

Energy transition - prospects for clean electricity and hydrogen

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Energiategollisuus

Triple jump

TOWARDS CARBON-NEUTRAL ENERGY



3.

Reliable and well-functioning new energy system

- Sector integration of energy
- Cooperation with the customer
- Enabling energy networks
- Developing expertise & services

1.

Carbon neutral energy production

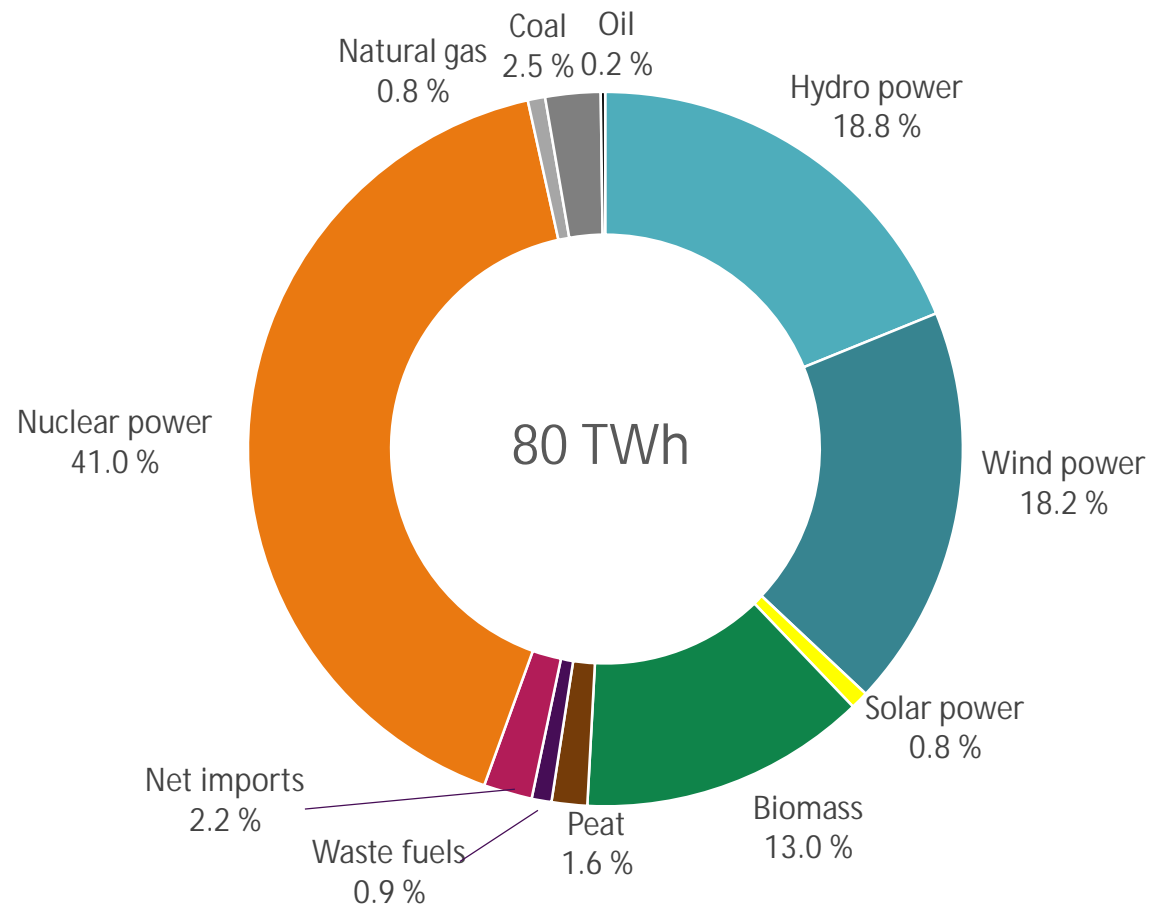
- Fossil-free electricity and district heat generation
- Circular economy
- Bioeconomy
- Clean gases

2.

