

FinH₂ – Results from company survey on Finnish hydrogen value chain

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16/05/2023 VTT – beyond the obvious



FinH₂ – Finnish runway to hydrogen business

- FinH₂ project generates novel, sector-coupled electrolyzer solutions that will lead to new investments and increased business in the international markets for Finnish companies.
- FinH₂ is a cooperative project between VTT, LUT, Aalto University, Business Finland and 18 stakeholders from various industries. The project is an important part of ABB's Green Electrification 2035 Veturi ecosystem.

<https://www.finh2.fi/>



Introduction to the company survey

Introduction to the survey

- The objective is to create a picture of the Finnish value chain for electrolyzer technology
- Focus is on electrolyzer technology, but light is shed on the whole value chain
- Targeted to:
 1. Companies in hydrogen business, and
 2. Companies that could be part of the Finnish hydrogen value chain in the future
- [Link to the survey](#)



Introduction to the survey

- Survey was conducted during Nov 2022 – March 2023
- 35 answers from 32 companies were received
- The companies were asked about their current hydrogen-related activities, future interests, and future research needs
- Companies already in the field were rather easy to identify, whereas SMEs and companies not knowing their clear role yet more challenging to reach



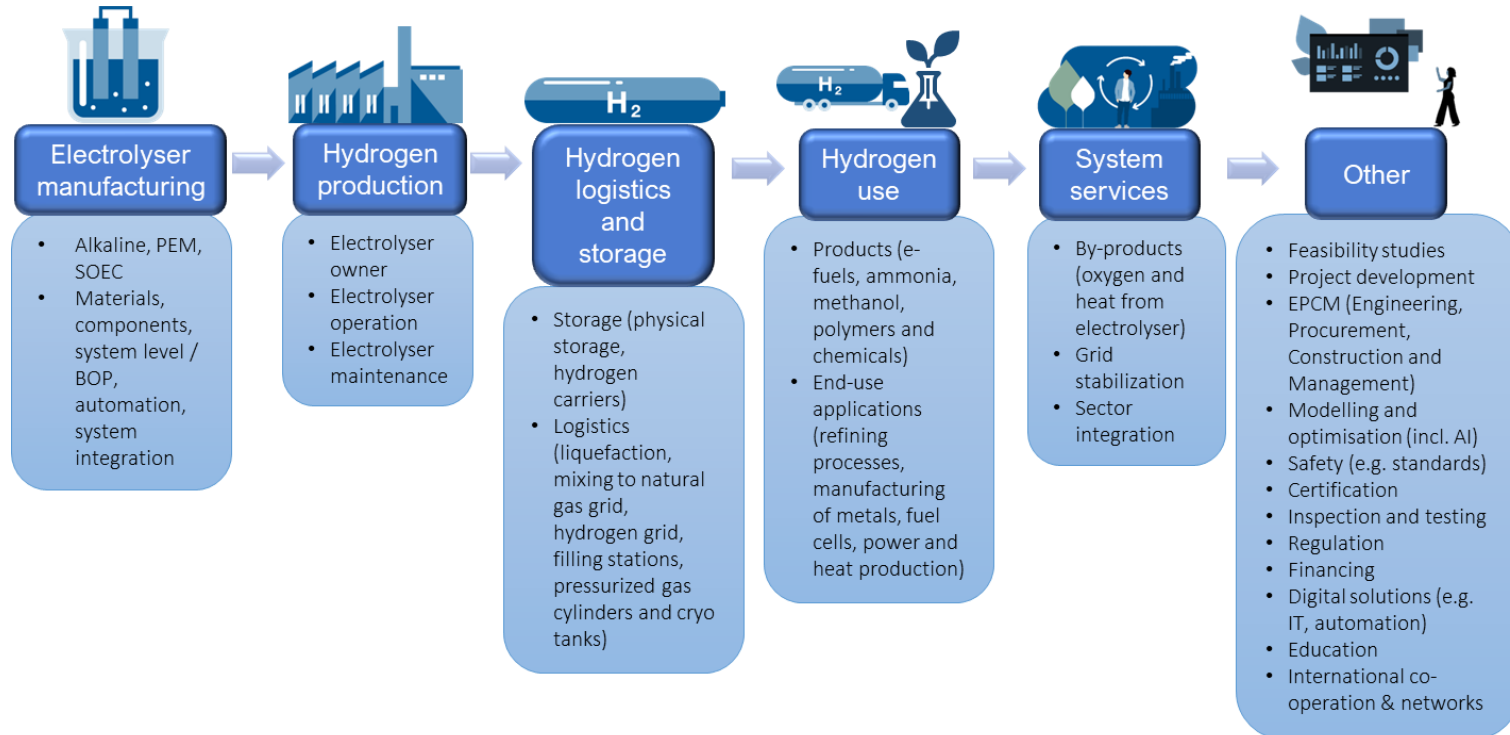
3. Where in the hydrogen value chain is your represented company involved in right now, or where is it planning to be in the future? *

Please choose all relevant options. Based on your choices, there might be further questions opening.

