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NATIONAL HYDROGEN ROADMAP FOR FINLAND

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Photo: Thomas Kast / Visit Finland

Finland aims for carbon-neutrality in 2035
Policy Framework

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The European Green Deal

Renewable Energy Directive (RED II)

A fair transition towards a carbon neutral Finland – Roadmap for achieving the carbon neutrality target

Finland's Energy and Climate Plan

Low-carbon roadmaps 2035

Energy production in Finland

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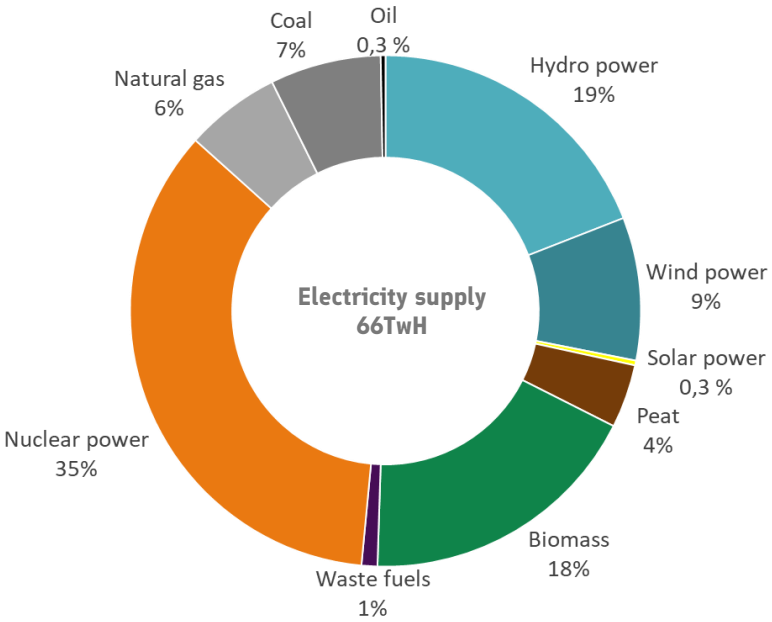
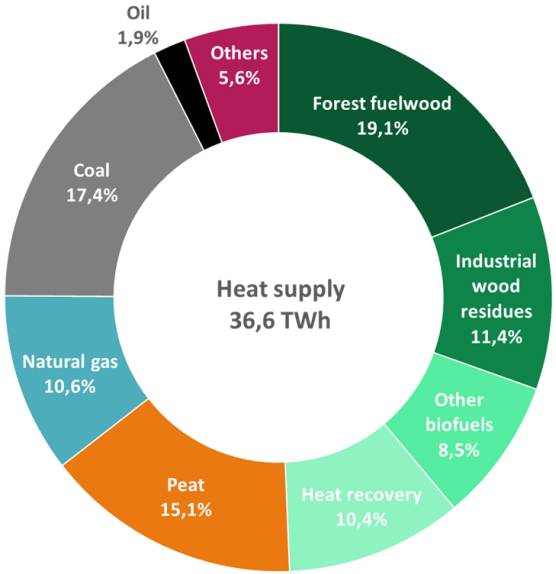
Electricity



*Total consumption is 87TwHgaped by 23% of electricity imports

District Heating



*Co-generation + separate production

Source: Energia Finland

Chemical Industry will became carbon-neutral at 2045

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CLIMATE NEUTRAL
CHEMISTRY

Joint Seminar with MAI: sustainability solutions for the Chemical Industry

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Hydrogen: Current production and use in Finland

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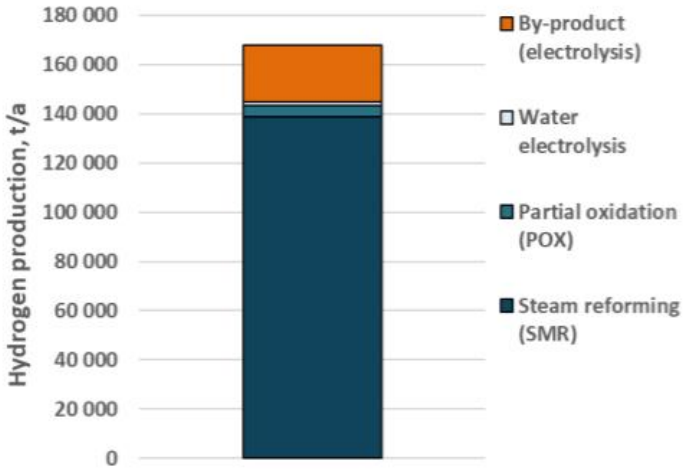

