FROM VISION TO REALITY: SCALING HYDROGEN IN THE NORDICS

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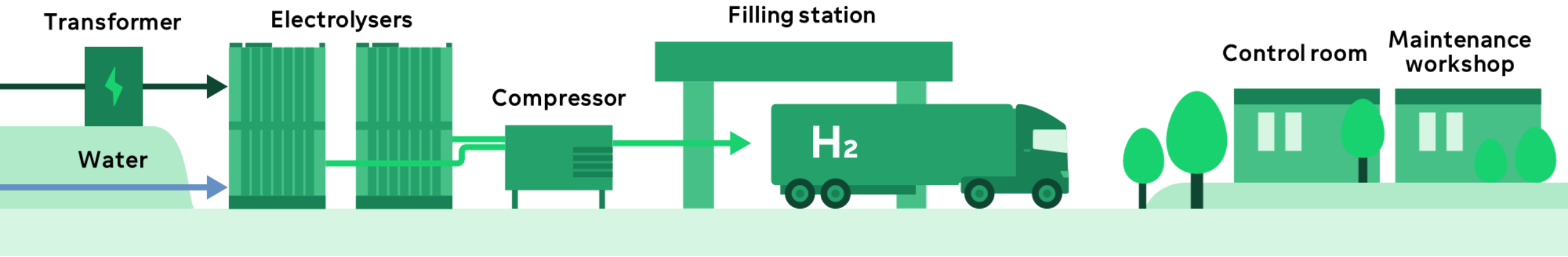
Kalla pilot is a testbed for Fortum to develop flexible PPA and services for industrial customers around hydrogen and flexibility

We are developing operational models and guidelines for safe, efficient, and flexible hydrogen production

Theme 1:
Operation and Safety

Theme 2:
Flexibility and Efficiency

Theme 3:
Optimization and Operability



We at Fortum have a wide range of services for Hydrogen industry

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Hydrogen and hydrogen-derived renewable fuels play a critical role in decarbonising hard-to-abate sectors

- Sectors decarbonise by converting to electric technologies
- Carbon-free hydrogen replaces fossil hydrogen existing use-cases
- Hydrogen-derived renewable fuels replace fossil fuels in transport sector
- New and existing industries switch to processes based on emission-free hydrogen to phase out fossil fuels

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However, low-carbon hydrogen is and will be relatively expensive compared to fossil hydrogen in its main use cases

Refineries

In refineries, hydrogen is used to remove impurities and improve fuel quality.

Low-carbon hydrogen is currently **3-5 times more expensive** than fossil at 6-10 EUR/kg vs 2-4 EUR/kg for grey hydrogen.

Image: Neste refinery in Porvoo, Finland

Fertilisers

Hydrogen is the primary feedstock for ammonia and ammonia-based fertilisers.

Fossil-free ammonia is expected **~2 times more expensive** than grey ammonia.

Image: Green North Energy ammonia project in Naantali, Finland

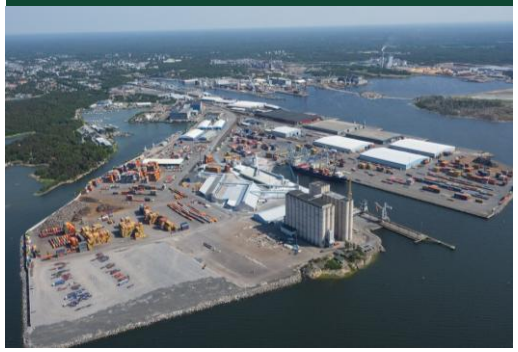
Steel

In fossil-free steel production, direct reduction of iron ore uses hydrogen..

Fossil-free steel is estimated to be **~2 times more expensive** than regular at 800 EUR/ton of steel (vs. 450 EUR/ton for grey).

Image: Stegra green steel project in Boden, Sweden

Kerosene



Sustainable aviation fuel from low-carbon hydrogen

eSAF is estimated at **7-9 times more expensive** at 7000 EUR/ton of fuel (vs. 800 EUR/ton of fossil kerosene).

