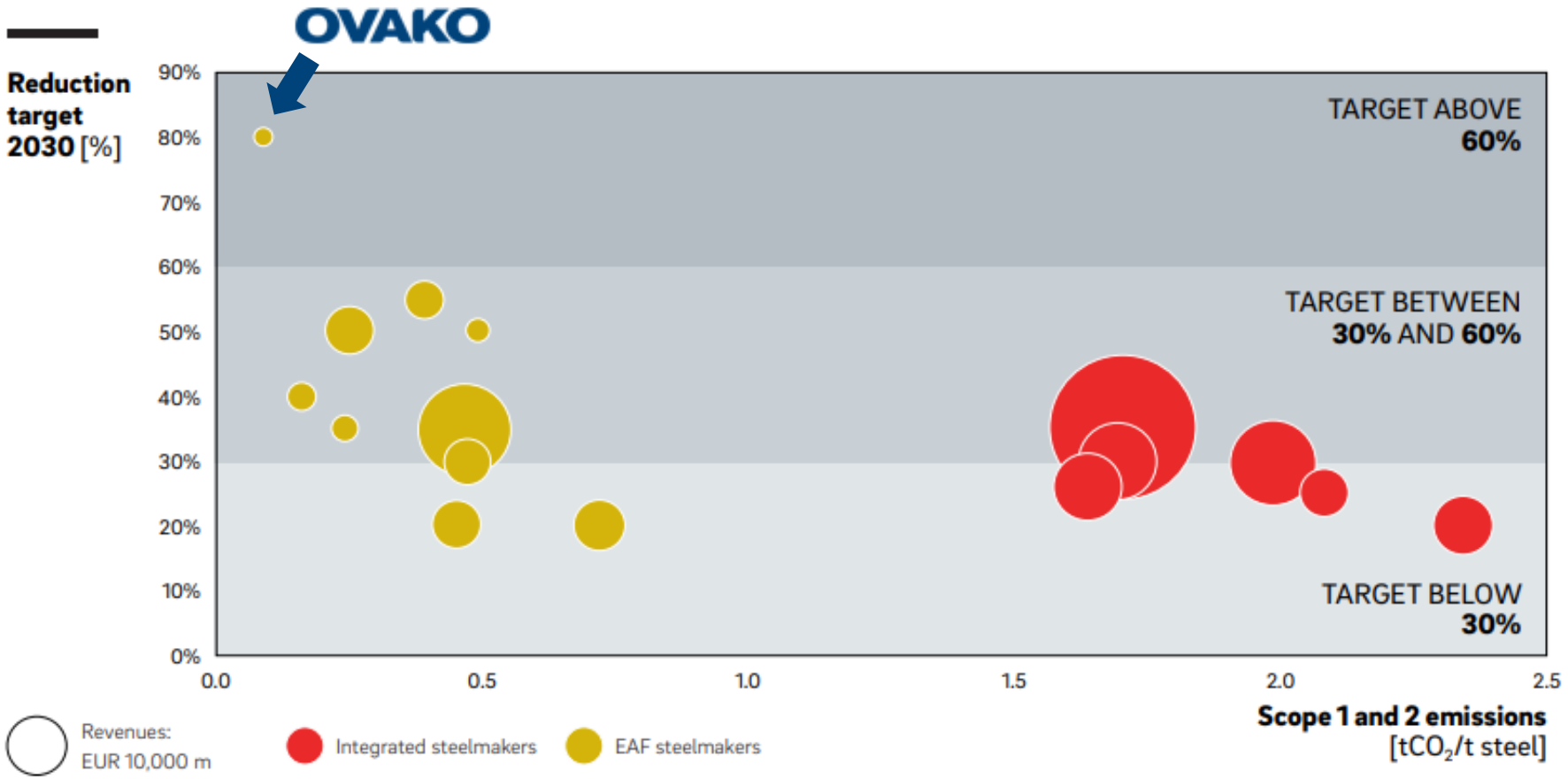
EU Emission Trading System (ETS)



Reference: European Environment Agency; Own estimations; BloombergNEF; Eurometal

Carbon reduction targets by 2030

Average reduction targets for scope 1 and 2 emissions among the 27 surveyed steelmakers



