ENERGYWEEK.FI

#ENERGYWEEK

EnergyWeek

Business opportunities in the hydrogen value chain

By: Pohjanmaan Expo Oy in partnership with
Alcea Oy & Novia University of Applied Sciences

14.3.2024

2024 MARCH 11–14 VAASA, FINLAND

EXPO POHJANMAAN ÖSTERBOTTEN

ALCEA

NOVIA UNIVERSITY OF APPLIED SCIENCES

Host

Kjell-Owe Ahlskog

Owner and Managing Director,
Alcea Oy

ENERGYWEEK.FI

#ENERGYWEEK

How can large scale H2/P2X projects cooperate with local businesses?

Herkko Plit

Founder and CEO,
P2X Solutions Oy

How can large scale H2/P2X projects cooperate with local businesses?

Herkko Plit
P2X Solutions
Founder & CEO
14.3.2024

#greenteam

Producer of hydrogen and e-fuels

First green hydrogen electrolysis plant operational in 2024

Target is to reach 1 GW of electrolysis capacity by 2031

Finland's Strengths:

Cheap electricity

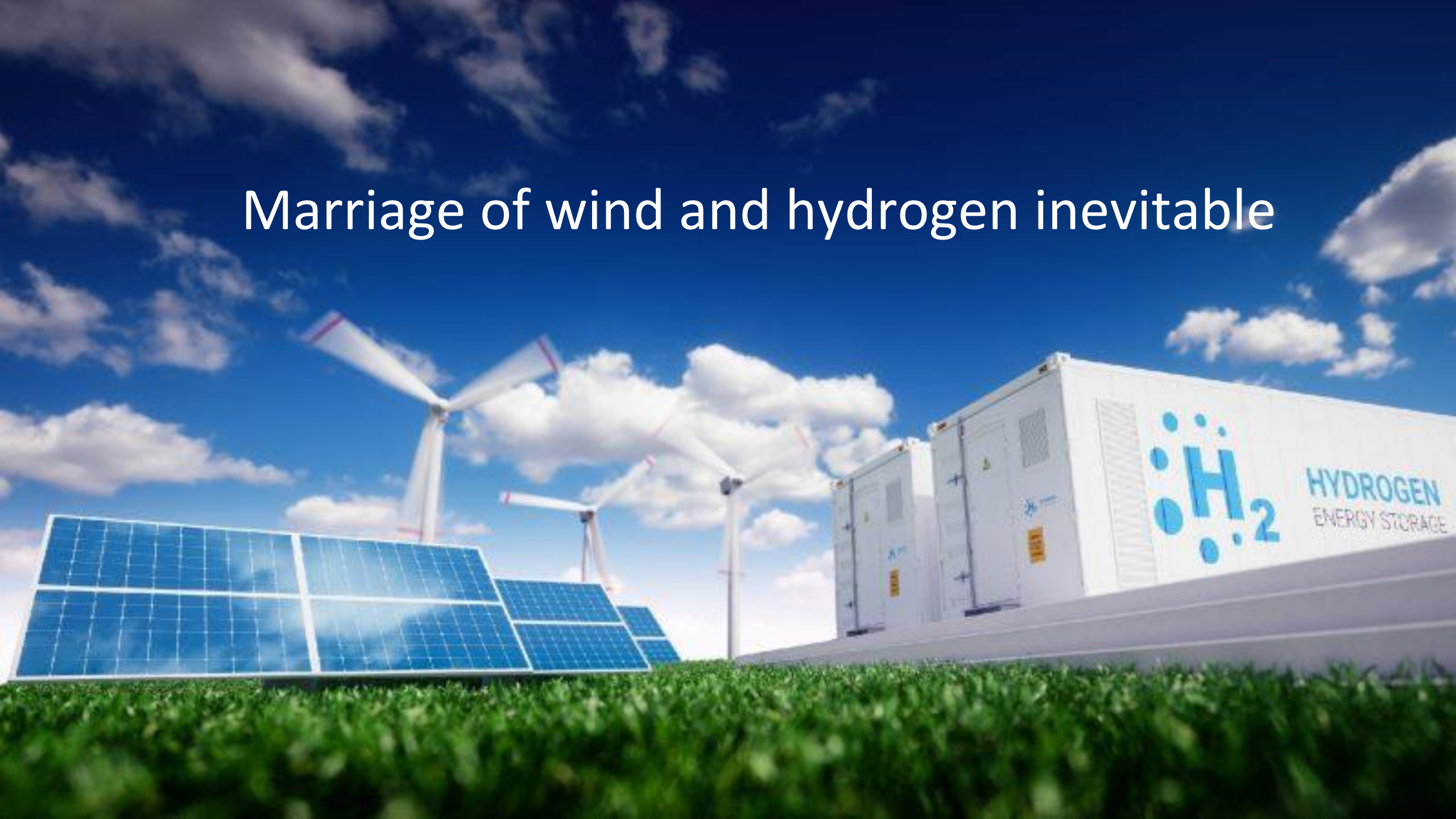
Biogenic CO_2

Stable grid

Clean water

Government: at least 10% EU green hydrogen production in Finland

Marriage of wind and hydrogen inevitable



