

Hydrogen opportunities and challenges

Tuukka Hartikka

Business Lead, Renewable hydrogen &
Power-to-X, Helen Oy

Helen in brief

Number of employees in the Helen Group

957

Net sales of the Helen Group in 2019

914 EUR mill.

Total of **1,300** km of district heating network

Total of **6,200** km of electricity network

In Helsinki, our security of electricity supply is among the best in the world:

99.9%

Heating, cooling and electricity form the basis of our operations.

We are building the new solutions upon this expertise.



Helen is carbon neutral by 2030

Over a hundred years of urban energy

The electricity company of the City of Helsinki was established in 1909 in order to create a safer and more environmentally friendly way to produce energy in a smoky city.

Key market drivers

Five main drivers are influencing both demand and supply side of green H2

Market drivers

Regulatory push



Regulatory support for green hydrogen is **growing throughout the world**

20 countries (44% of global GDP) either already have or are currently developing a **national hydrogen strategy**

Capital market push



Large investment companies are **shifting capital towards 'green' assets**

Declining investments in fossil-based energy businesses and increasing pressure on top-level management

Decarbonization pull



Global trend to **reduce CO₂ emissions** with impact on **all relevant industrial sectors**

Strong pull **across energy intensive industries** to **decarbonize using green hydrogen**, e.g. chemicals, steel, transportation, etc.

Growth of renewables



LCOE for renewable electricity are a main driver for the price of green hydrogen

Due to the achievable full load hours, countries with a **large share of hydropower** and/or **geothermal generation** (e.g. Norway, Iceland) will be among the first to be able to **offer cost-competitive green hydrogen**

Build back better



The **EU announced a stimulus fund** to recover from the **COVID-19 pandemic**

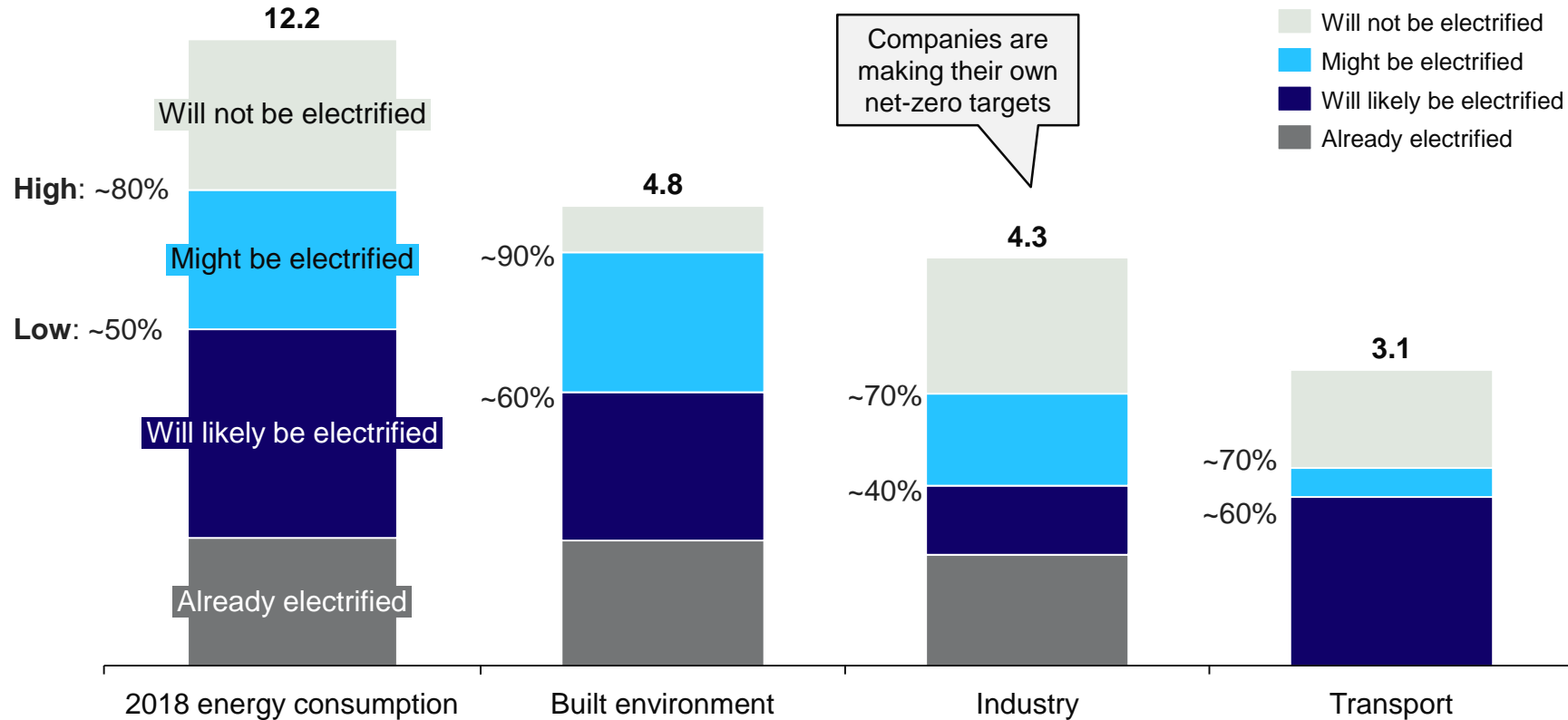
Next Generation EU (EC's economic recovery plan) highlights hydrogen as an investment priority to boost economic growth and resilience, create jobs and consolidate EU's global leadership