Energy transition in consumption: electrification and hydrogen economy

- Industry
- Transport
- Heating

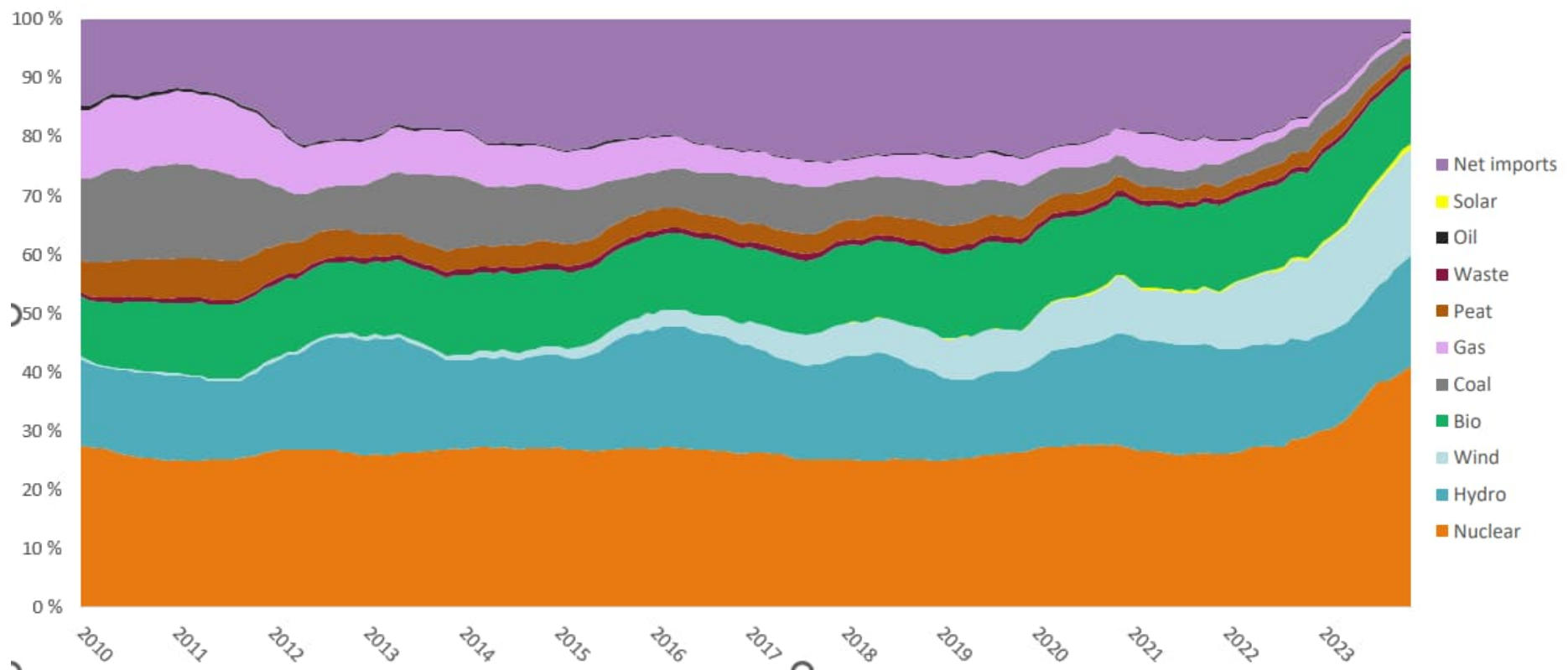
Electricity by energy source and net imports 2023