- Electrolyser manufacturing
- Hydrogen production
- Hydrogen logistics and storage
- Hydrogen use
- System services
- Other
- None

Renewable hydrogen value chain

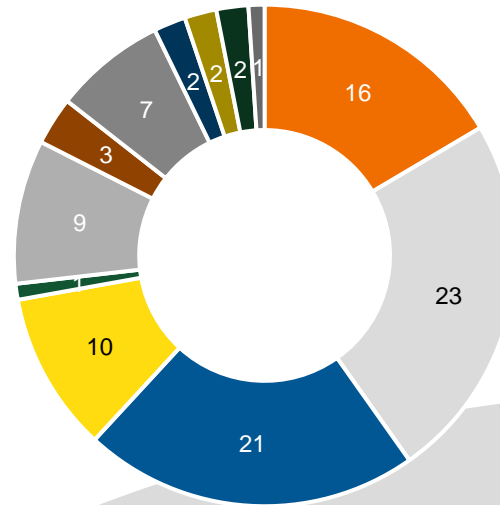
Electrolyser based



Value chain analysis

Existing and potential Finnish hydrogen actors

- Engineering/consultant/project developer/EPCM
- Component provider / Equipment manufacturer
- Technology provider
- Energy company
- Transmission System Operator (TSO)
- Chemical company/refinery
- Forest industry
- Steel, metal and mining industry
- Food industry
- Construction company
- Service provider
- Financing



Key conclusions – based on the answers

Electrolyser manufacturing

Component providers available, but specific product requirements needed to develop the products.

Room for domestic stack/module manufacturers and system integrators.

Hydrogen production

Not many hydrogen producers yet.

Energy companies interested, but application and business model not yet defined.

Turnkey suppliers of RE projects interested to combine hydrogen plants in the delivery.

Hydrogen logistics and storage

Limited experience from hydrogen grids and storing – but high interest, especially towards large-scale storage.

Hydrogen use

Many potential, and varying, end-users identified.

Experience so far mainly from refining and chemical industry.

Interest in further processing of hydrogen into products and derivatives / P-t-X.

System services

Experience (optimization, data management, smart solutions) in e.g., balancing energy markets, heat recovery, and sector coupling can be expanded to hydrogen applications.

Other

Experience e.g., in digital solutions, and energy and data management can be utilized in hydrogen sector.

Good base of EPCM companies, consultants and project developers.

Room for companies in safety issues, certification, testing, regulation, and financing.

- Many companies are interested to be part of the Finnish hydrogen economy and searching for their own role and business model.
- There are also companies that are not directly part of the hydrogen value chain but recognize that their business is much affected by the future hydrogen economy.
- Finnish companies have good experience from RE business, which is a good starting point for roll out.

Research needs

*”What research needs do you see related to hydrogen value chains?
In your opinion, what do we not know enough about?”*

Research needs (1/4)

1. Further technical development and technical specifications for hydrogen applications are needed

- Development and assessment of existing technologies, especially regarding efficiency, scale-up and operation as a part of power system
- Research on new technical options, especially fuel cell technologies and reversible electrolyzers mentioned
- Component manufacturers need information on technical and process requirements for components in hydrogen applications to develop their products for specific needs, e.g., hydrogen properties in different applications (e.g., purity, pressure level, moisture), requirements, certificates and standards for components
- Information and knowhow on materials and production methods needed, e.g., ageing management, requirements for materials in hydrogen applications, and standards
- Hydrogen use as fuel and synthetic fuels

Research needs (2/4)

2. Large-scale storage and transportation of hydrogen

- (Large-scale) storage of hydrogen mentioned many times (the most feasible ways for storing) – Would enable constant use of VRE-based hydrogen in industrial processes
- Flexible hydrogen production through storing of hydrogen, enabling purchase of lower cost and VRE-based electricity, and power grid balancing
- Also, development of hydrogen infrastructure mentioned many times - EU-wide collaboration and infrastructure

3. More information on safety and regulation

- Guidance for municipal authorities about implementation of hydrogen projects
- Consistency in permitting processes

4. Business models and hydrogen markets

Research needs (3/4)

5. Integration of electrolyzers to current and future energy system

- Sector-integration and flexibility in electricity demand, e.g., rSOC for energy storage and power system flexibility according to market conditions
- Grid stability features and grid compliance
- By-product heat utilization in smart district heating and its optimization with data
- Heat integration of SOEC to industrial processes

6. Modelling and optimization to improve economic energy system integration

- Energy system analysis of the hydrogen economy from a systemic view
- Modelling and simulation of sector integration and electrolyzers in VRE-based system (business model –based approach)
- Optimization of electrolyser operation in different conditions
- Electrolyser integration to power system – co-locating VRE production or power grid connection
- Optimization of transportation and storage costs – local hydrogen production or large-scale centralized production

Research needs (4/4)

7. Finnish hydrogen vision with systemic view

- In which sectors will hydrogen be used? Where does it have the most impact in terms of GHG reduction? Standard way of calculating GHG reduction along the whole value chain is needed.
- Where will electrolysers be located? (centralized hubs vs decentralized production)
- Identification of unique, spearhead technologies and activities for Finland and accelerating their development

8. Lack of knowhow

- Lack of knowhow is a challenge, mainly due to still low volume in the hydrogen business
- Research community could spread the existing knowhow and educate

Survey Part 2: *Vauhtia valmistavan teollisuuden kasvuun Suomessa: Vesielektrolyysijärjestelmät*

- The survey continues from FinH₂ survey and narrows the scope from overall renewable hydrogen value chain to component manufacturing and system integration
- Conducted by Teemu Valminen (Aalto University PhD student), in collaboration with FinH₂ project (VTT)

[Link to the survey](#)

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