BalticSeaH2

Demonstrating hydrogen economy with the largest cross-border Hydrogen Valley in Europe

The project is supported by the Clean Hydrogen Partnership and its members.

Clean Hydrogen Partnership

Co-funded by the European Union

BalticSeaH2 objective

BalticSeaH2 establishes a large-scale **hydrogen valley** across the Baltic Sea region.

Focused on main valley in southern Finland and Estonia, **the project aims to revolutionize the energy landscape, fostering self-sufficiency and minimizing carbon emissions in various industries.** Results from the main valley will be replicated in other regions of the project.

With a consortium of 40 partners from nine Baltic Sea area countries and several different industries, BalticSeaH2 strives to build **an integrated, interregional hydrogen economy on an unprecedented scale in Europe.**

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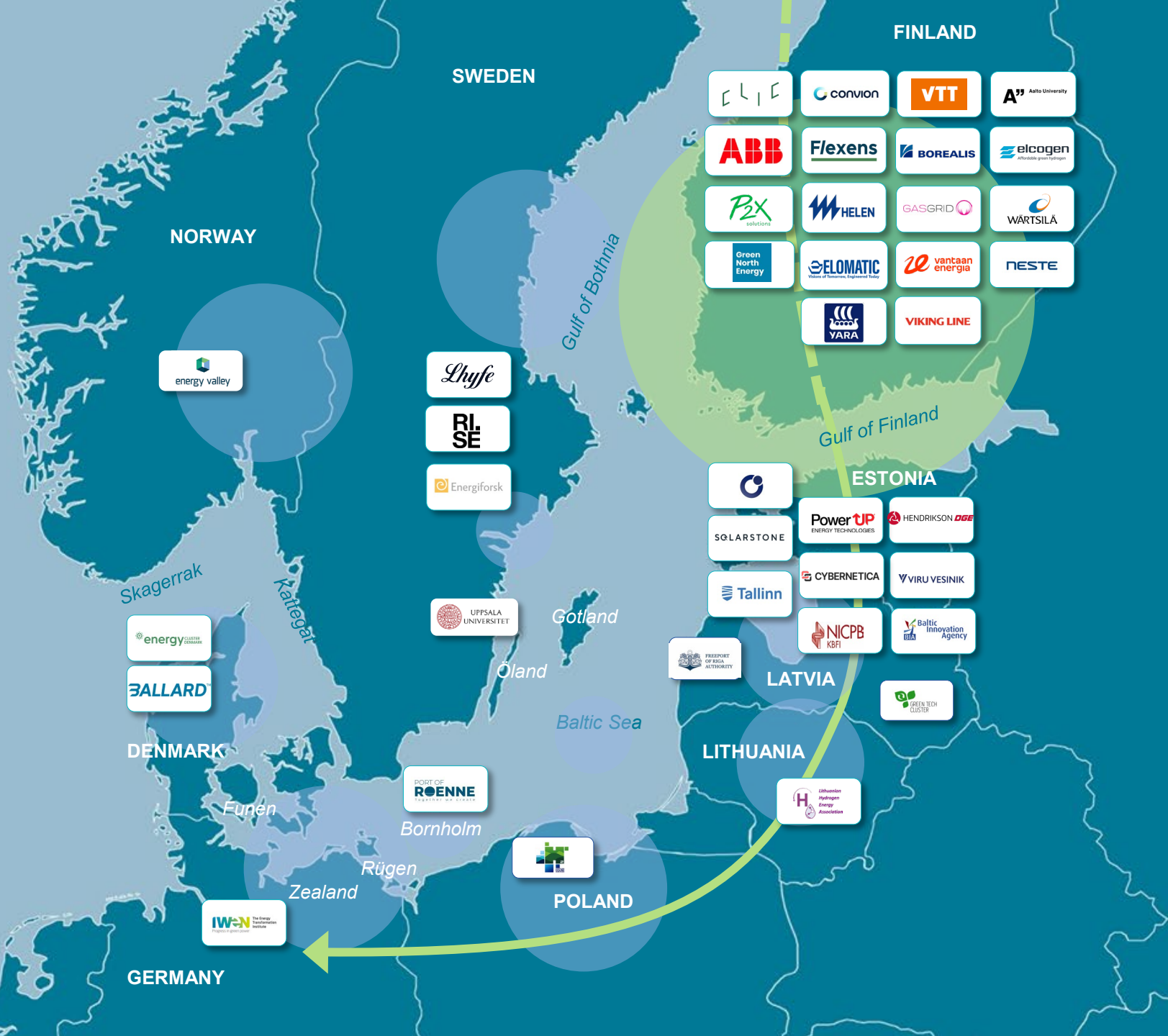
40 partners in 9 countries: main valley between Finland and Estonia