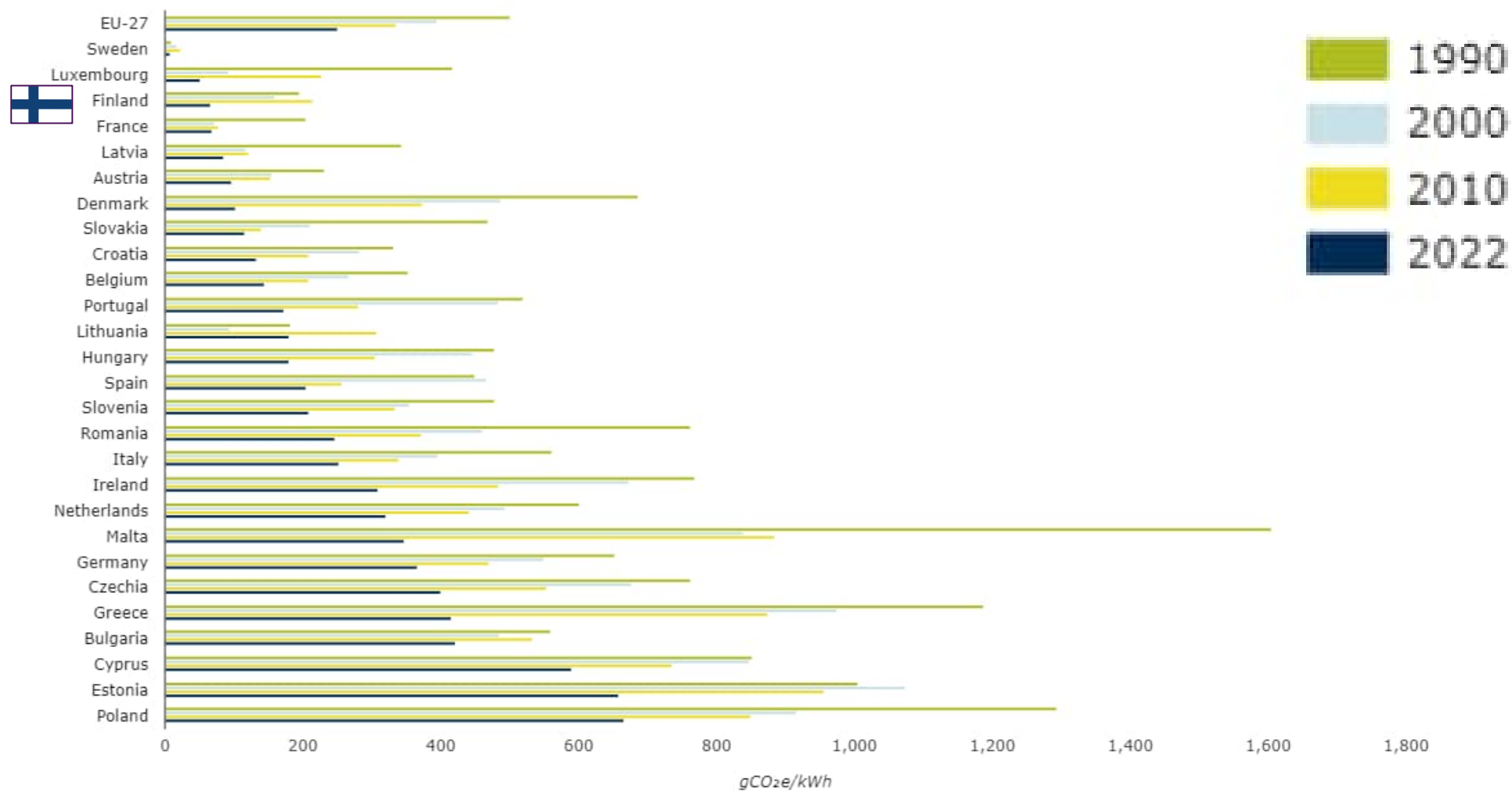
Power generation in 2023:

- Carbon neutral: 94 %
- Renewables: 52 %
- CO₂-emissions: 33 g/kWh_e
(EU average around 220 g/kWh)
 - -87 % since 2010
- Finland used to be the EU's biggest importer of electricity but has now replaced the net imports.