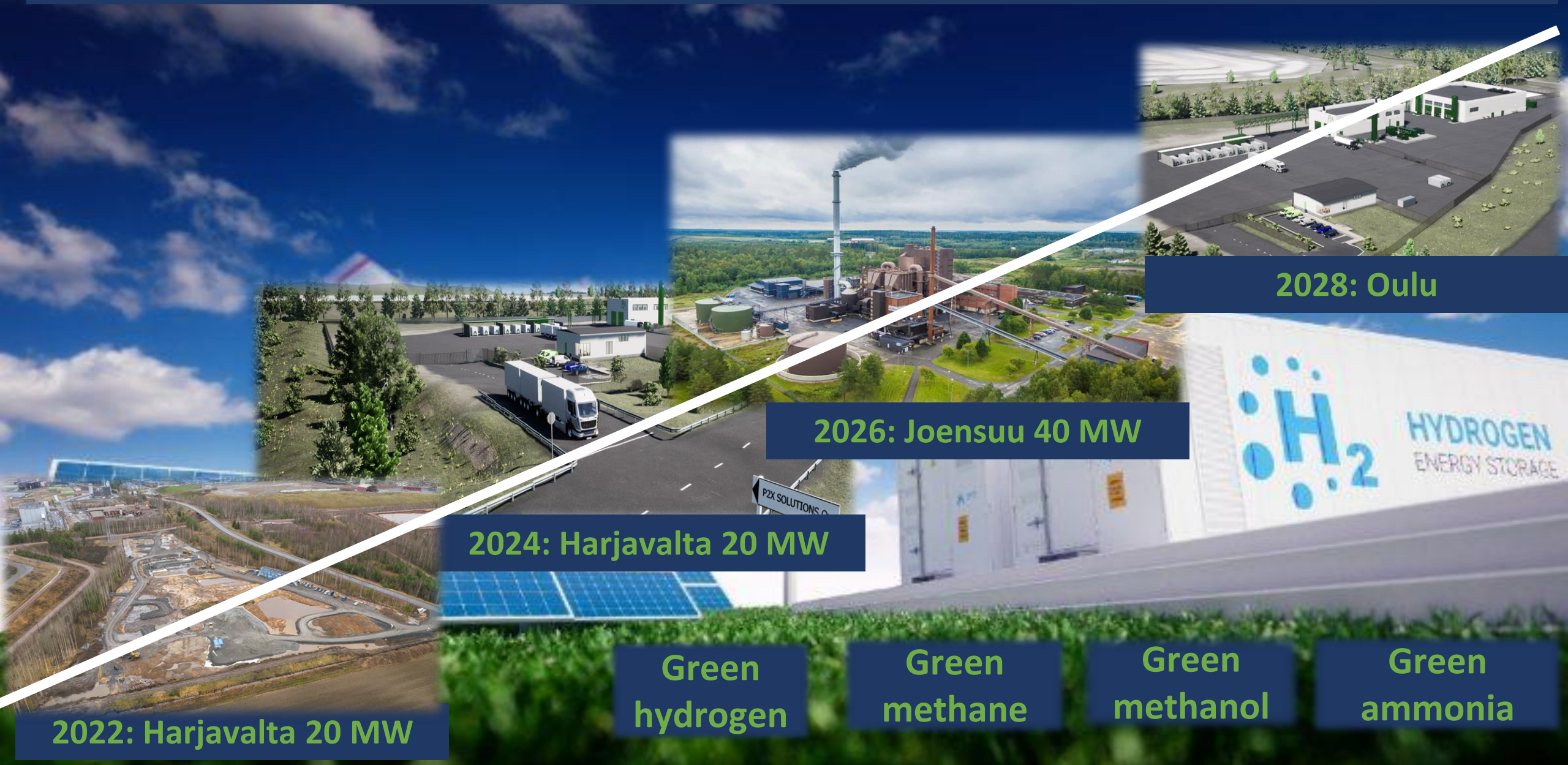
Harjavalta green hydrogen production opens up Finnish hydrogen economy

Harjavalta green hydrogen production opens up Finnish hydrogen economy

Harjavalta green hydrogen production opens up Finnish hydrogen economy

Pic: Esa Syväkuru / Yle

We scale systematically our production up to 1 GW



Green hydrogen

Green methane

Green methanol

Green ammonia

Pioneer view points

- Path of pioneer – opening the track or something else
- Safety and permitting – almost everything new
- Mind set: Forerunner, innovativeness, curiosity, winning challenges, creation of new and foremost the purpose

Local and societal view

- Societal view necessary
- System solution vs single company solution
- Local employment important

- **Politics enable the change, the investments are doing it**
- **Change needs to be done together – each of us has important role on it**

Herkko Plit
Founder & CEO
P2X Solutions Oy
+358 50 462 0788
herkko.plit@p2x.fi

P2X solutions

How can local business benefit from large infrastructure projects?

