Hydrogen Cluster Finland
The Finnish Hydrogen Value Network

New technology, business potential and climate impact in every segment

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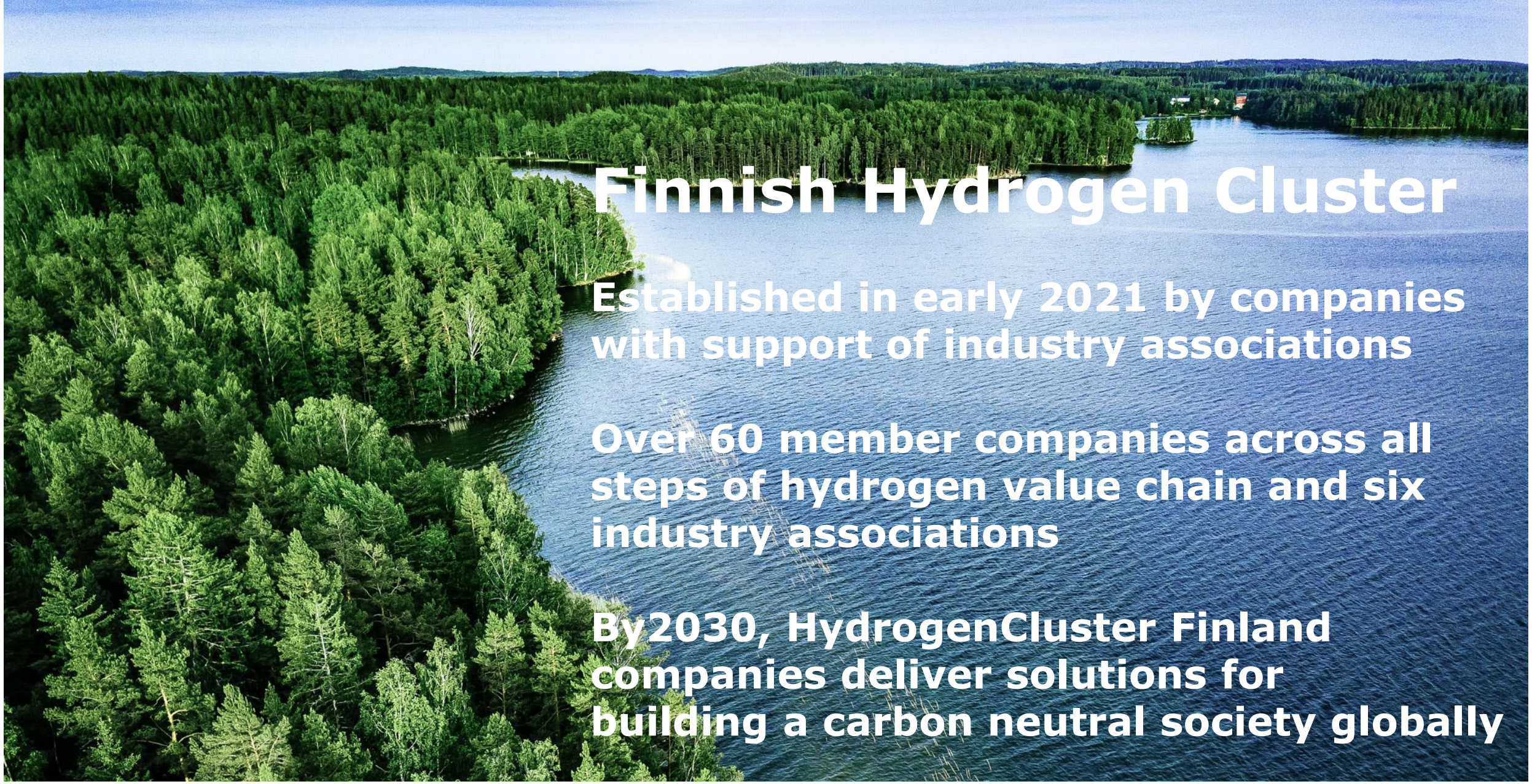

Finnish Hydrogen Cluster

Established in early 2021 by companies with support of industry associations

Over 60 member companies across all steps of hydrogen value chain and six industry associations

By2030, HydrogenCluster Finland companies deliver solutions for building a carbon neutral society globally

H2cluster FINLAND

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Finnish Strengths in Hydrogen economy