Key market drivers –  Decarbonization pull

Significant electrification potential across industries drives decarbonization efforts

Energy electrification potential towards 2050

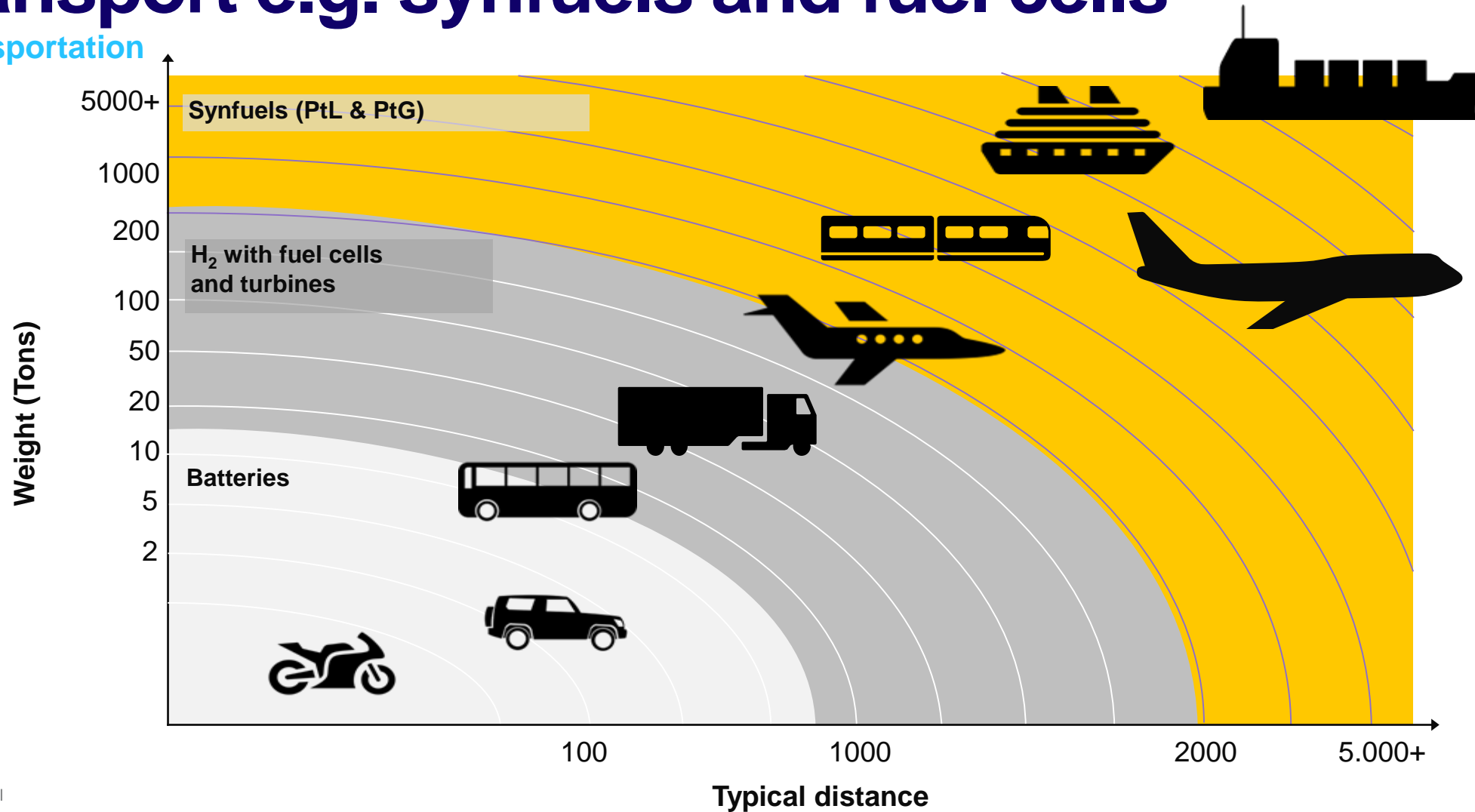
(EJ)