Source Roland Berger benchmarking analysis

Roland Berger

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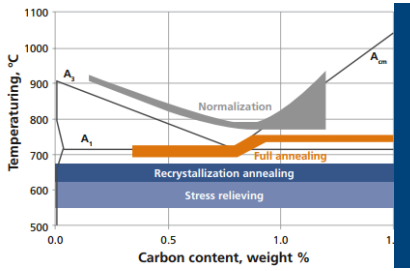
Reference: Decarbonizing steel production, Roland Berger, 2022

Hydrogen:
The beginning of the end of our electrification journey

✓ Melting steel >1400°C

→ Heating steel for hot-forming ~1200°C

✓ Heat treatment for product properties <1000°C



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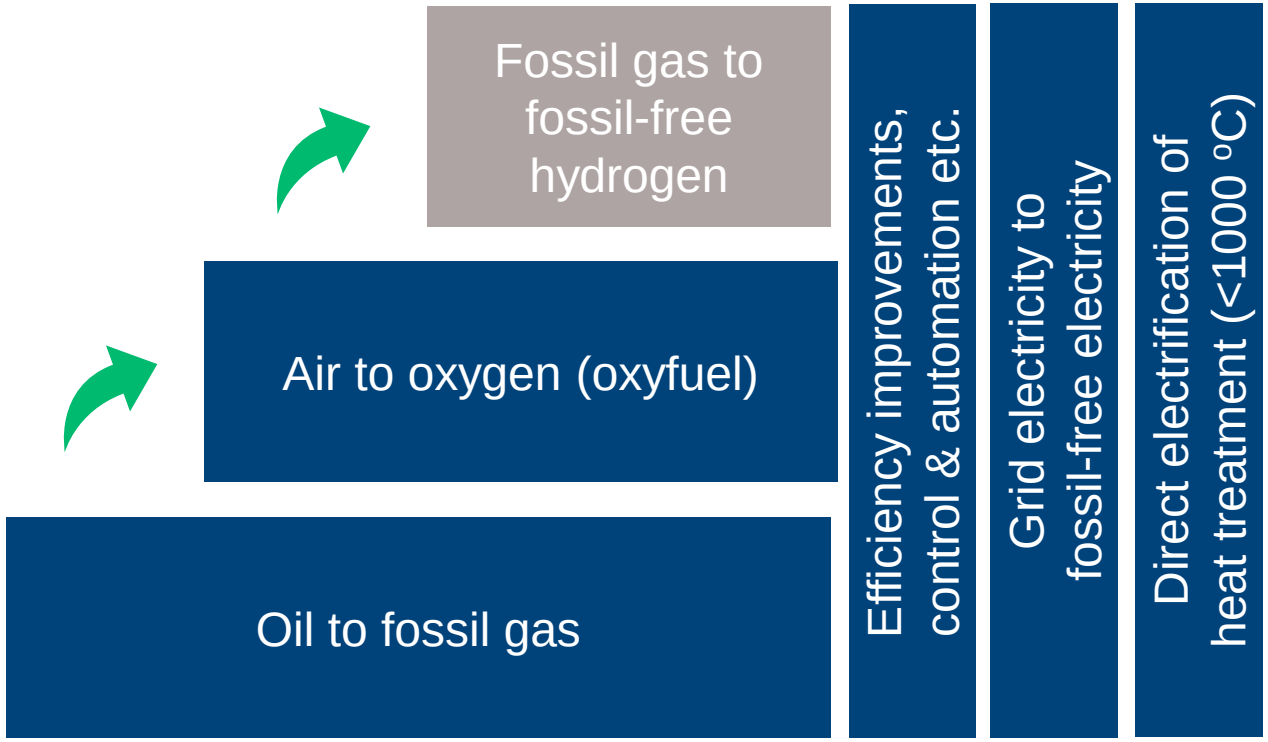
Building blocks in carbon emission elimination