A robust and clean electricity system as a basis for clean hydrogen expansion

- Massive growth potential for cost competitive land based wind power expansion
  - Shallow off-shore waters extend opportunity further
  - Strong, intelligent and digitalized electricity transmission and distribution networks enable rapid scaling
- Pragmatic energy policy offers additional flexibility for generation of clean electricity (e.g. use of nuclear in the mix)

High-tech, stable society with unique competencies basis for ecosystems

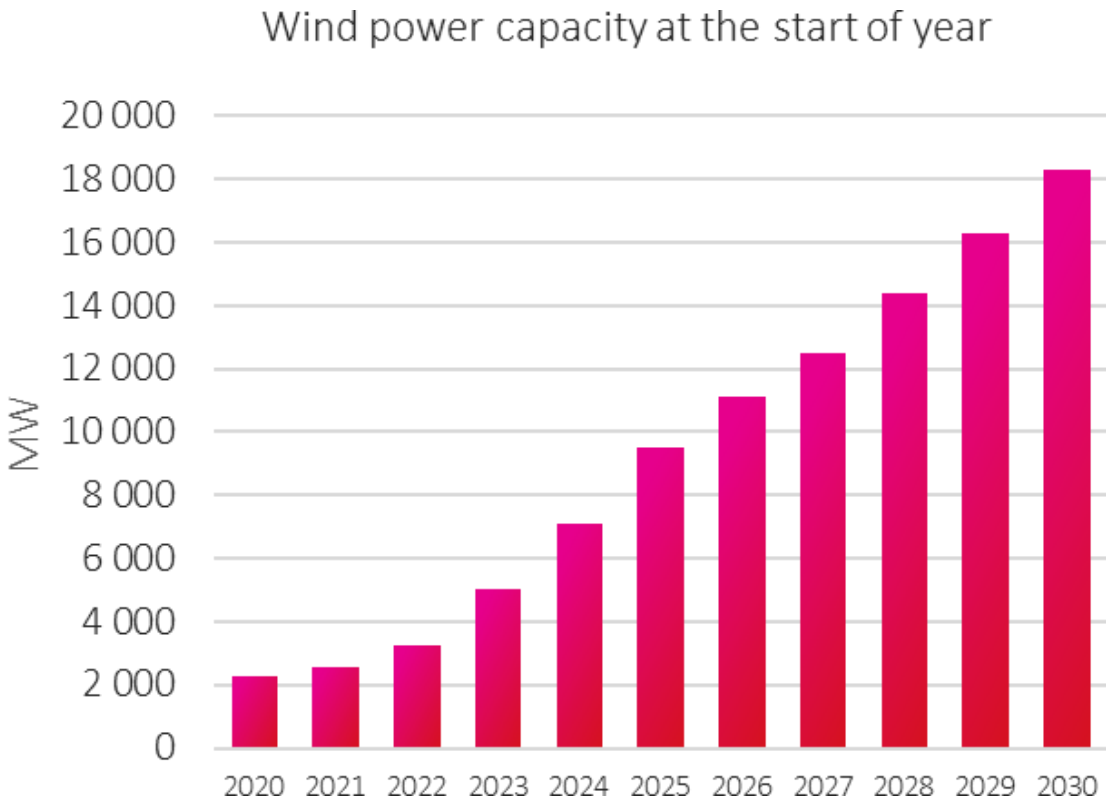
- Electrical engineering, process systems, ICT, cyber security…
- Effective public-private collaboration
- Low risk investment environment

Extensive sector coupling opportunities to integrate hydrogen across industries and energy sectors from maximum value add

- Discrict heating networks, CHP, energy intensive process industries, (bio) CO2 sources, clean water, marine cluster…

