HYBRIT – System integration and flexibility

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HYBRIT in short

HYBRIT = HYdrogen BReakthrough Ironmaking Technology

A joint venture between SSAB, LKAB and Vattenfall
Order of magnitude – transition of Swedish ore-based iron/steel

- Reduce up to 35Mt of CO2
- +40% increase in Swedish electricity demand
- Minimum power demand can be reduced from 7GW to 1.3GW by storage flexibility

Electricity consumption [TWh]
- Sweden final electricity consumption 2018
- SSAB supply conversion
- LKAB pellet conversion excl. SSAB supply

Power demand 52TWh case [GW]
- Swedish electricity peak load 2018
- Constant load, no flex
- Flex with 100% electrolyser overcapacity
Scenario analysis with market feedback

North European power market simulation
- 2035-2055
- 51 weather scenarios
- Energy demand is compensated with 100% wind

Flexible 21TWh (40% in SE1)
- 180% electrolysis capacity [3.7GW]
- 7 days hydrogen storage [0.3TWh]

Flexible 52TWh (95% in SE1)
- 180% electrolysis capacity [10.2GW]
- 14 days of hydrogen storage [1.6TWh]

Flexible consumption can lower cost for Hybrit and increase the value of wind
SE1 price duration curves 2040: 52TWh

- Hybrit flexibility raises low prices and lowers high prices
- More wind increases the number of low-price hours

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Hybrit cost reduction with demand flexibility

Analysis exclude grid costs

- Flexibility reduces the cost of hydrogen production for Hybrit
- Increased wind penetration increases the value of flexibility
Wind value impact of Hybrit flexibility

Wind value impact of Hybrit: Flexible vs. constant hydrogen production [%]

- Demand flexibility increases the value factor of wind
- Challenging grid situation between SE1 and SE2 in the 52TWh case
Integrative approach

• Partnerships enable a more attractive approach to value chain transitions.
• Industry flex can increase build-out of variable renewables, which in turn benefits the industry.
• Solutions are built for fitting into the next generation electricity system.