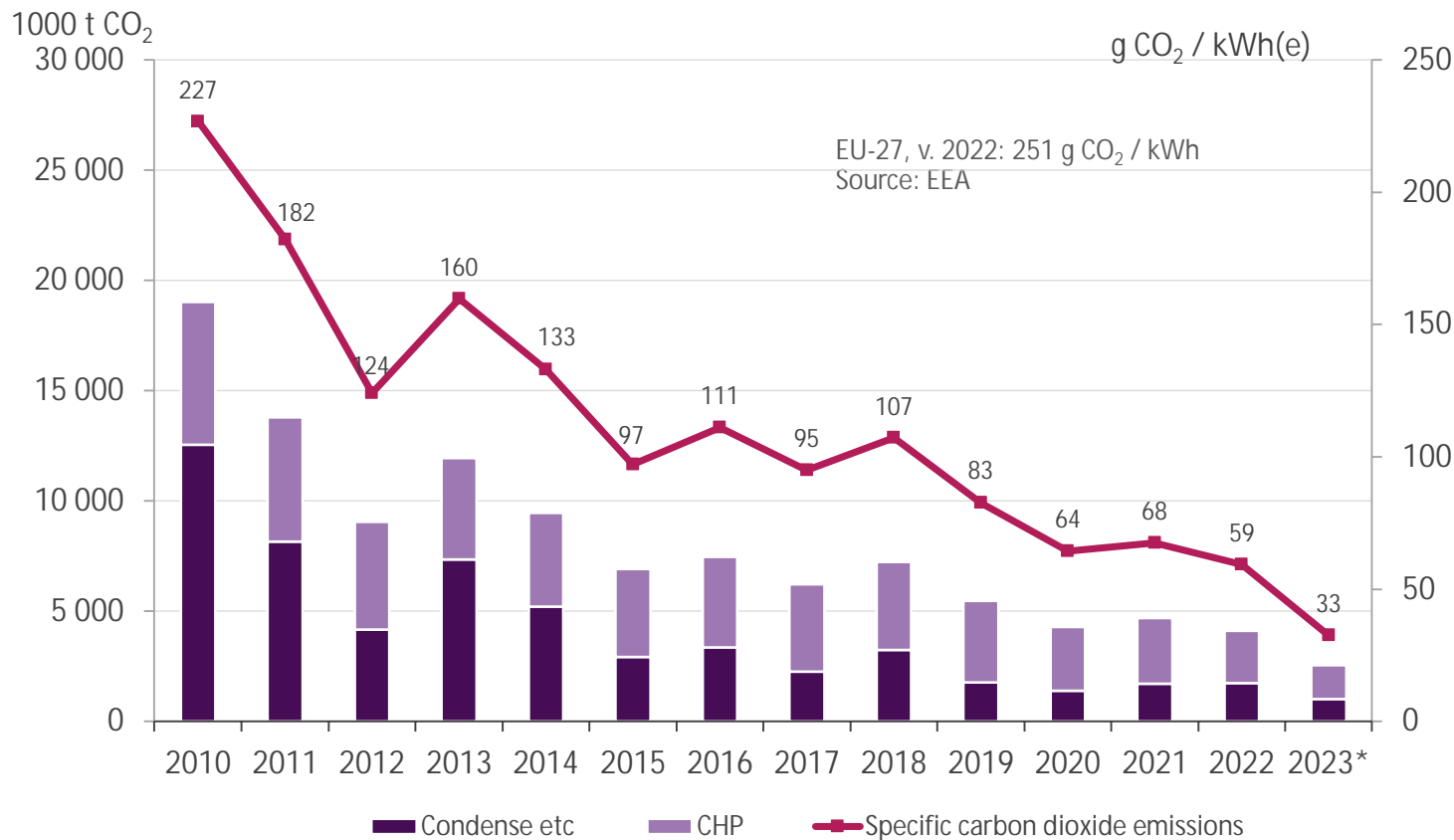
Fossil fuels and net imports have been replaced with carbon neutral generation



Power generation emissions in EU countries (gCO₂/kWh)



CO₂-emissions of power generation -87 % since 2010



CO₂-emissions of power generation:

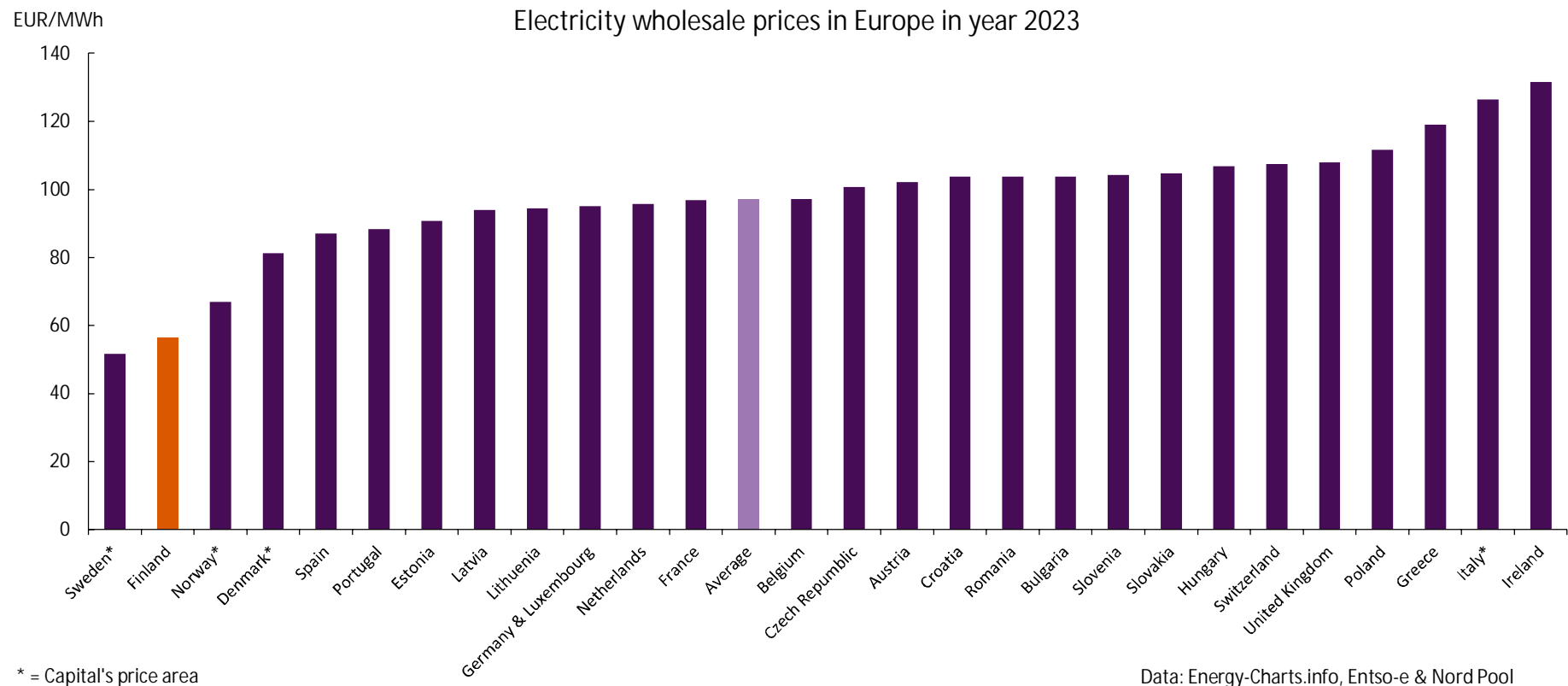
- 2.5 Mt in year 2023
- 4.1 Mt in year 2022
- 7.5 Mt in year 2016
- 19 Mt in year 2010