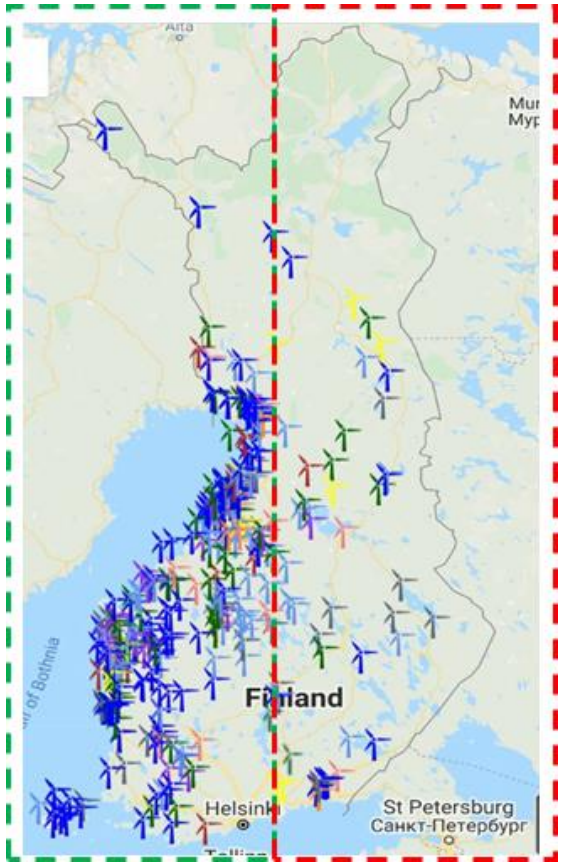
The production potential of clean hydrogen in Finland is significant – and competitive

- In 2021, 87% of electricity produced in Finland was produced carbon-dioxide neutrally and 54% with renewable energy sources
- Wind power boom: It is estimated that the total wind power capacity will reach approximately 18,000 MW by the end of the decade
  - Finland combines factors such as good wind conditions with the possibility of constructing cost-effective onshore wind power based on tall hub height
  - The cost level of Finnish onshore wind power is significantly lower than that of European offshore wind power



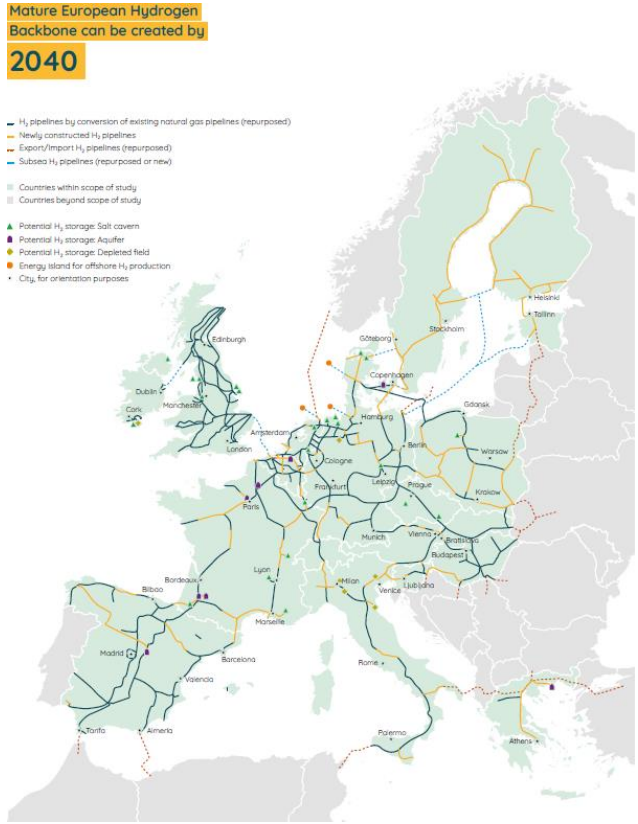
Projected development of wind power capacity in the 2020s. Source: Fingrid Oyj

Wind power and hydrogen as a basis for a major new export industry for Nordics



Source: Suomen tuulivoimaprojektit, Ethawind.com

- Excess clean power, mostly onshore wind
  - Case Finland: > 500 TWh
- Compatible industries for e.g. H_2 derivates
- Land area, water, heat demand…
- Relatively close to future demand centers in Europe
- Advanced energy markets
- High personal, governmental and company ambitions to tackle climate change
- Good investment environment for capex intensive industries



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Finnish Hydrogen projects

1. Hycamite TCD Technologies - Production of hydrogen and high-quality solid, sustainable carbon without CO2 emissions, Kokkola