5-year project coordinated by CLIC Innovation and Gasgrid, started in June 2023

Total project budget 33 M€, European public financing 25 M€, plus partner investments

12 investment cases and over 20 use cases build the whole hydrogen value chain



BalticSeaH2 Main Valley

Special features:

- Cross-border main Valley Estonia - Southern Finland with pipeline connection
- Included end-use sectors in the main Valley:
  - Traffic (direct use and e-fuels)
  - Chemical industry
  - Energy industry (P2X with X=different products)
  - Maritime: usage and hydrogen transport
- 7 connected Valleys via pipeline and maritime connections support build-up of a full Baltic Hydrogen Economy

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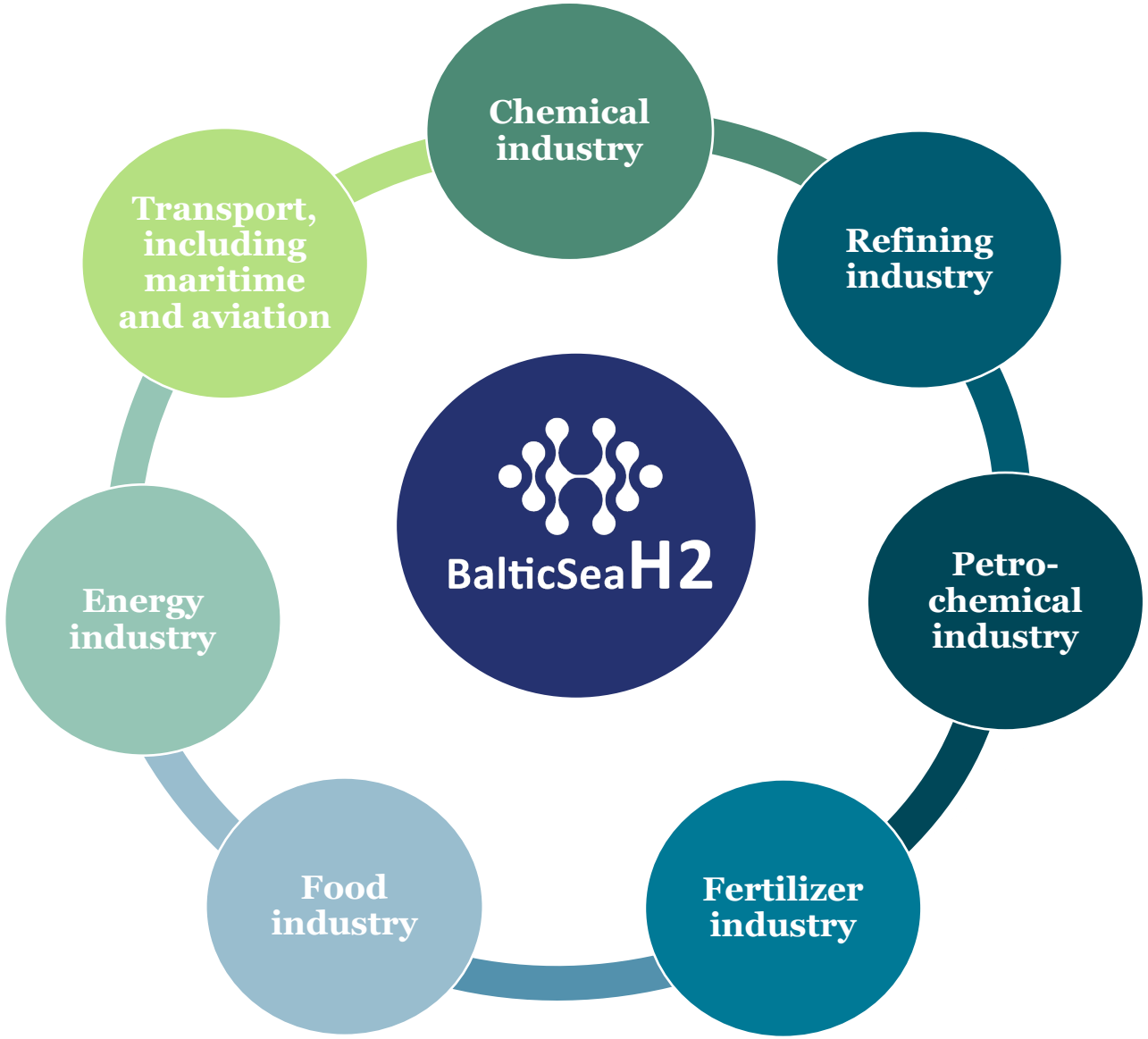
Use cases and industries involved in BalticSeaH2