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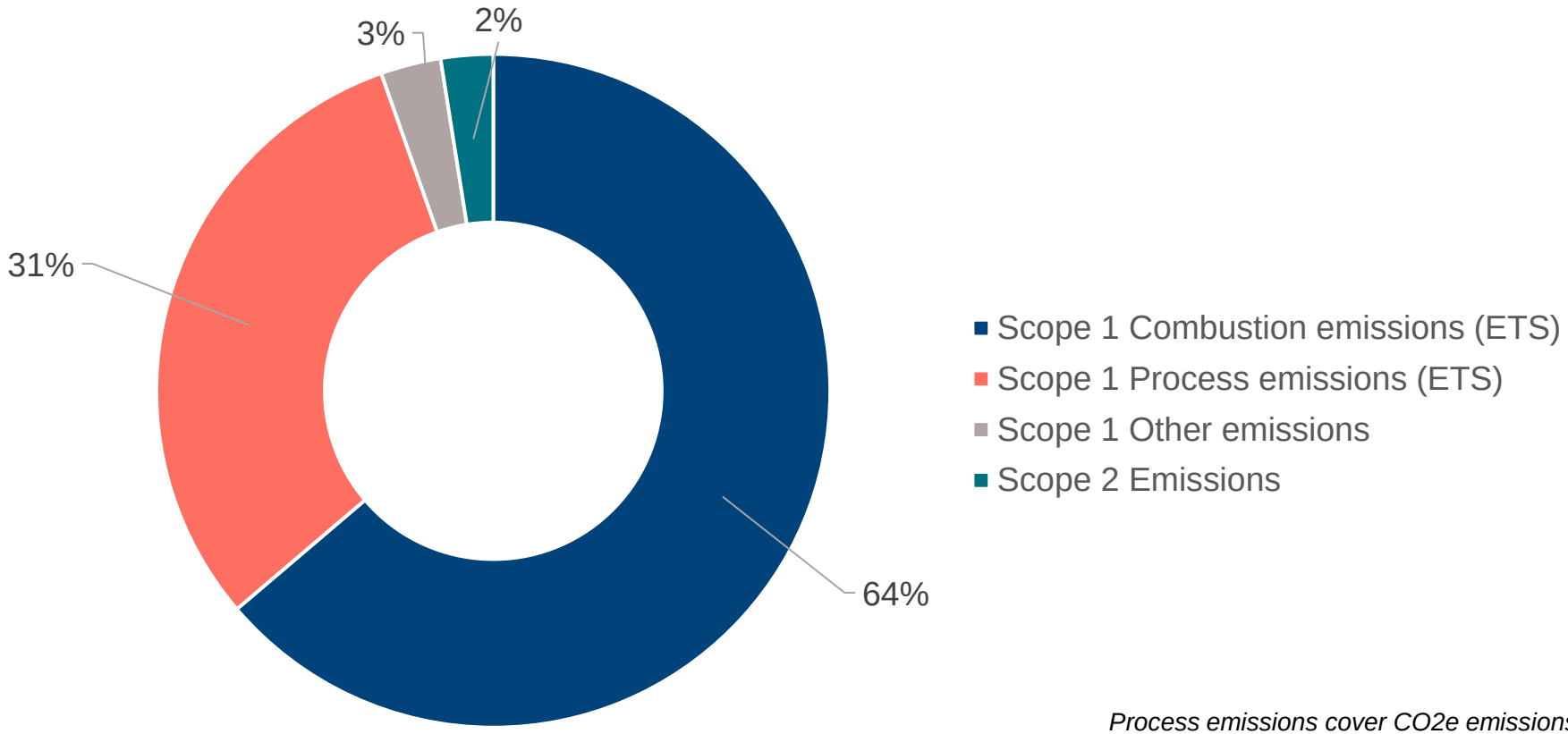
The upscaling of hydrogen eliminates >60% of remaining inhouse carbon emissions



Process emissions cover CO2e emissions from the use of coke, scrap, alloying elements, electrodes etc., whilst combustion emissions cover CO2e emissions from fuels such as propane, natural gas and oil.