2. Aurelia Turbines, CHP generation with small gas turbines, Kokkola

3. EPV Energia, H-FLEX-E Hydrogen production, storage and utilisation, Vaasa

4. Flexens, Hydre, Åland Islands

5. Green NorH2 Energy, Green Hydrogen production and P2X, Naantali

6. P2X Solutions, green hydrogen production, Harjavalta

7. Nordic Ren-Gas, Green Hydrogen production and Power to Gas, Tampere

8. Nordic Ren-Gas, Power- to-Gas facility producing renewable methane and green hydrogen, Mikkeli

9. Nordic Ren-Gas, P2G-production, Lahti

10. UPM-Kymmene, Kaukas Biorefinery Green Hydrogen production, Lappeenranta

11. STR Tecoil, Hydrogen plant producing hydrogen for used lube oil regeneration process, Hamina

12. STR Tecoil, Enlargement and upgrade of the current plant, Hamina

13. Nordic Ren-Gas, Green hydrogen production, Kotka

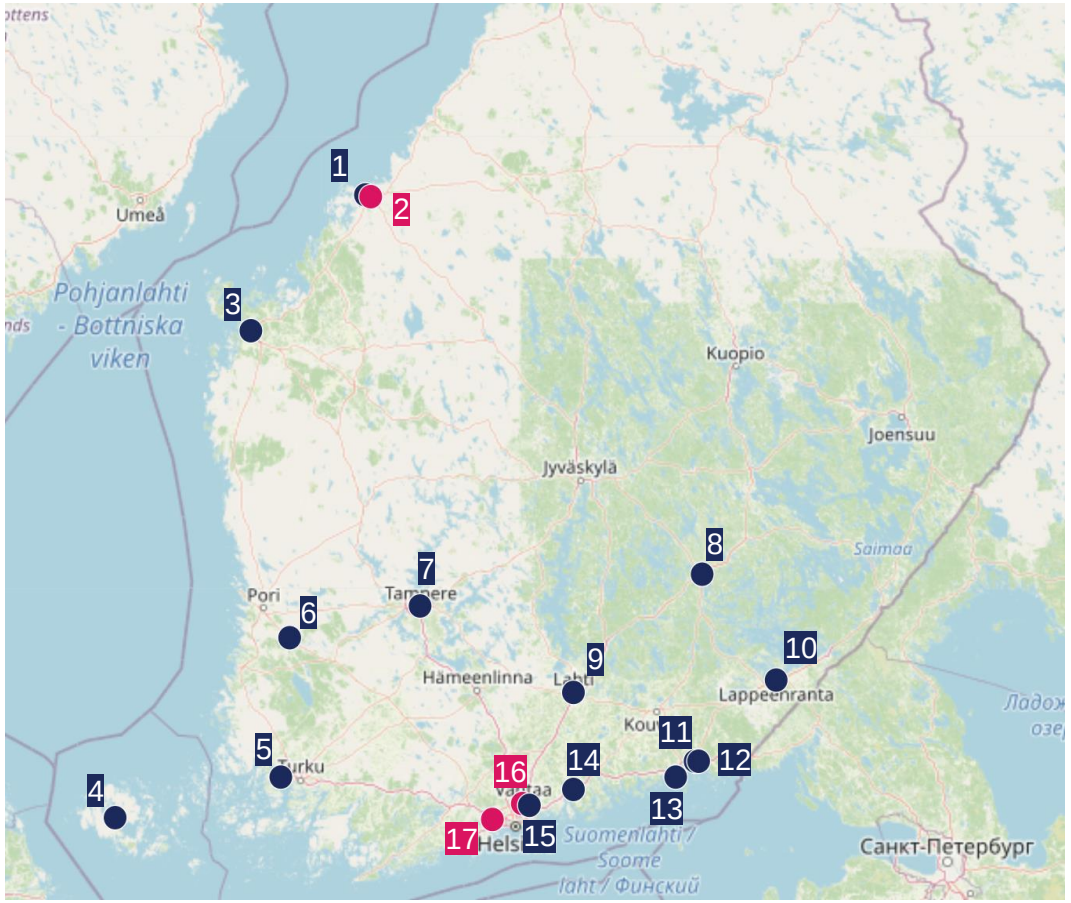
14. Neste, SHARC (green hydrogen production and CCUS), Porvoo

15. Vantaa Energy, power to materials/chemicals, Vantaa

16. Vantaa Energy, Power-to-Gas plant, Vantaa

17. Convion, ConvionSOE electrolyzer in hydrogen production for e-fuel production

18. Neste, MultiPHLY green hydrogen production, Rotterdam



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