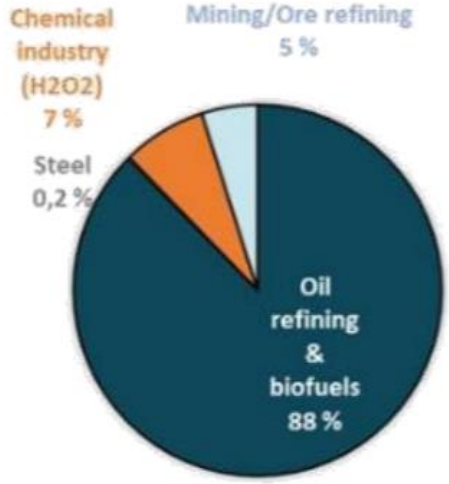

CURRENT PRODUCTION AND USE CA. 150 000 t/a

Current and post-2030 outlook

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Key Investments & Projects

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Increase in BioFuel production – projected expansions (Neste, UPM BioVerno)

SSAB Steel plant, Raahe (post 2030, 30% increase in demand)

R&D/early stage projects

Neste: BF funded project, for new and sustainable solutions for fuels and chemicals
St1 & Q power: joint project for hydrogen-based synthetic biomethane
Vantaa Energia & Wartsila: study of power-to-gas at VE W2E plant

Solar Foods: protean from renewable electricity and air (hydrogen as input)
Soletair: Renewable fuels from electrolytic hydrogen and captured CO2

VTT: BECCU-process polyol carbon from carbon dioxide and sustainable hydrogen
LUT University: Carbon-based materials Vaasa University: Hydrogen in Shipping

Hydrogen-related Ecosystems

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ENERGYVAASA

Hydrogen value chain in Finland

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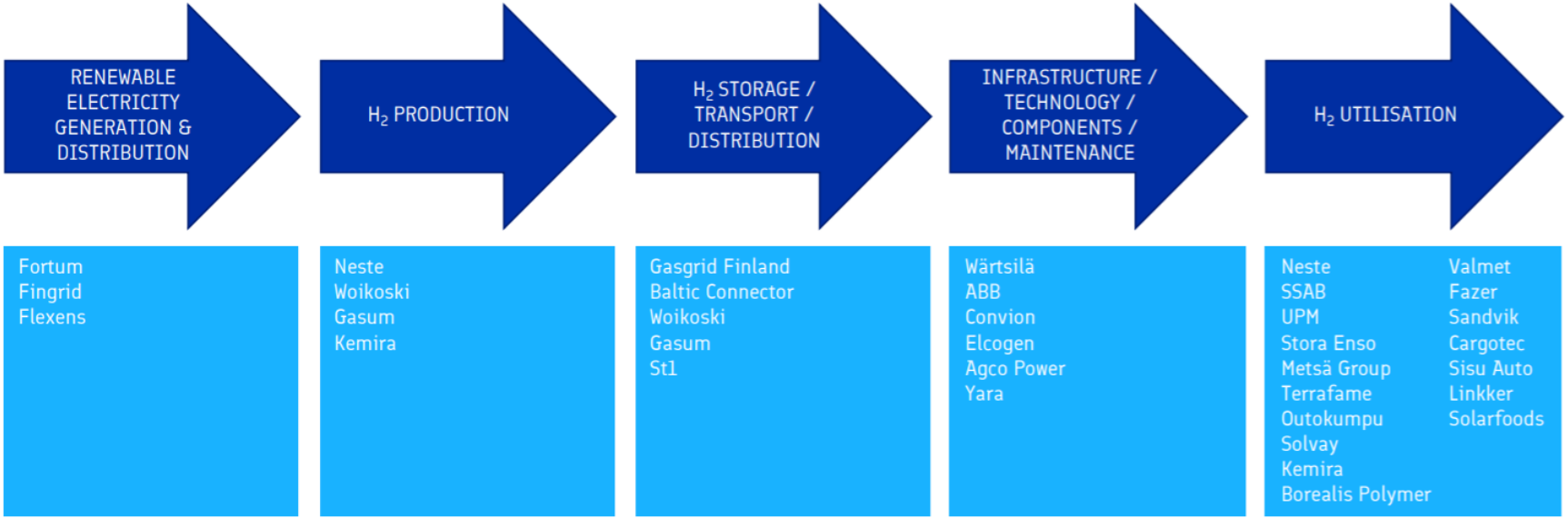