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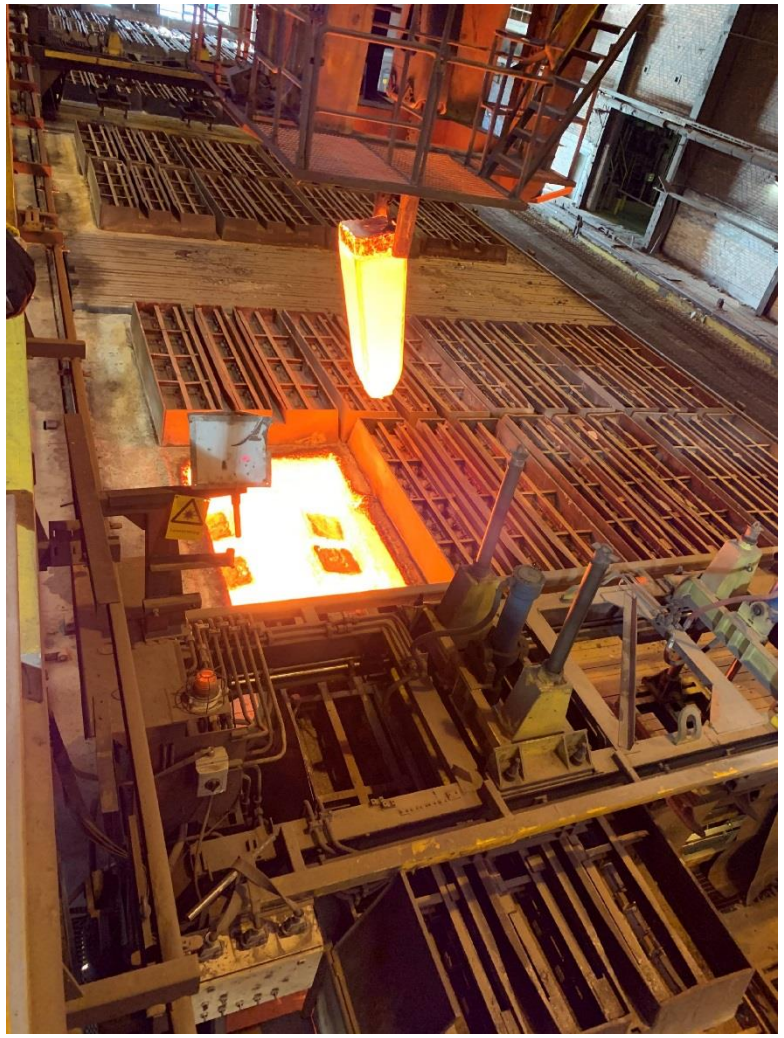
2020-03-18: World’s first full-scale hydrogen heating



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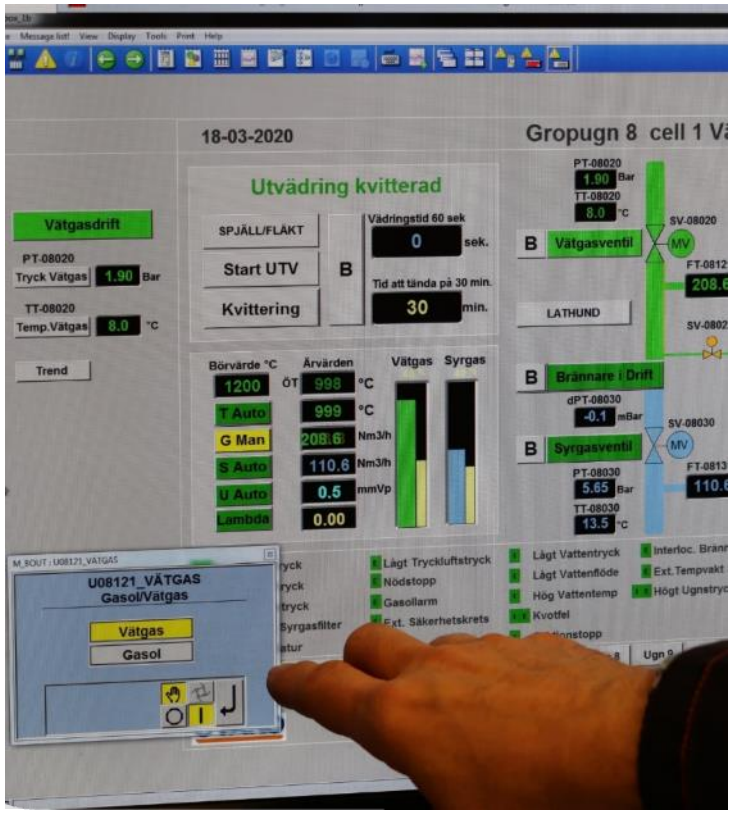
Flexibility: A key to the energy system of the future



- Control system with H_2 parameters
  - Allows fast switch between H_2 or LPG/NG as fuel
- Two completely redundant energy systems
  - A tool for true electricity flexibility
  - Down to frequency regulation levels