Sara Kärki

Senior Vice President / COO,
Gasgrid Finland Oy

Energy networks for the Hydrogen Economy

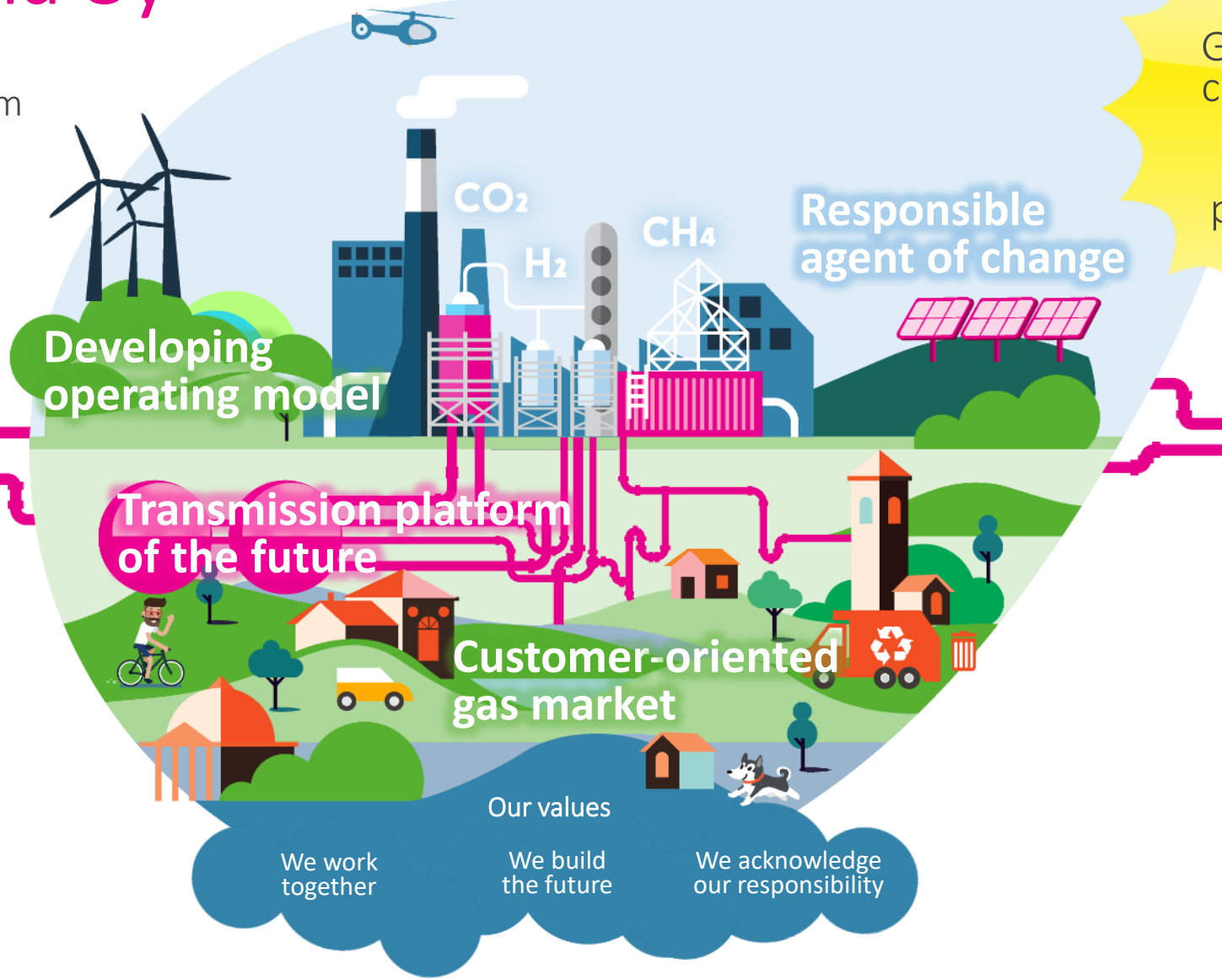
How can local business benefit from large infrastructure projects?