Image: Norsk e-Fuel eSAF project in Rauma, Finland

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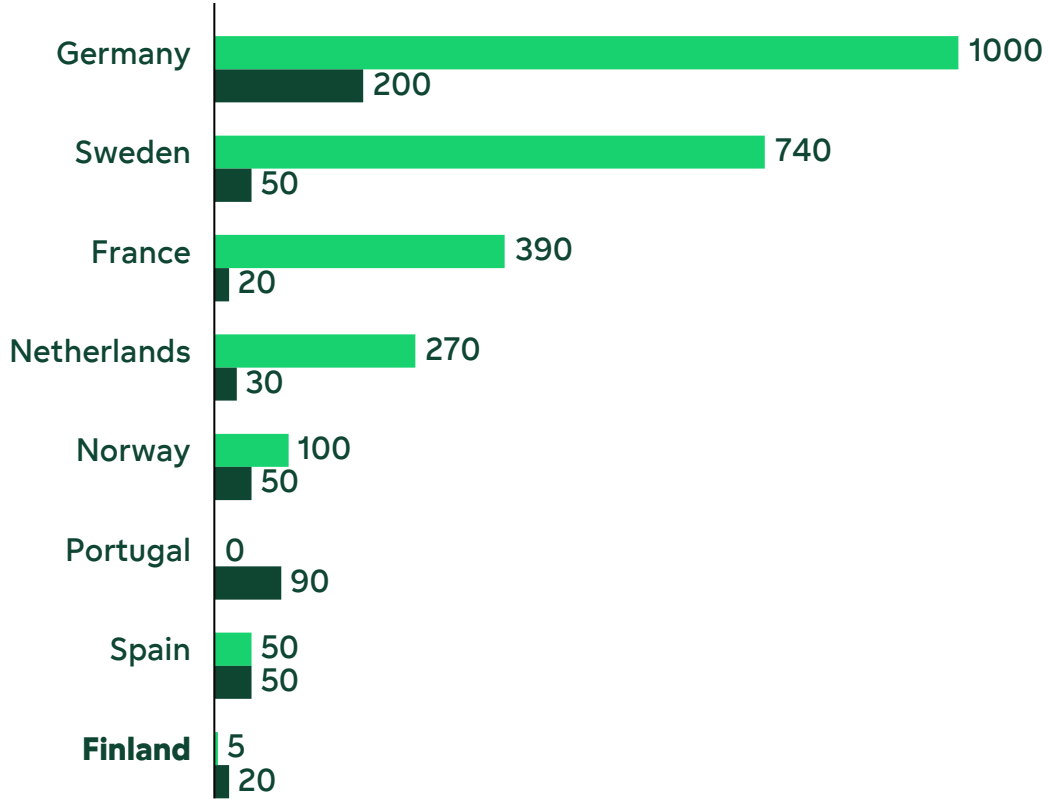
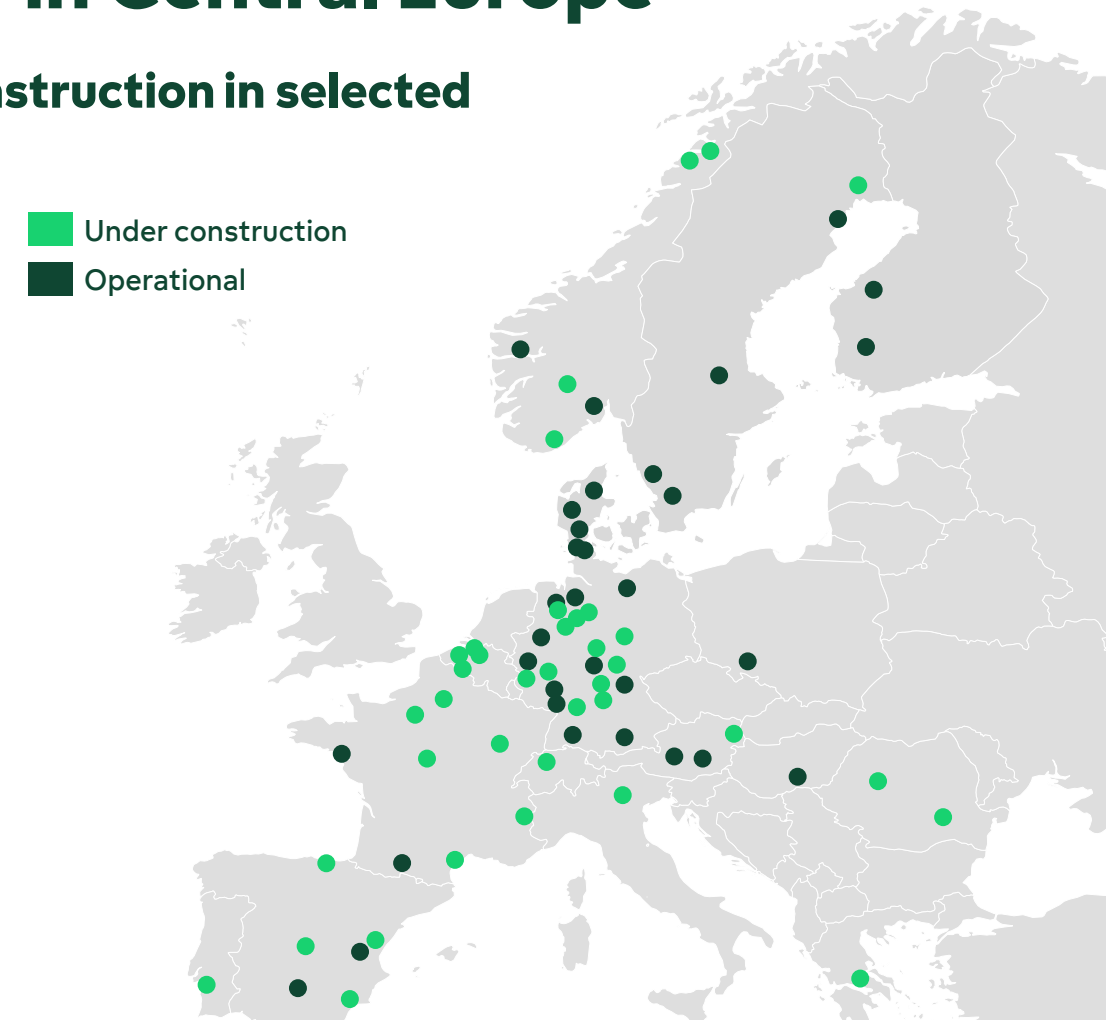
Sources: Hydrogen Europe and PwC EU lead market report 11.2025, Project SkyPower insights report, BloombergNEF.