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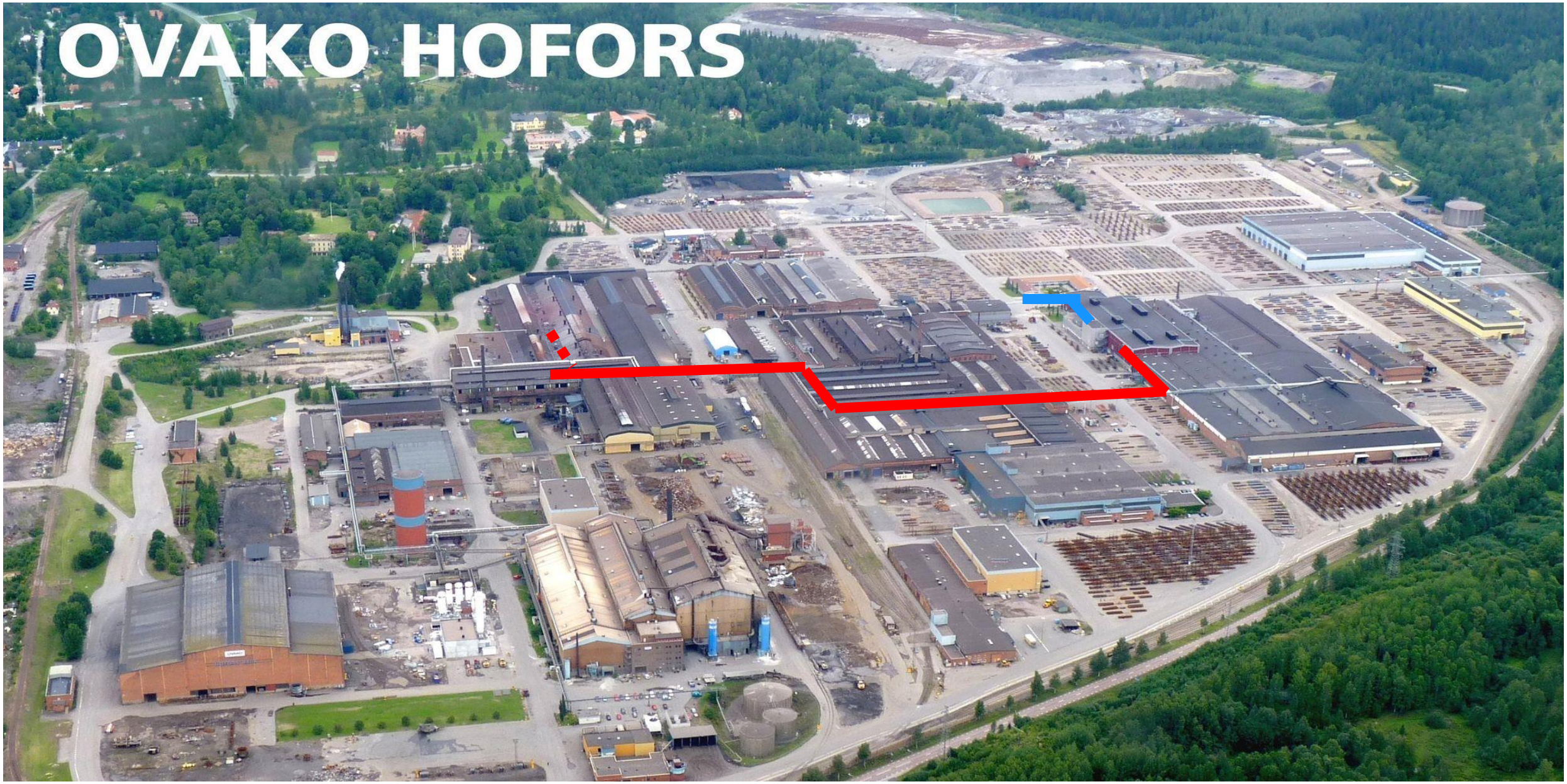
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Distinguishing features of Ovako's hydrogen concept

- Ovako is both producer and off-taker
- Large continuous H2-offtake at low pressure
  - Low compression
  - Very limited storage
- Increased efficiency by O2 and heat generated, and potentially third-party usage
- Quick energy source change
  - Existing LPG energy storage
  - Not dependent on H2

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Ovako’s hydrogen plant #1: key facts

CO_2e-reduction
- up to 20 000 tCO2e

H_2O as sole emission

Capacity
- ~ 20 MW
- ~ 4000 Nm3/h hydrogen
- ~ 2000 Nm3/h oxygen

Energy efficiency
- 76 % (prior to flue gas recovery)
- Most efficient way to cut emissions from re-heating before rolling