Sara Kärki, SVP Hydrogen development, Gasgrid Finland Oy

Vaasa Energy Week - Energy networks for the Hydrogen Economy
14.3.2023

Gasgrid Finland Oy

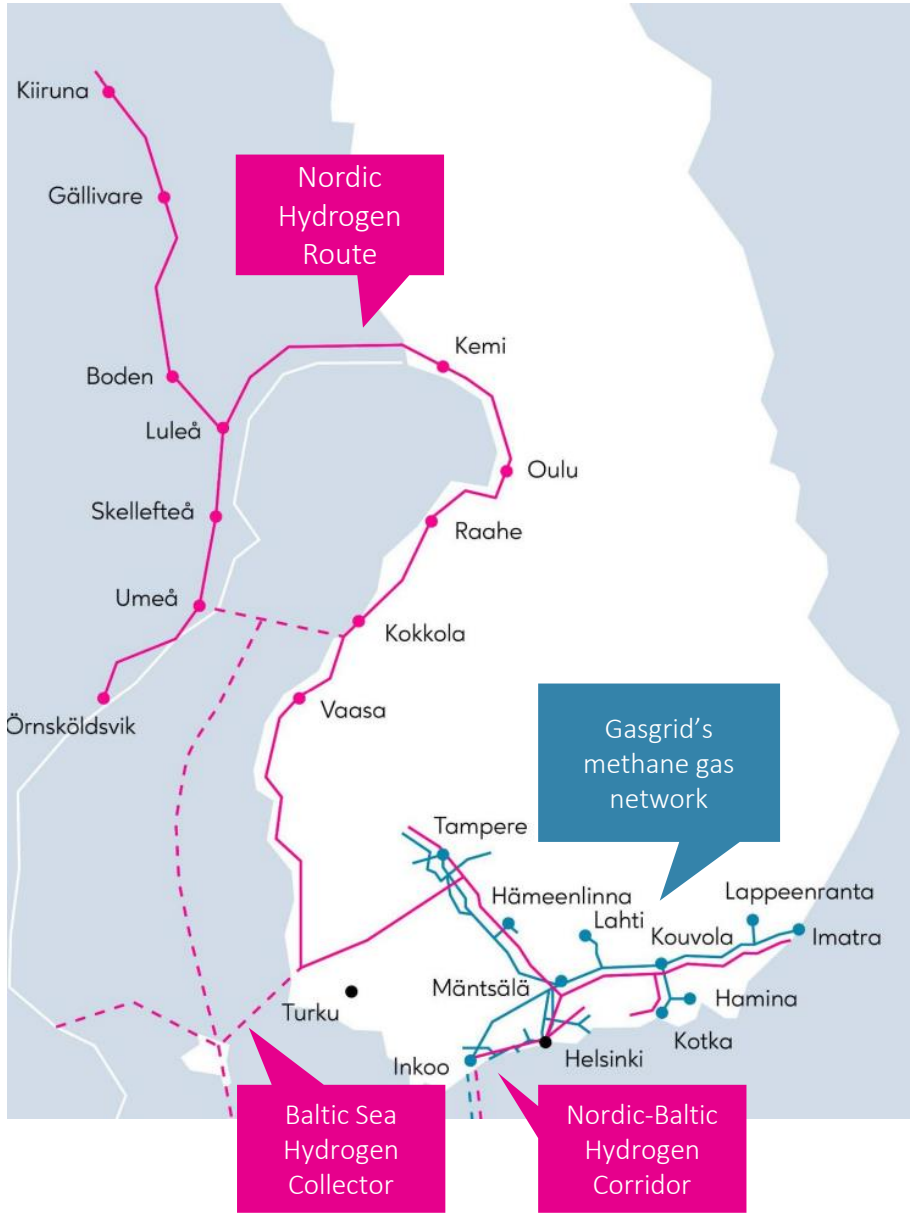
State-owned company.
Acts as the TSO with system responsibility for gas transmission in Finland.



Vision 2035
Gases enable a carbon-neutral society – we provide a platform for it

Our mission
We offer our customers safe, reliable and cost-efficient transmission of gases.

We actively develop our transmission platform, services and the gas market in a customer-oriented manner to promote the carbon-neutral energy and raw material system of the future.