‘Investment cases’ integrate multiple use cases from our collection of + 20 use cases to create the hydrogen value chain simultaneously.

Not all cases are published yet – follow the project to know first when our partners publish their investments!



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Use Case Map

The use cases span a wide area and are not all connected to production cases. Some use cases are still far from implementation, but they are being explored to assess feasibility and identify potential challenges.

- P — H2 Production
- S — H2 Storage
- T — End Use: Transport
- I — End Use: Industry
- E — End Use: Energy
- O — Other

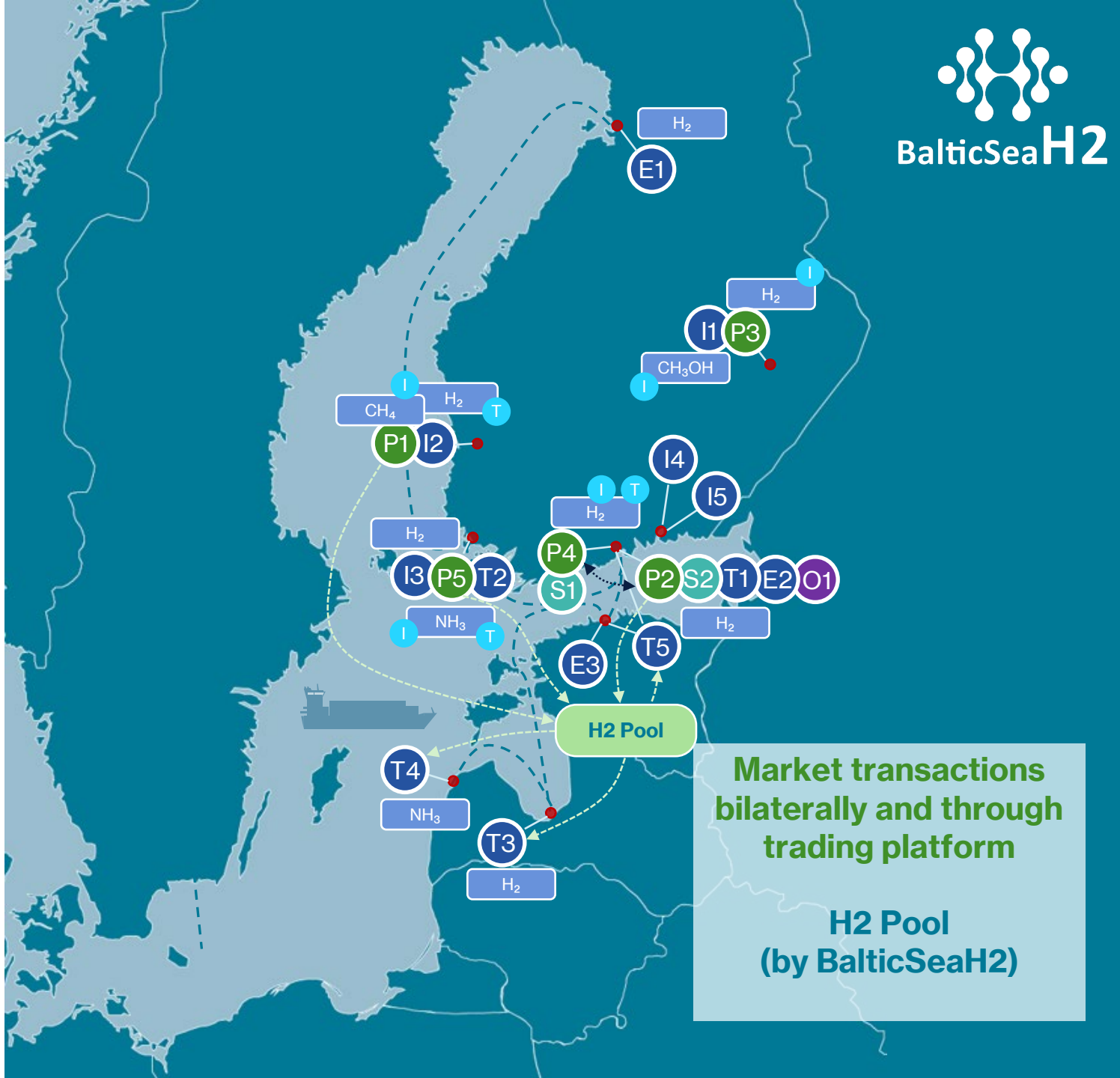
H2 trading

Use Cases not linked

Use Cases linked

CH_3OH H_2 CH_4 NH_3 — Products & derivatives

T I E — End Users outside the consortium



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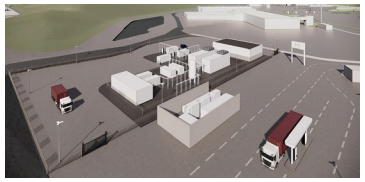
BalticSeaH2 Valley implementation plan by 2030

Renewable hydrogen production targets (tonH_2/year)

In production
Harjavalta 20 MW



FID made in 2024
3H2 pilot plant 3 MW

FID estimated H1/2026
Joensuu 30-40 MW

FEED
Naantali 280 MW

70000
60000
50000
40000
30000
20000
10000
0

3,000 ton/a | 500 ton/a | 5,500 ton/a | 36,000 ton/a | 15,000 ton/a

Total ~60,000 ton/a

H2 & E-methane

H2 for refuelling

H2 & E-methanol

Green ammonia

2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030

Target sectors:
Transport
Food industry
Storage

Target sectors:
Transport
Storage

Target sectors:
Transport
Energy
Industry

Target sectors:
Maritime
Industry

Target sectors:
Transport
Energy
Industry
Storage

Note: The plants that are already under construction have received investment financing from the Innovation Fund, IPCEI, RRF, or other funding from the Finnish ministry or the Finnish Climate Fund.