Despite the cost challenge low-carbon hydrogen projects are progressing – in particular in Central Europe

Electrolyser projects in operation and under construction in selected European countries (MW)





Projects > 5 MW or 500 t/year. Source: Hydrogen Europe

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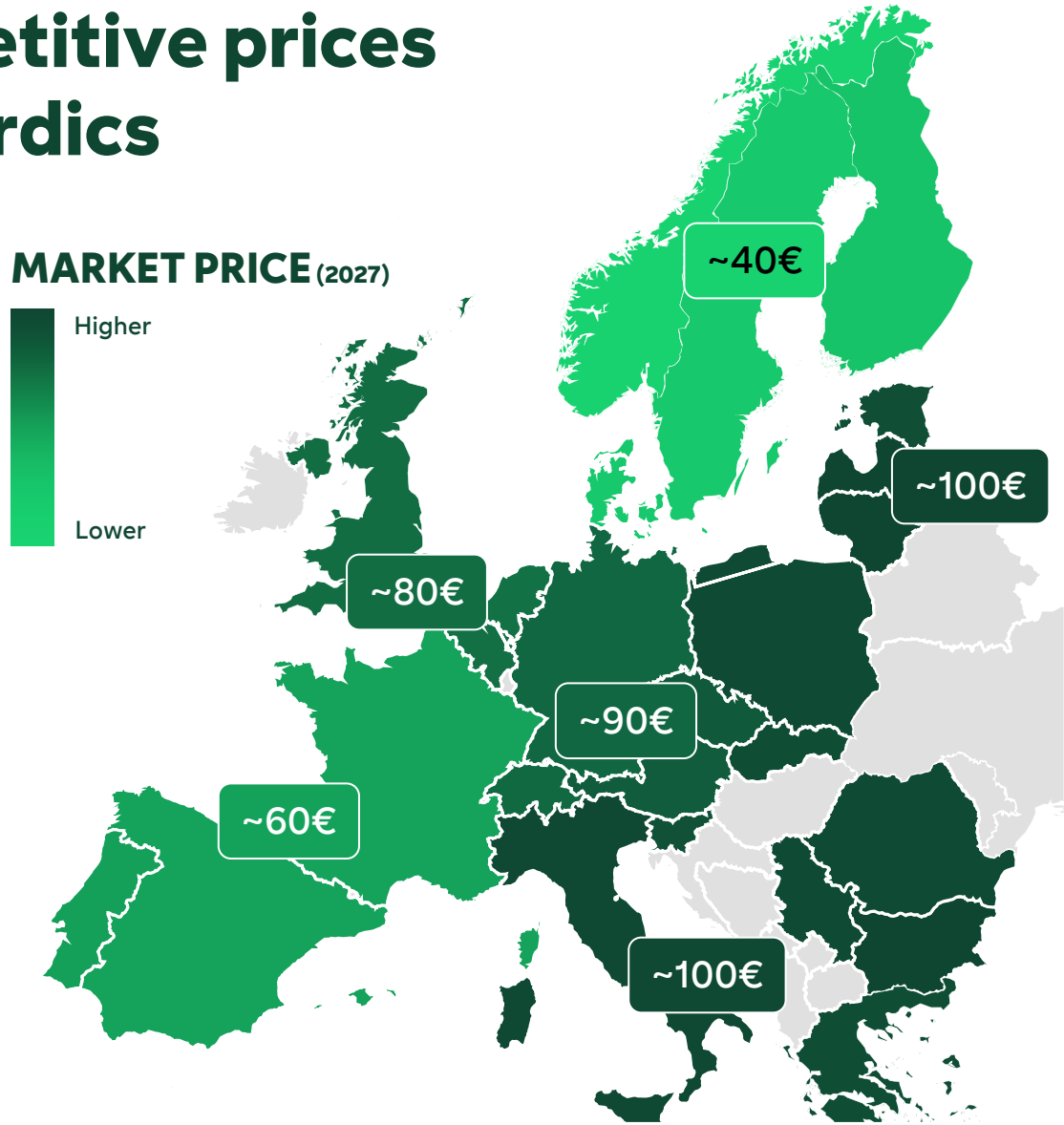
Low-carbon power and competitive prices attract investments in the Nordics