Gasgrid is developing the national hydrogen infrastructure

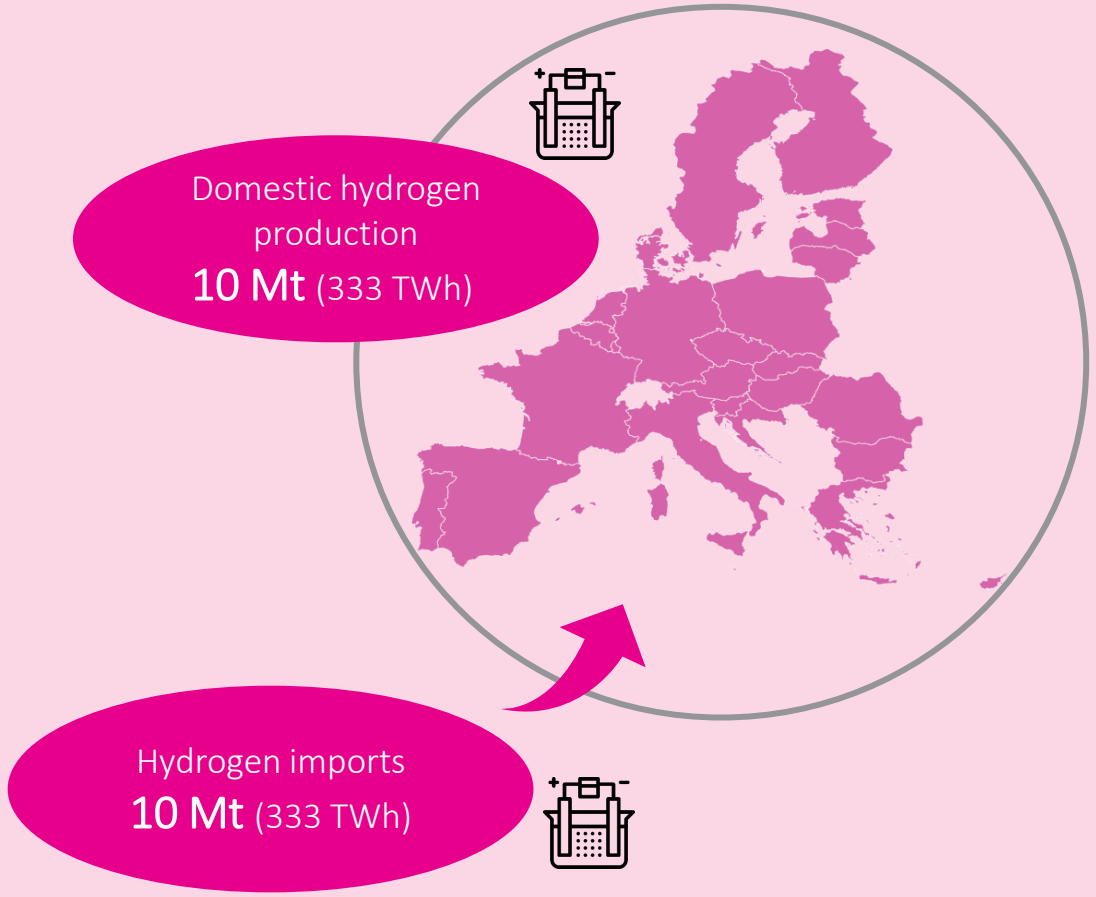
- The Finnish Government has given Gasgrid a task to promote the development of the national hydrogen infrastructure, international infrastructure cooperation and the hydrogen market in the Baltic Sea Region as soon as possible
  - The aim is to attract new investments and jobs to Finland and to support Finland's energy security and self-sufficiency
  - Hydrogen networks create new business opportunities for different actors through the development of new value chains, products and services.
- Gasgrid Vetyverkot Oy was established in 2022

Hydrogen has a key role in the European energy transition

Hydrogen plays a key role in Europe’s green energy transition

- Scalable, clean energy solutions are needed to achieve carbon-neutrality by 2050 in Europe
- Clean hydrogen is one of the central solutions
- Clean or green hydrogen refers to hydrogen production with electrolyser, which use electricity to split water into hydrogen and oxygen
- When electricity required to power the electrolyser is emission-free, the process does not lead to greenhouse gas emissions nor use fossil resources