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ABB Marine fuel cell eHouse

General description

- PEMFC-based technology
- +1MW rated power
- 40-ft standard high cube container
- Marine fuel cell modules with integrated balance of plant
- Cabling for the fuel cells, auxiliaries and control systems
- Control, saftery, and piping systems
  - ✓ Auxiliaries control
  - ✓ Safety systems with instrumentation
  - ✓ Ventilation and air conditioning
  - ✓ Piping for the hydrogen, cooling, ventilation and exhaust

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BalticSeaH2 fuel cell demonstrator

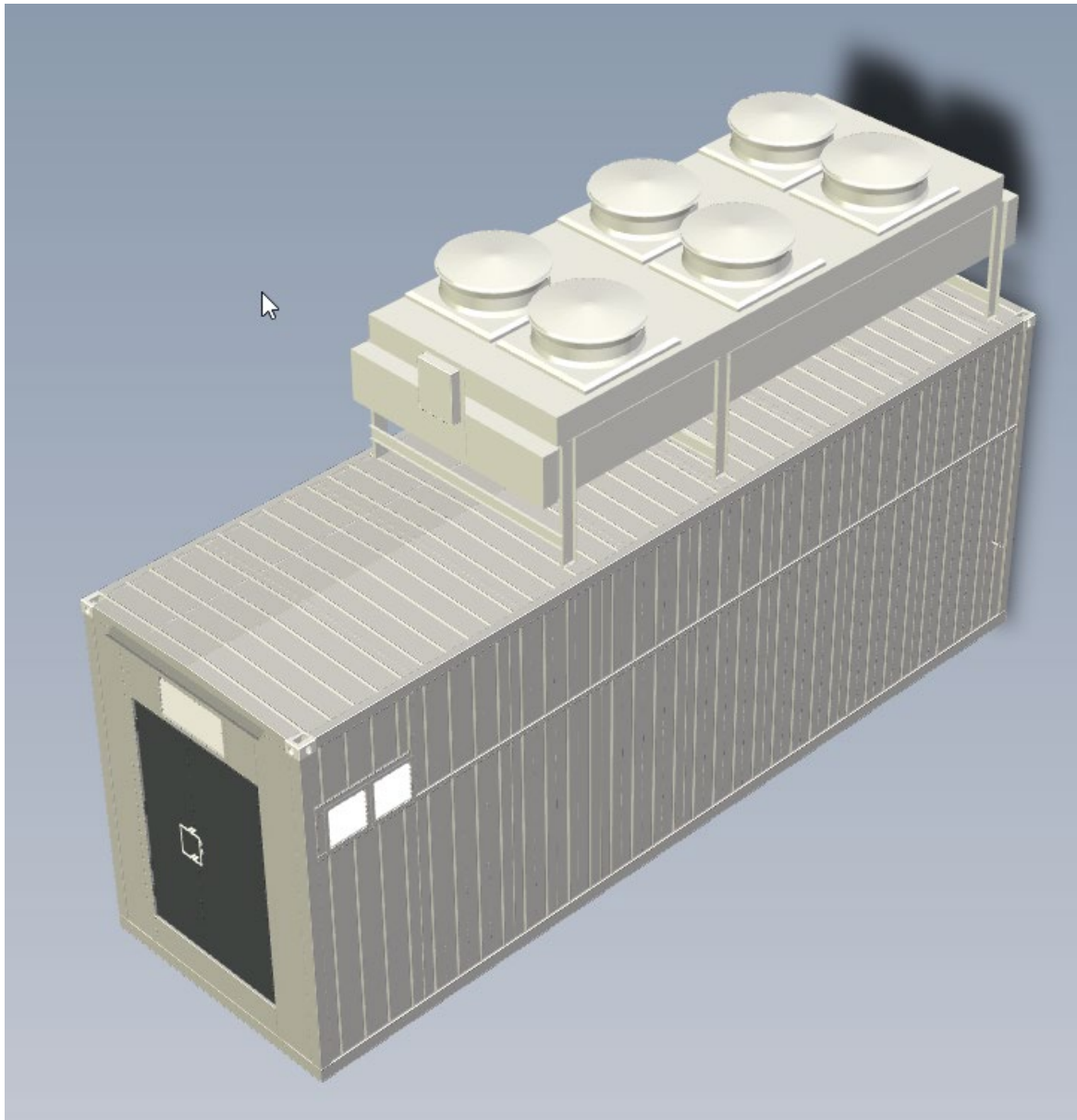
Landbased piloting of marine solution

BalticSeaH2 fuel cell demonstrator serves as a proof of concept and test bed for components and subsystems