Key market drivers –  Decarbonization pull within Transport

Different solutions exist to decarbonize transport e.g. synfuels and fuel cells

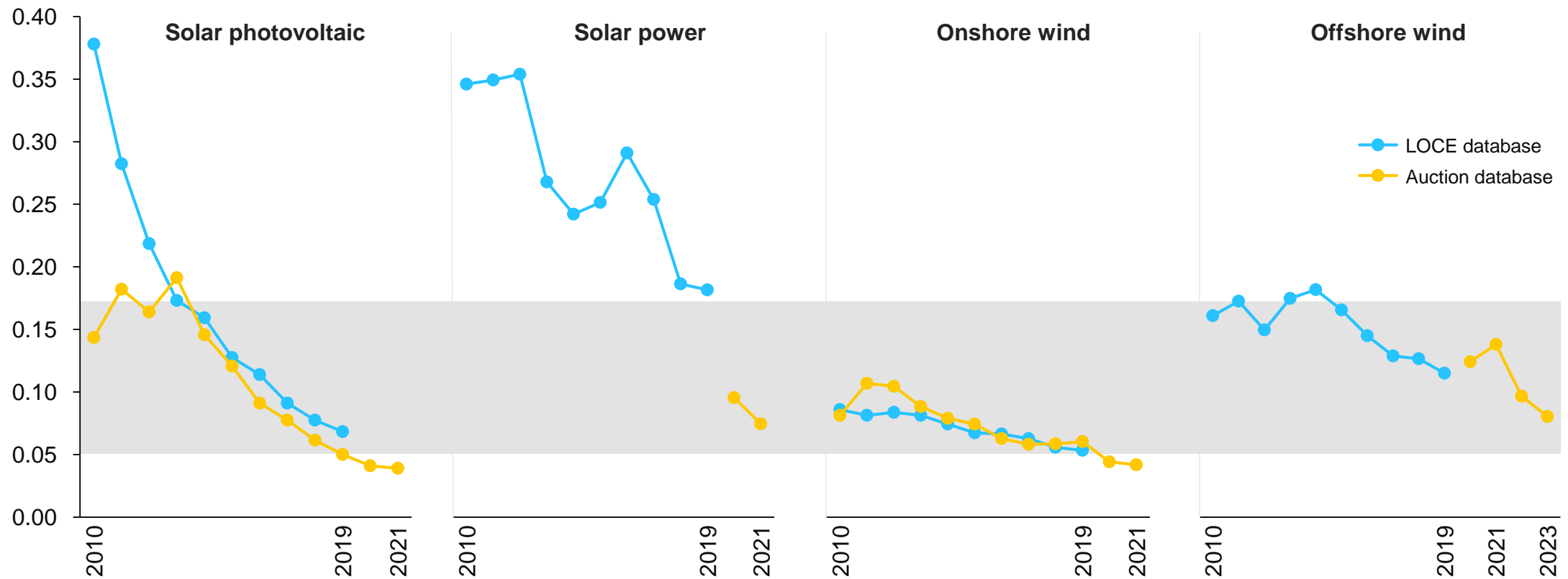
Transportation



Key market drivers –  Growth of renewables

Renewable energy sources outcompeting fossil fuels

Global weighted average LCOE and Auction/PPA prices, (USD/KWh)