RePowerEU Hydrogen strategy

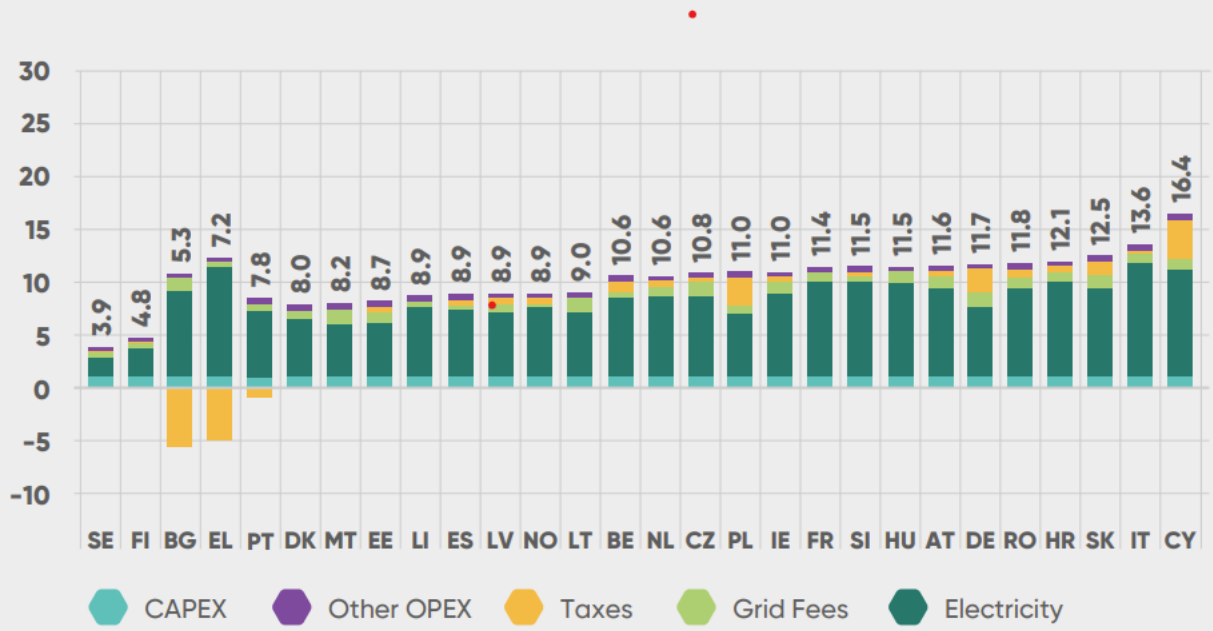


What can Finland’s role be?

Finland and the Nordics can play a significant role in the energy transition of Europe

FIGURE 3.4

Grid-connected electrolysis hydrogen production costs in the EU (+NO) in 2022 (EUR/kg)



Source: Hydrogen Europe.

- Excellent renewable energy resources
- Cost competitive electricity and hydrogen production costs
  - Availability of land and water
  - Strong electricity grids and continuous investments to the development of the electricity grid
- Excellent possibilities to produce high-value P2X products
  - Availability of biogenic CO2 for production of synthetic fuels or chemicals
  - High-level technological know-how from energy and biorefining industry that can be utilised in the P2X sector