- Marine certified fuel cell modules (2 x 200kW Ballard FCWave)
- ABB Marine compliant ACS880 power converters
- Experimental converter solutions to enable scaling up to multi-MW scale installations
- Thermal management to enable operation in cold climate
- Safety automation solutions for marine fuel cell rooms

Land-based pilot offers cost effective alternative with easier accessibility and availability of hydrogen.

End-user in Oulu, Finland with plan to harness the unit as reserve market asset after BalticSeaH2 R&D project completed.



BalticSeaH2 awarded Hydrogen Valley of the Year

Hydrogen Valley of the Year was selected by the funder, Clean Hydrogen Partnership.

Finnish-led BalticSeaH2 awarded Hydrogen Valley of the Year

The €33 million BalticSeaH2 project is building a hydrogen valley across the Baltic Sea region, connecting hydrogen production, distribution, processing and use.

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The role of Aalto University and ABB in BalticSeaH2

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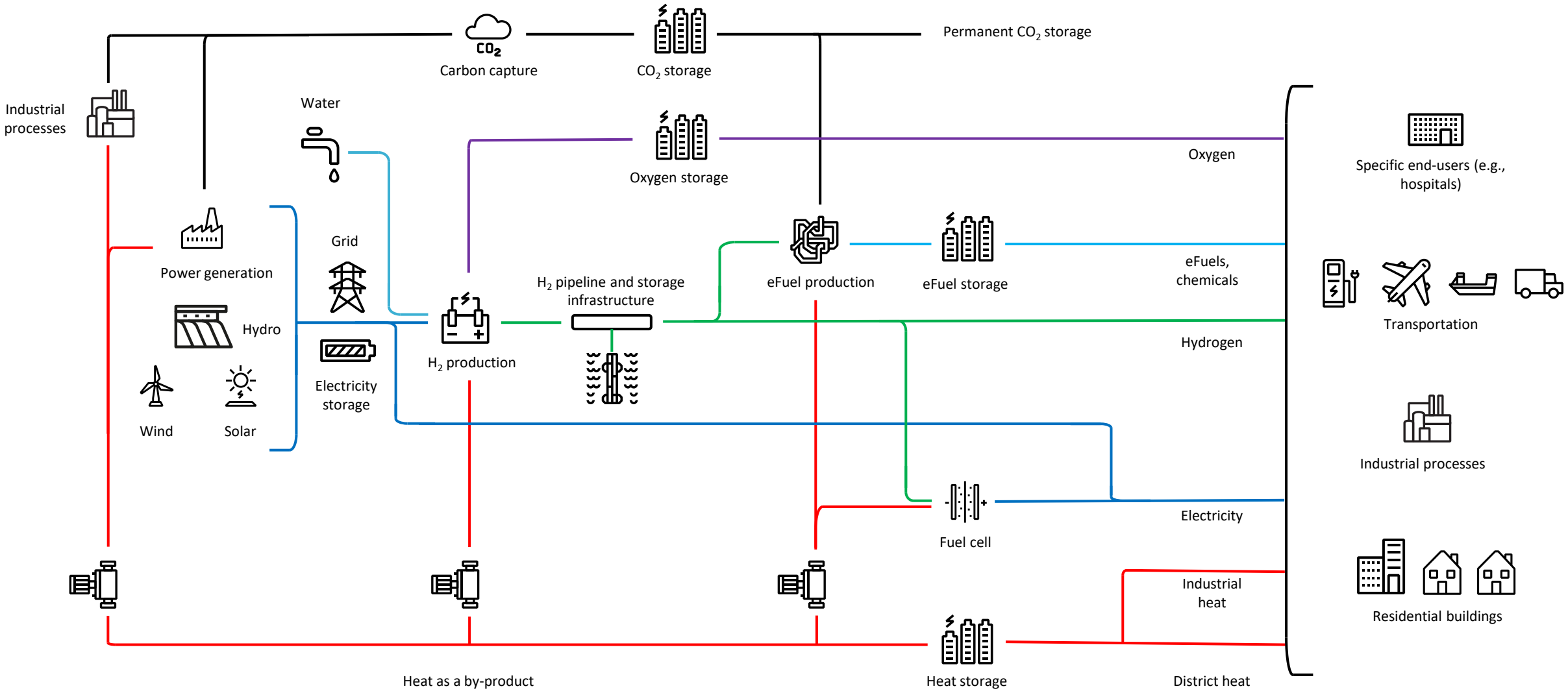
Sector integration – P2X – is key to the circular energy system