WHY NORDICS?

- Low-carbon
- Waste heat utilisation
- Affordable electricity
- Land and water availability
- Grid and infrastructure
- Skilled workforce
- Biogenic CO2

MARKET PRICE (2027)



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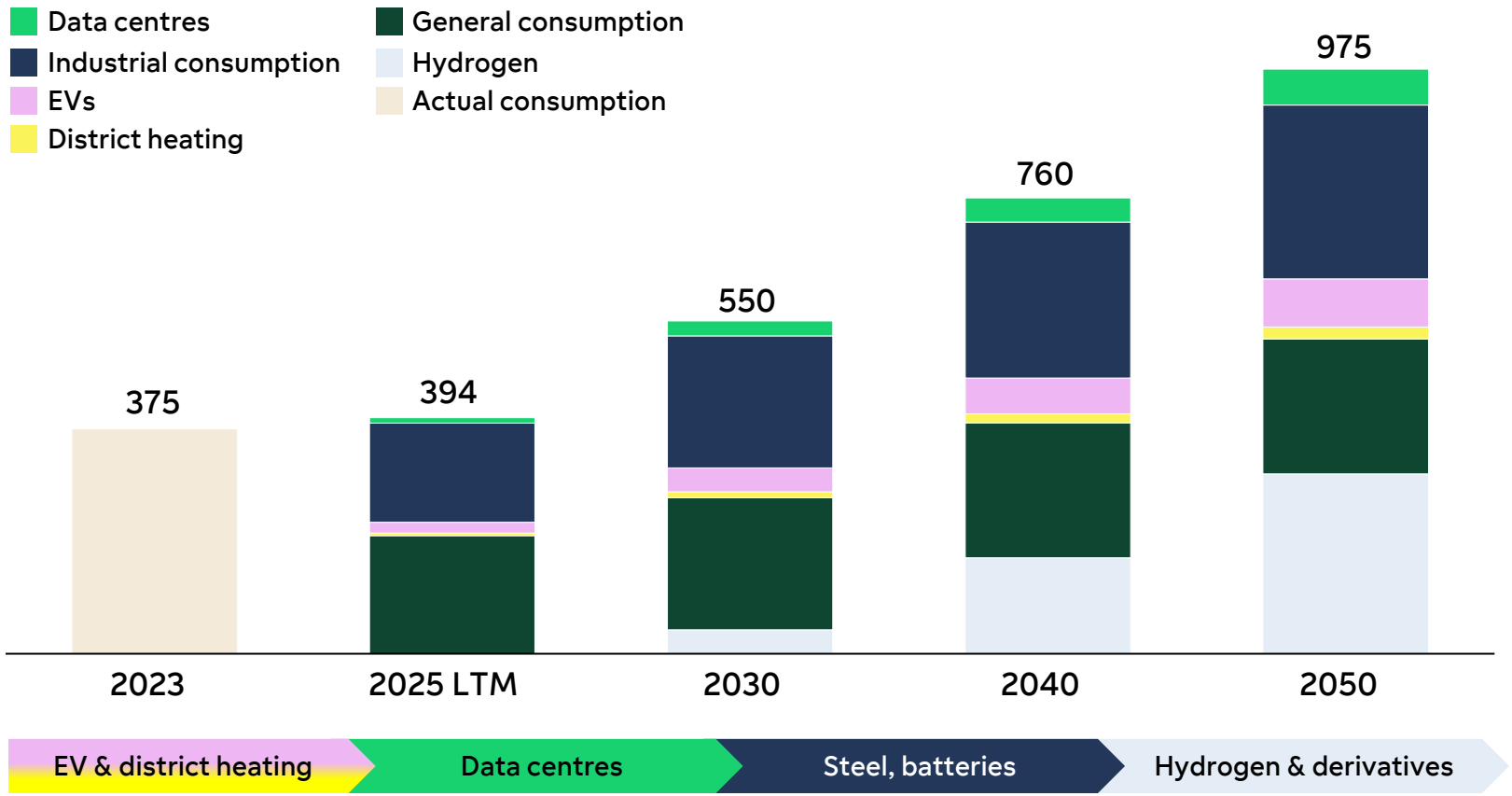
Hydrogen and derivatives expected to drive Nordic power demand growth from the 2030s onwards