Excellent renewable energy resources available in Finland

Grid connection inquiries

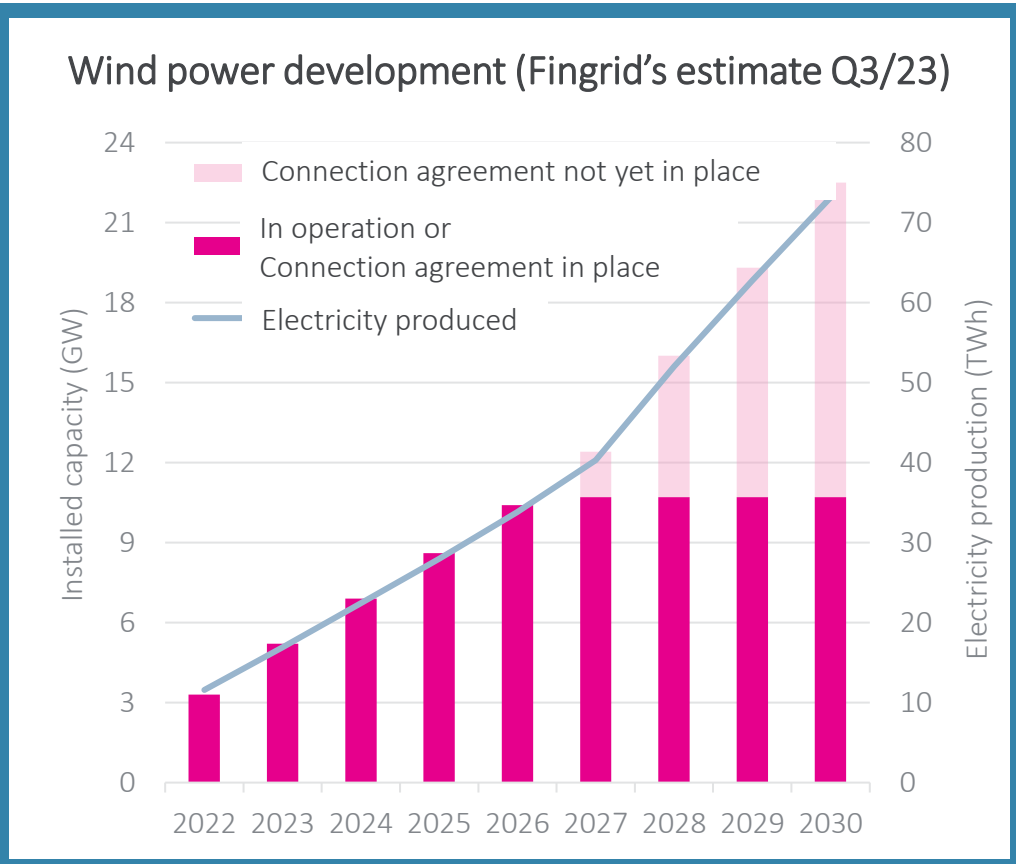
Power production*

340 GW / ~1000 TWh

Power consumption

22 GW / ~150 TWh

*Includes onshore wind, offshore wind and solar power



Source: Gasgrid & Fingrid. (2023). Energian siirtoverkot vetytalouden ja puhtaan energiajärjestelmän mahdollistajina. Available at: Energian siirtoverkot vetytalouden ja puhtaan energiajarjestelman mahdollistajina - Loppuraportti

Preliminary hydrogen network “connection inquiries”

Hydrogen production:

>80 TWh/year

(2,4 Mton H2/year)

Hydrogen consumption:

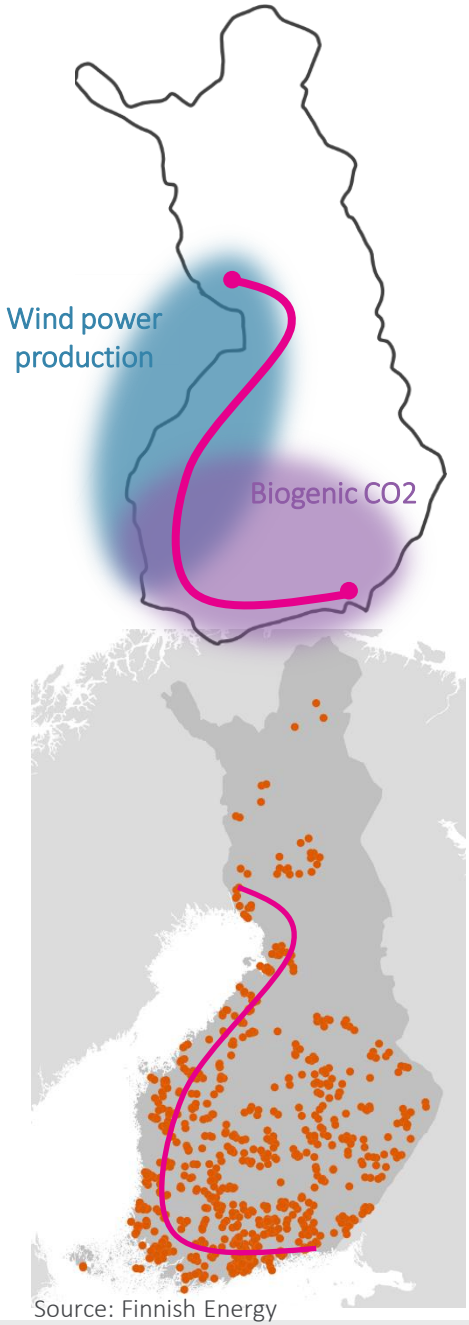
>20 TWh/year

(600 kton H2/year)

*Industrial market actors’ indications about connecting to hydrogen network in the future from Gasgrid Finland’s hydrogen market consultation as of

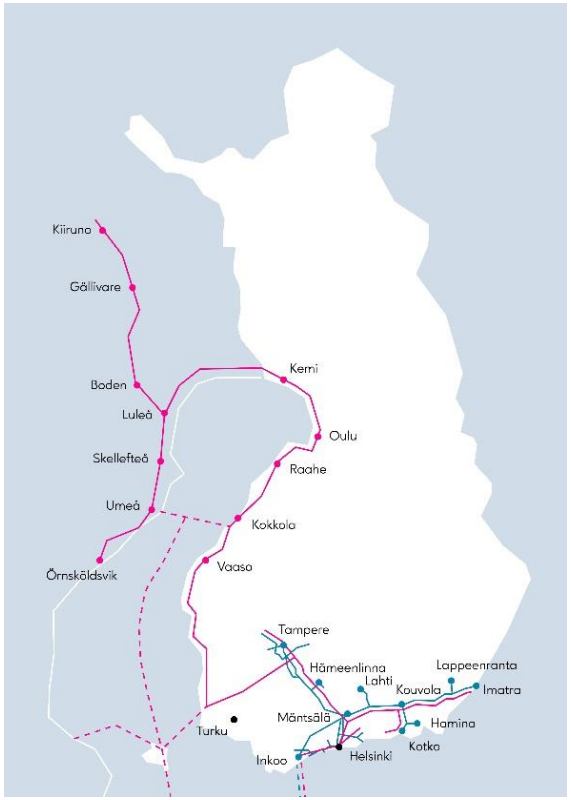
Source: Gasgrid & Fingrid. (2023). Energian siirtoverkot vetytalouden ja puhtaan energiajärjestelmän mahdollistajina.