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System Dynamic Model of the Valley

- Production model
  - To model the potential development of the green hydrogen and derivative production in the future (until 2050)
  - Model is driven by investments into production capacity
  - Resource availability constrain the model (e.g., renewable electricity, pipeline capacity)
  - Does not currently take prices into account
  - Different scenarios can be tried by varying supply and demand
- Investment model
  - We have been experimenting with a dynamic investment decision making model that calculates optimal level of new investments based on profitability

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Main policy observations concerning development of green hydrogen market in **Finland**

1. Renewable electricity becomes a bottleneck
2. Sector couplings: CO2 demand and heat supply match with national supply and demand
3. Significant potential for avoiding CO2 emissions
4. Data center investments are problematic in many ways
5. Regulation is uncertain and volatile and not helping the market

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Hydrogen market model

Hydrogen market model consists of two separate – but highly interlinked – parts:

1. **Competitive commodity market**, where producers and end-users of hydrogen and derivatives operate based on their own business logics.
2. **Market of regulated services** in the hydrogen system, including hydrogen transmission, storages, and terminals.

Important building blocks of hydrogen market model include:

- Market roles
- Market products and transmission service products
- Certificates
- Bilateral over-the-counter hydrogen purchase agreement, trading via an exchange

In BalticSeaH2 project, hydrogen market model is being co-developed by several partner organizations, such as Gasgrid, ABB, Aalto University, Cybernetica, Helen, Viru Vesinik, VTT Technical Research Centre of Finland, CLIC Innovation and PowerUP Fuel Cells.

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Hydrogen marketplace

As part of the BalticSeaH2 project**, Cybernetica is developing a digital marketplace for hydrogen.** The goal is to build a secure and transparent platform with a strong value proposition that fosters trust and supports the emergence of a competitive hydrogen market.

The platform will be created with the needs of the BalticSeaH2 main valley between Southern Finland and Estonia in mind. However, it will be designed to be scalable and replicable for wider regions.

In addition to the trading of hydrogen, the platform will feature a digital twin component – a simulation environment allowing users to model and forecast market conditions under various scenarios.

More info available here: Hydrogen marketplace: From motivations to Proof of Concept | Cybernetica

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Hydrogen Valley Podcast

Launched here today!

The podcast covers issues like:

- What does hydrogen economy mean, and what can we expect from it?
- What aspects of hydrogen economy are realistic?
- Why is Finland in a strong position to leverage green hydrogen?

In total 8 episodes

Interviews with experts from academia and industry, mostly from BalticSeaH2 firms, Aalto University, and VTT.

Hosted, scripted, recorded, edited, and mixed by Mikko Heiskala, a visiting researcher at Department of Industrial Engineering and Management

- Mikko has previously co-scripted, recorded, edited, and mixed another expert podcast on psychology, Psykopodiaa, which has over 3.4m streams and downloads and has regularly ranked in Top50 for Spotify and Apple Podcasts in Finland since 2020.

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BalticSeaH2

Thank you for your attention!

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