→ 2023 vs. 2022 -38 %

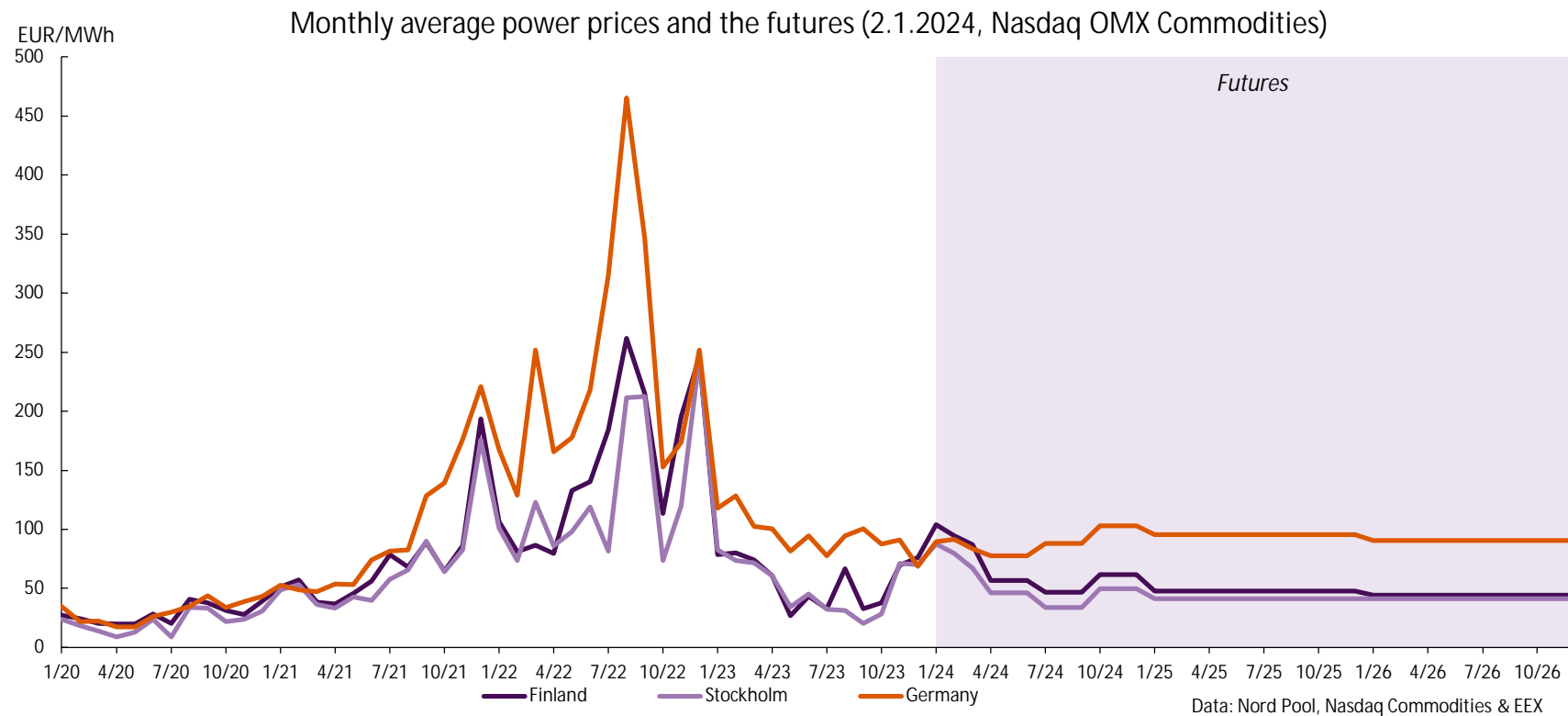
→ Emissions -65 % in last 5 years

→ Emissions -87 % vs 2010

Finland has the second lowest electricity wholesale prices in the European electricity market