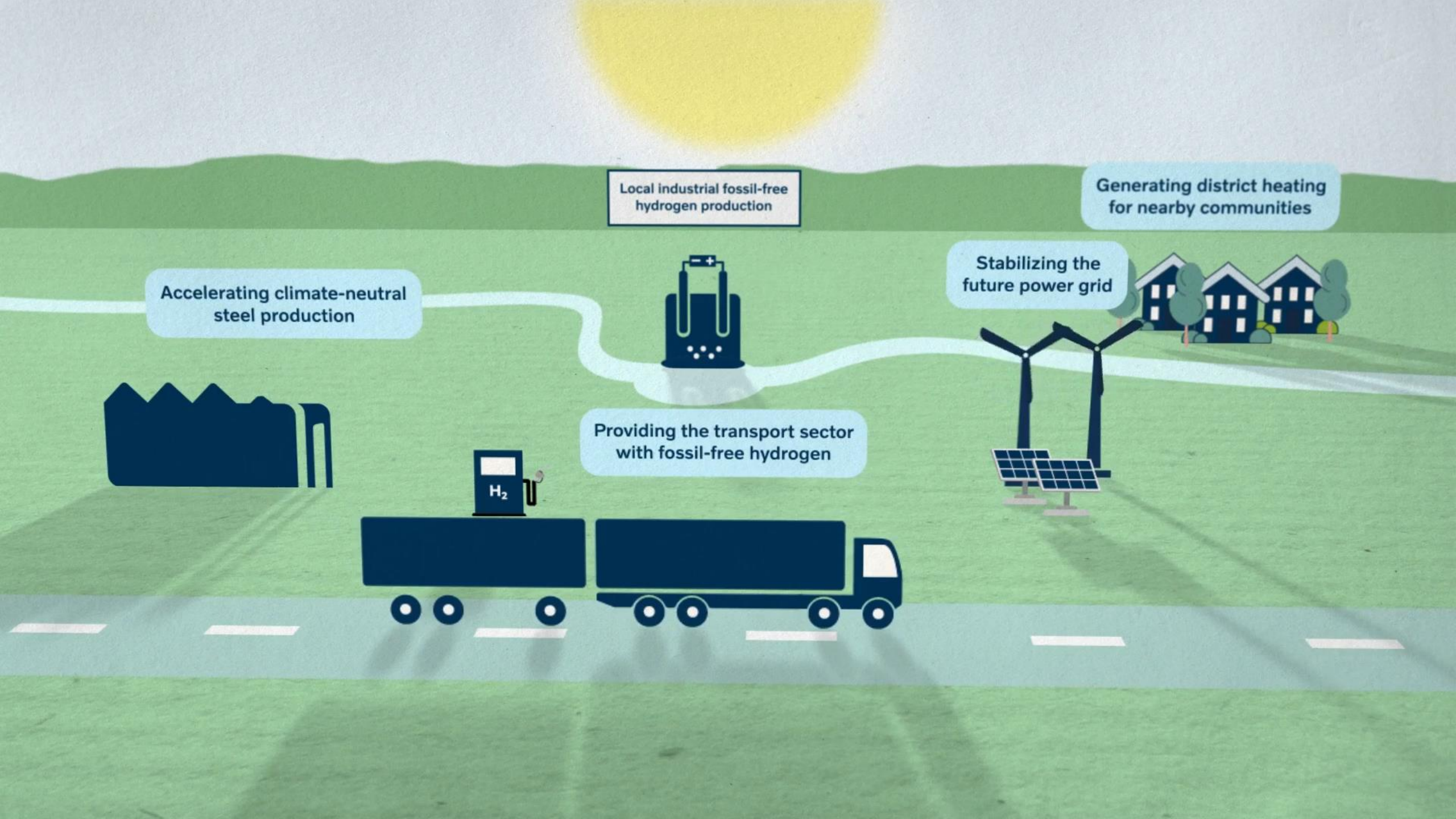
Outlook at decision time vs what happened

- Electricity cost STABLE/DOWN
- Flexibility services income UP
- ETS costs UP
- Fossil fuel prices UP/STABLE
- Investment costs DOWN