Nordic power demand (TWh/a)



- Growth in Nordic power demand is currently driven by data centers and electrification in the district heating sector
- Hydrogen and derivatives expected to pick up during the 2030s

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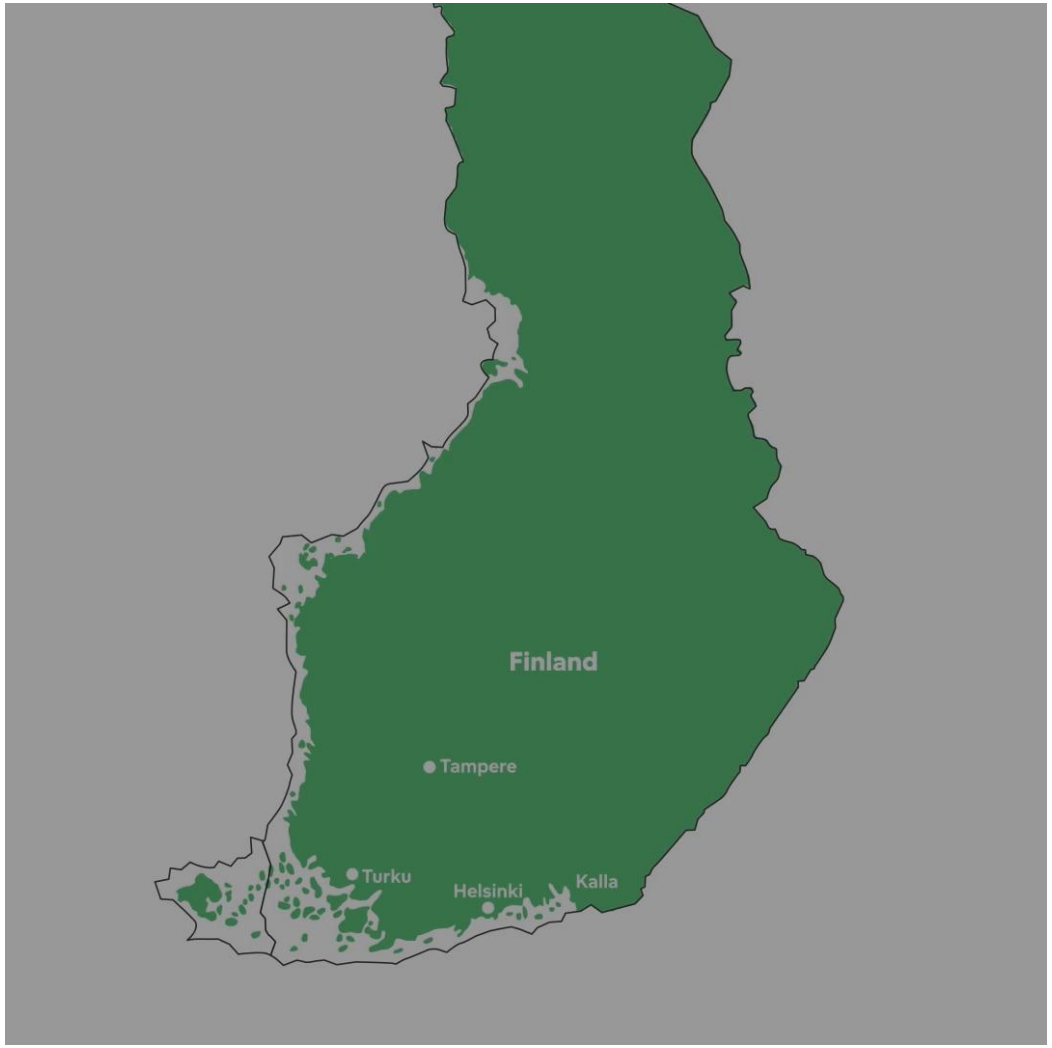
Source: Nordics TSO report, updated in June 2025