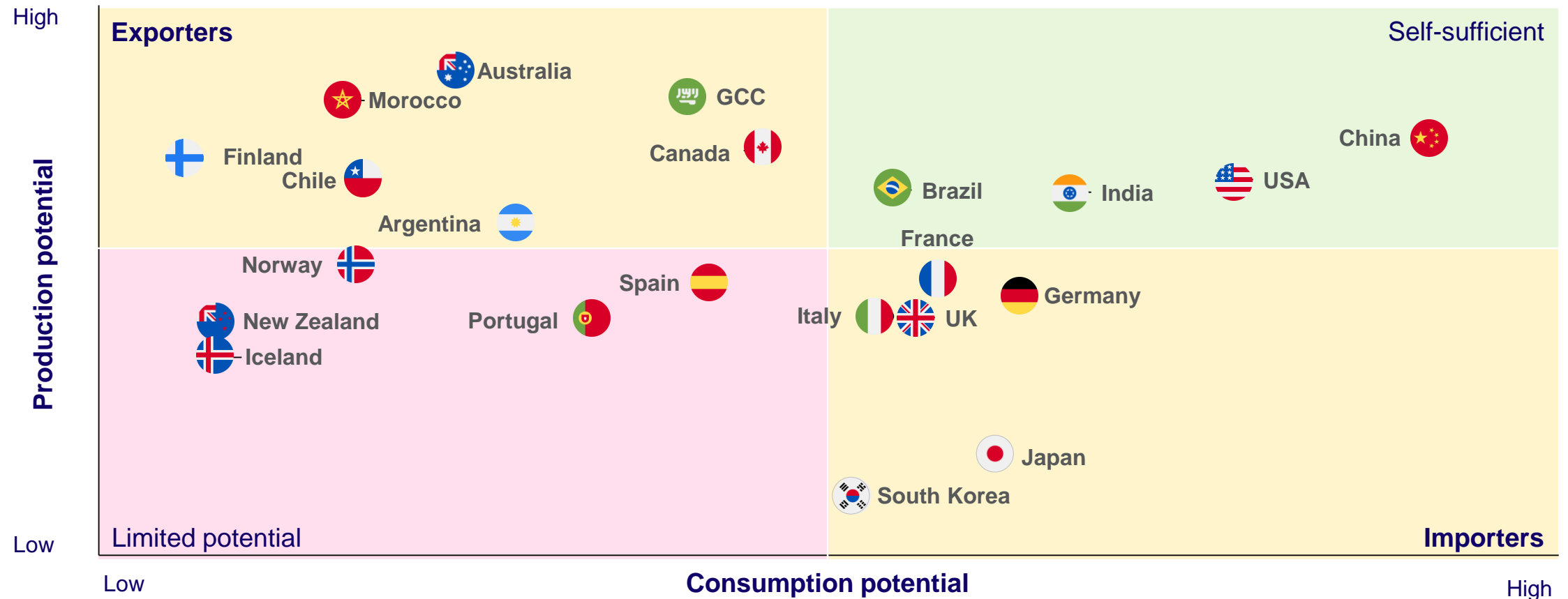




Market size and outlook

The roles of import vs. export differ between countries

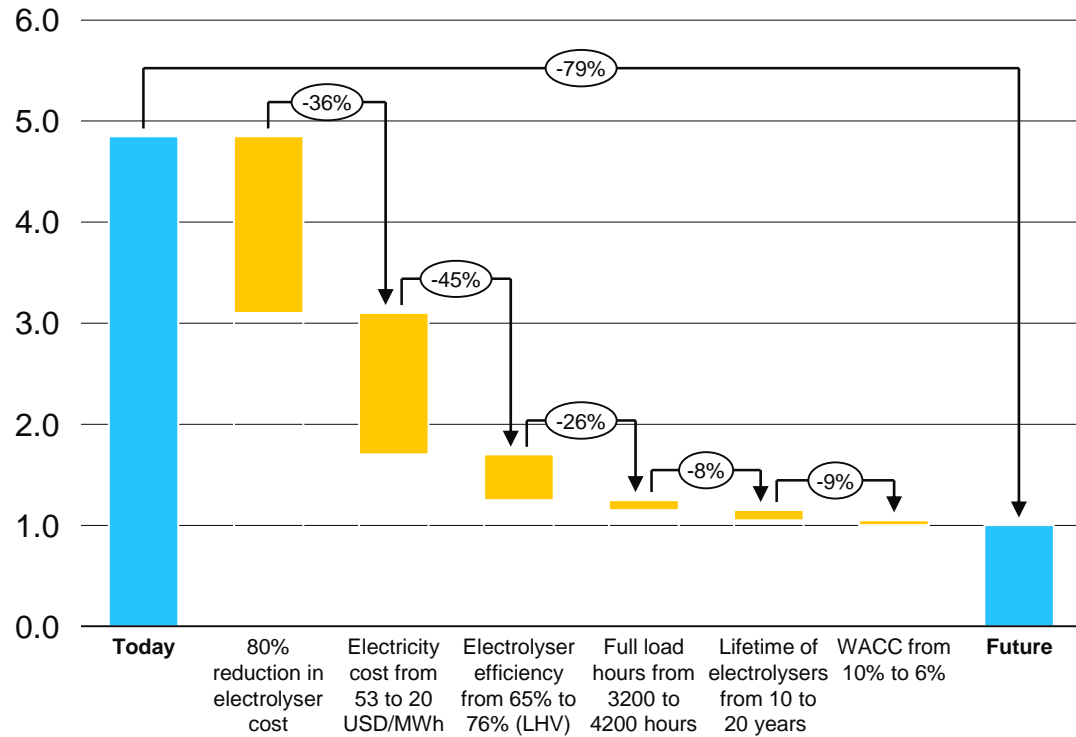
Production vs. consumption potential by country



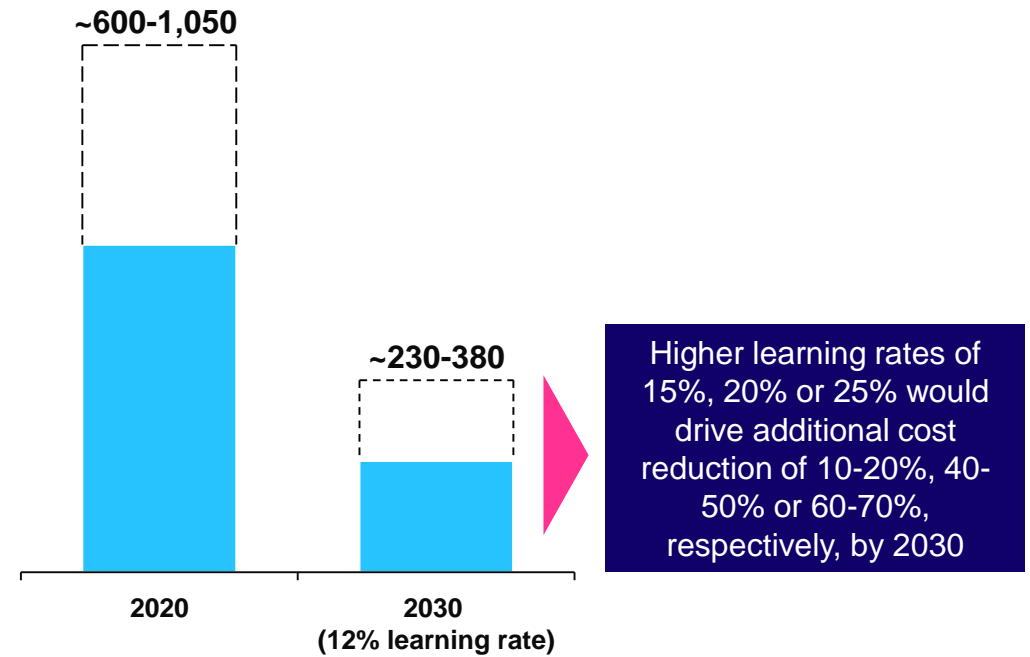
Electrolyser costs decline as technology improves and production scales

Equipment costs

Reductions in hydrogen production costs (USD/kgH₂)



Electrolyser system capex reduction (USD/kW)



**”If you always do what you
always did, you will always
get what you always got.”**

Albert Einstein