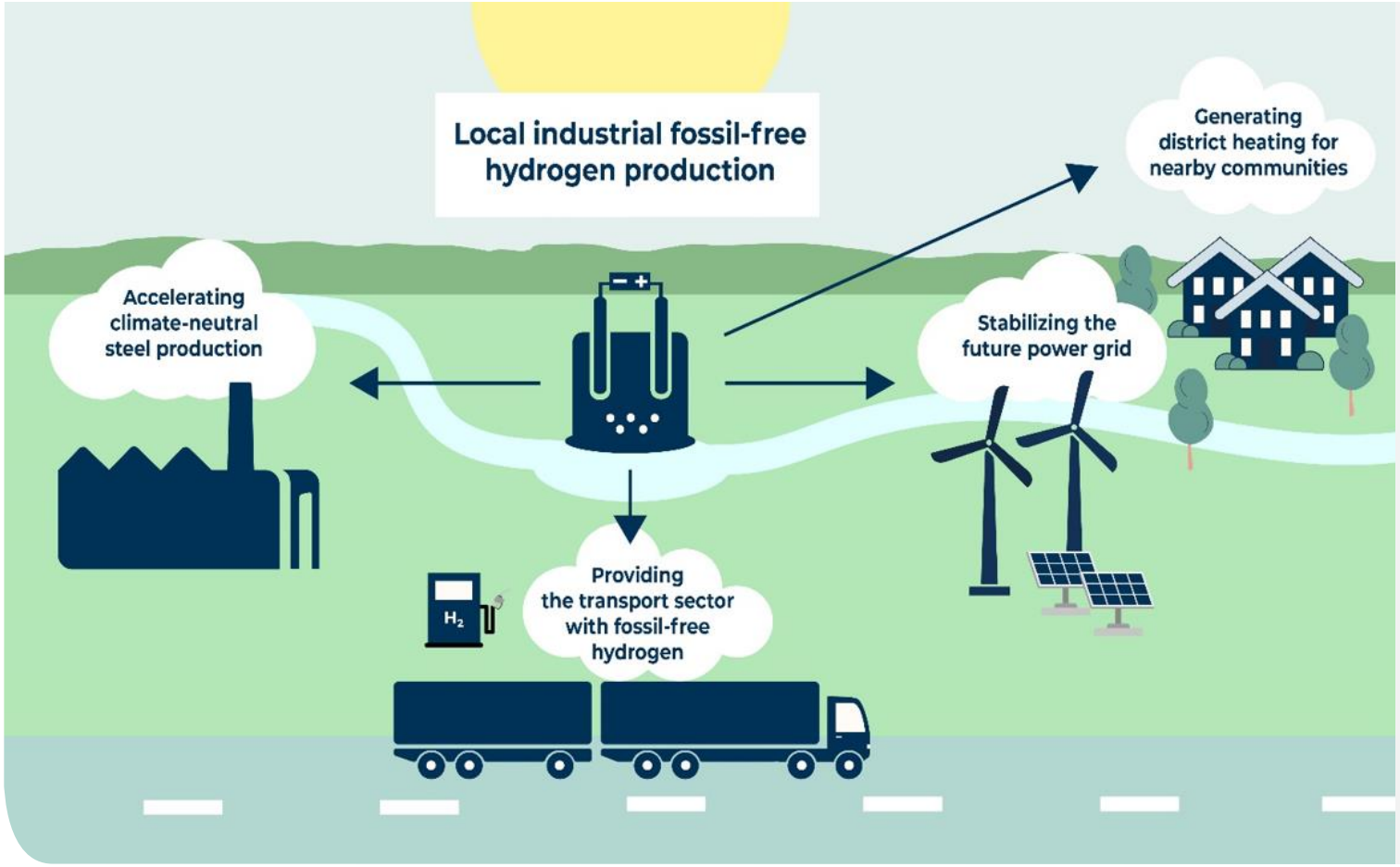
- Electricity cost UP
- Flexibility services income DOWN
- ETS costs DOWN
- Fossil fuel prices DOWN
- Investment costs UP

Learnings and insights

- Efficiency tools in place (e.g. oxyfuel, hot-flows, control systems) and inhouse competence
- Hydrogen production ramped up 2024 but with some technology issues / “teething problems”
  - The concept is right, but it has not been easy
- Energy source change whenever necessary
  - System in place to automatically turn on/off the hydrogen production based on cost-benefit assessments
  - Cost for electricity, emission rights and conventional fuels are important factors for the hydrogen use together with potential income from electricity flexibility services
- Unchanged product properties using H2 heating