The power prices in Finland and Sweden seem to remain lower than in Central Europe



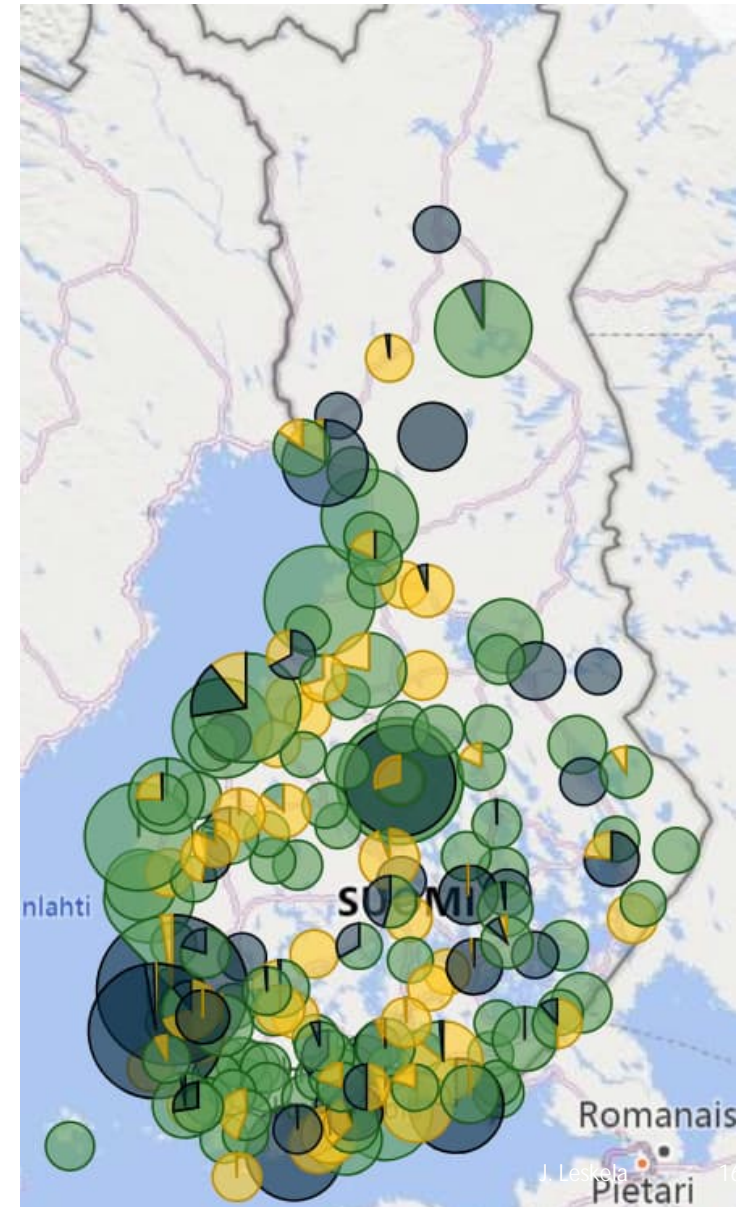
Tremendous opportunities to increase carbon neutral capacity

- Huge amount of wind and solar power projects
 - On-shore wind projects under development alone could double or triple Finnish power generation
 - Multiple off-shore wind power projects
 - Industrial scale solar power emerging, tens of GWs in pipeline
- Nuclear power outlook very good
 - “Old” NPPs lifetime extensions agreed
 - Olkiluoto 3 on production
 - Large interest on small modular reactors by energy companies and industrial users



Huge interest for industrial investments based on clean electricity and hydrogen

- There are investment plans for more than 220 billion euros in clean energy, hydrogen and carbon neutral industry in Finland alone.
 - Confederation of Finnish Industries keeps up a data dashboard
 - <https://ek.fi/en/current/news/the-data-dashboard-tracks-finlands-green-investments/>
- This development is business-driven
 - Technology, customers, financiers,...