Hydrogen economy in Finland: SWOT analysis

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strengths

- Wind resource
- Transmission Grid
- Solid & stable policy
- Experience with industrial use

weaknesses

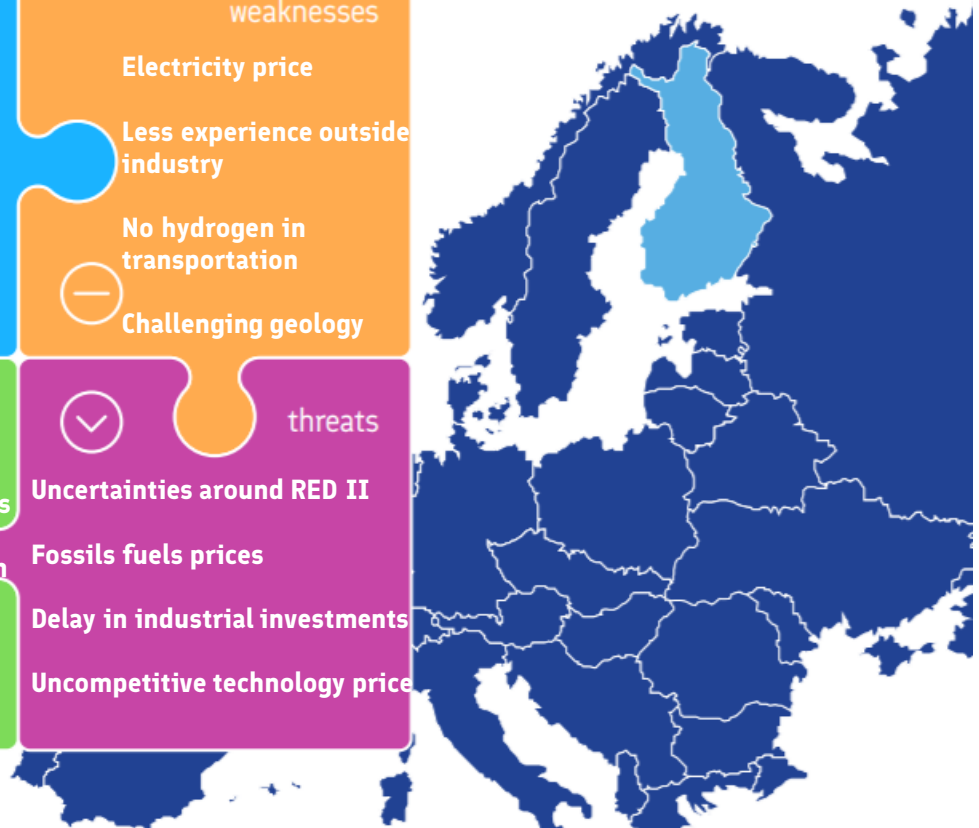
- Electricity price
- Less experience outside industry
- No hydrogen in transportation
- Challenging geology

opportunities

- Existing production of renewable transportation fuels
- Cost-effective decarbonization
- Demand boost by SSAB steel factory in Raahe
- Pilot for heavy transport

threats

- Uncertainties around RED II
- Fossils fuels prices
- Delay in industrial investments
- Uncompetitive technology price



key conclusions and recommendations (general outline)

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Good demand and value chain for hydrogen economy (mainly industrial)
Utilization of by-product heat

Potential for energy storage & conversion require investments (R&D, facilities)

Follow developments in transportation, opportunities for heavy transport & shipping

Additional investments in grid & storage is required

Aligning regulation and policy & follow EU developments

Kiitos

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