Local industrial fossil-free hydrogen production
Generating district heating for nearby communities
Stabilizing the future power grid
Accelerating climate-neutral steel production
Providing the transport sector with fossil-free hydrogen
H2

The wider benefits of the hydrogen facility



Redundancy and flexibility

- Two energy systems redundant from each other
- Simple and fast switch between H_2 or LPG/LNG
- Electricity flexibility that help balance the power grid

The transport sector

- Possibility to provide hydrogen to fuel cell trucks

District heating

- Recovery of excess heat

Accelerating the transition

Funded by the European Union NextGenerationEU
Swedish Energy Agency
VOLVO
HITACHI Inspire the Next Hitachi Energy
nel
Stegra
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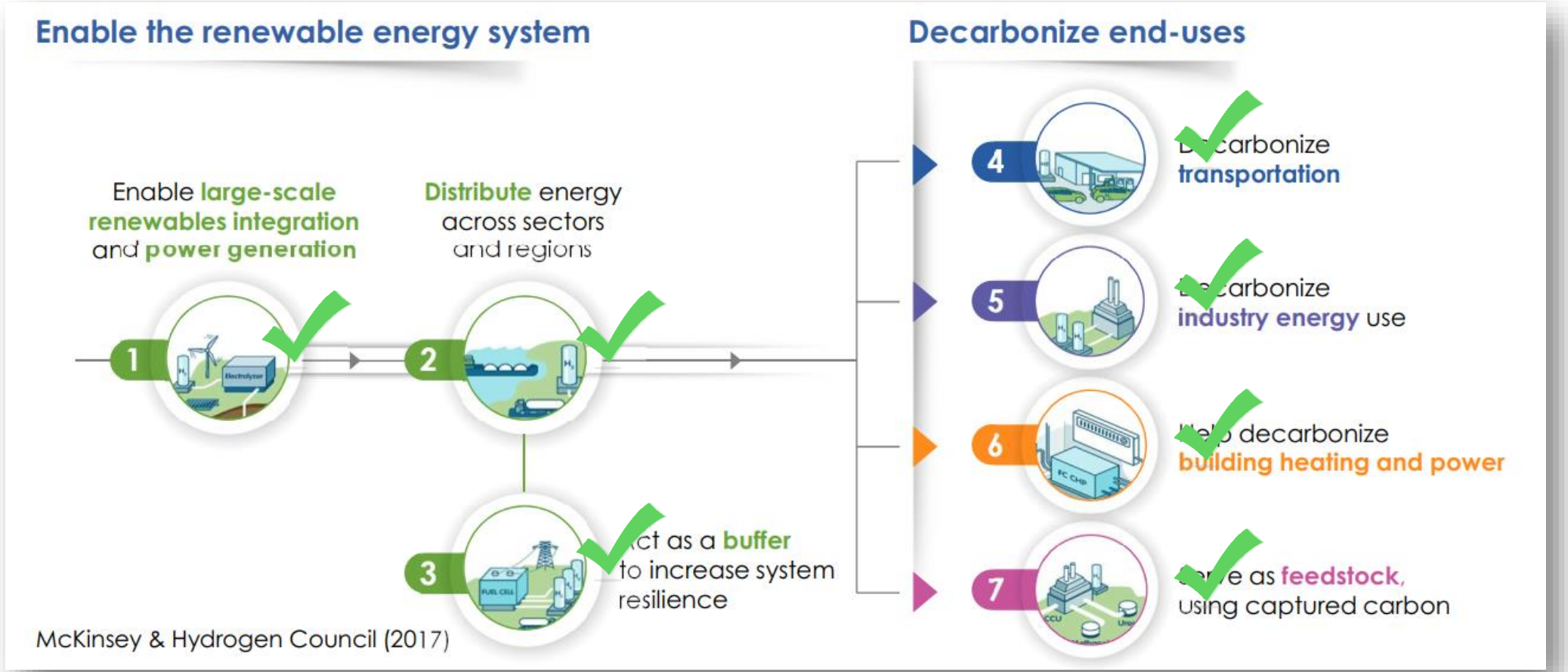
Touching most key areas in a hydrogen economy – making Ovako much more than an “off-taker”



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THANKS!

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