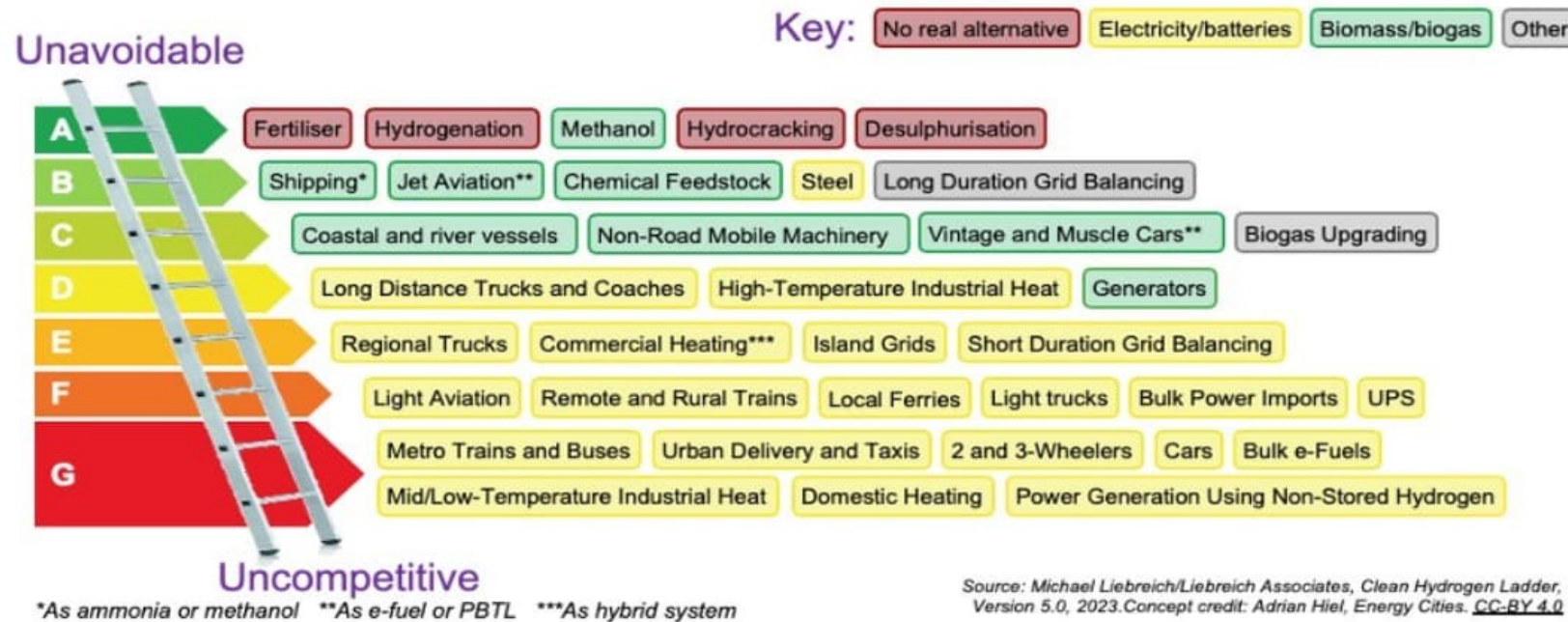


Large potential for utilisation of hydrogen

Competitiveness and probability is not equal for different purposes

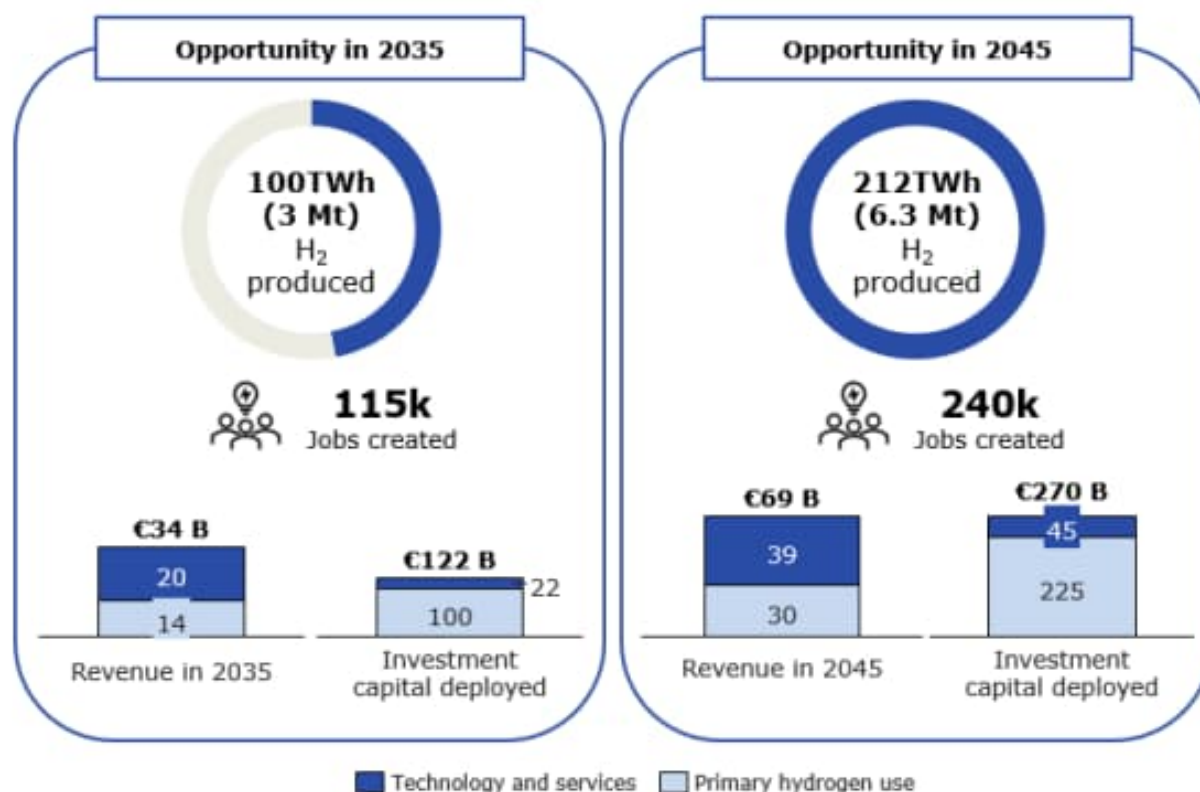
Hydrogen Ladder 5.0

Liebreich
Associates

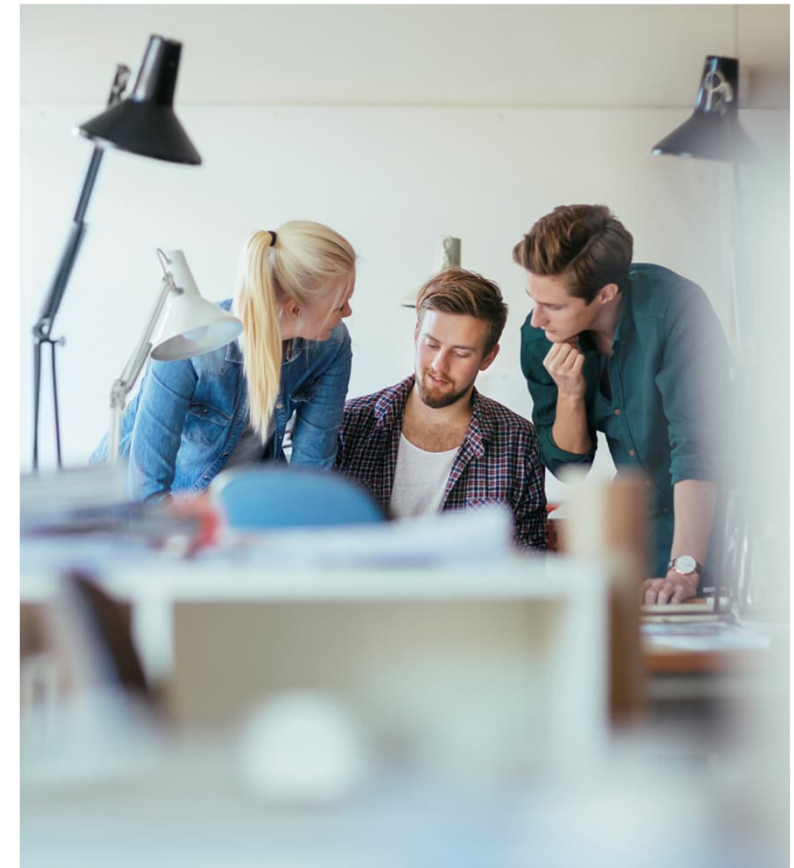


The Hydrogen Ladder, Version 5.0

Opportunities for Finland according to Finnish H2 Cluster's hydrogen strategy



How to reach the goals of the strategy?



A photograph of two young women with long hair, wearing sunglasses and smiling, making peace signs with their hands. They are standing on a sunny street with buildings in the background. The image has a warm, golden-hour glow.

Climate neutral energy system is
possible and a great opportunity



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