Low-carbon hydrogen projects struggle with commercial viability, leading to lack of investment decisions

OBSTACLES	ENABLERS
Regulatory uncertainty	Solid commitment to both national and EU climate targets, in practise through implementing all clean hydrogen obligations within various regulations
Gap between LCOH and customer willingness to pay	Launch EU-funded double-sided auctions to cover the price gap until LCOH and willingness to pay converge
Stacking of risk premia across value chain	De-risk first-of-a-kind projects through public financial guarantees across P2X value chain
Biogenic CO2 supply	Create subsidy mechanisms to enable investments into BioCO2 capture for P2X production, also supporting e.g., pulp and paper business diversification

Fortum produces first hydrogen at Kalla Test Center



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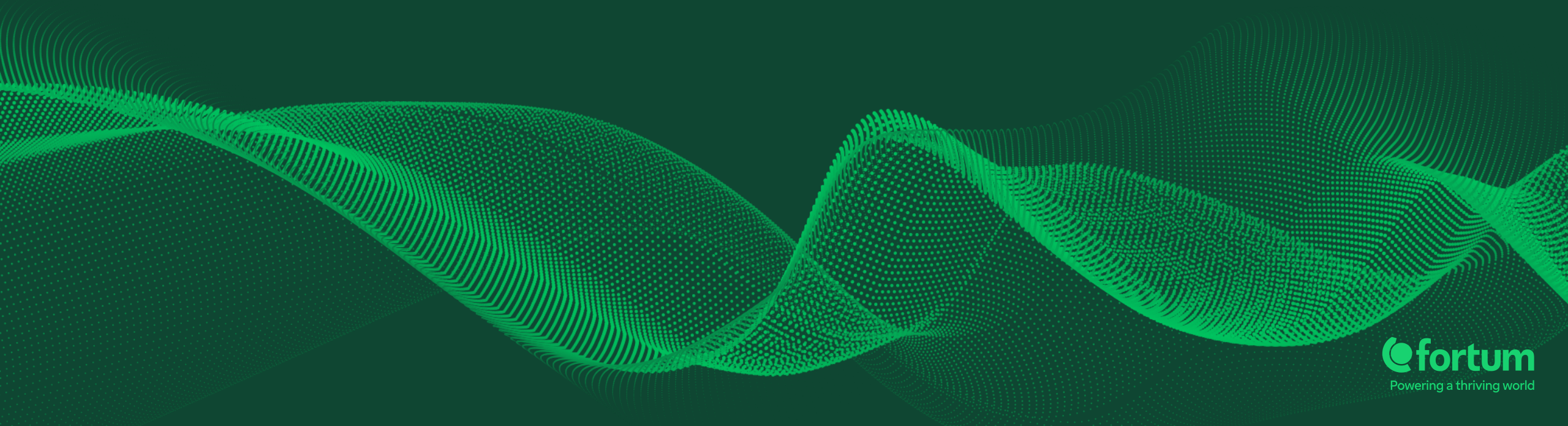
THANK YOU



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