Vision for Finnish hydrogen backbone development



Source: Finnish Energy

Gasgrid's vision for hydrogen backbone 2030



- Finnish hydrogen network will locate close to wind power projects and CO2 point sources
- Hydrogen network connects hydrogen production and consumption points and enables efficient energy transport as hydrogen and energy storage in pipelines
- The hydrogen backbone connects the local Hydrogen Valleys
- It is beneficial to co-develop hydrogen and power infrastructures to achieve a cost-efficient energy system
- Extensive district heating networks provide a platform for side-product heat utilization

Baltic Sea Region – Globally the Most Efficient Hydrogen Market by 2030

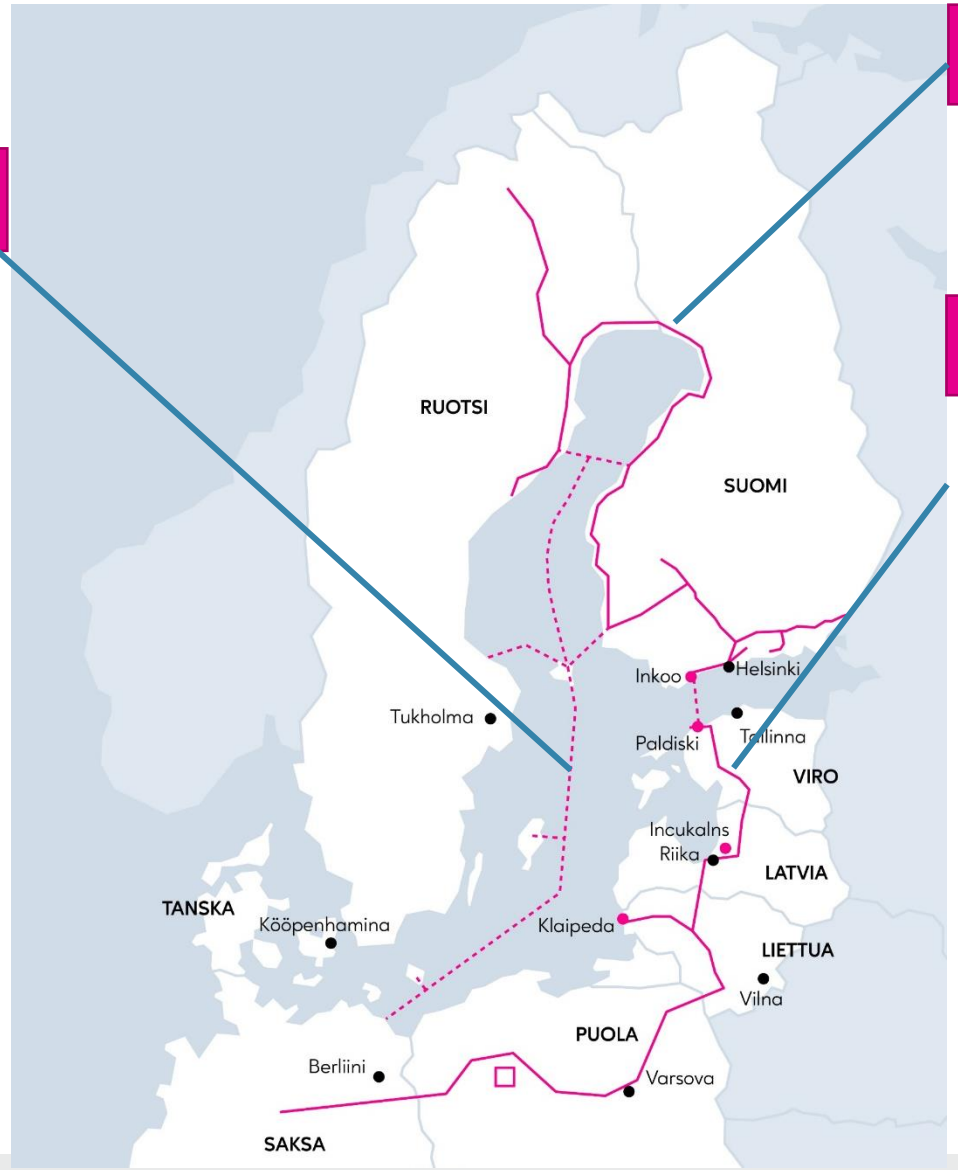
Baltic Sea Hydrogen Collector (BHC)

GASGRID

NORDION ENERGI

CIP
Copenhagen Infrastructure Partners

OX2



Nordic Hydrogen Route (NHR)

GASGRID

NORDION ENERGI

Nordic-Baltic Hydrogen Corridor

GASGRID

elering

Amber Grid

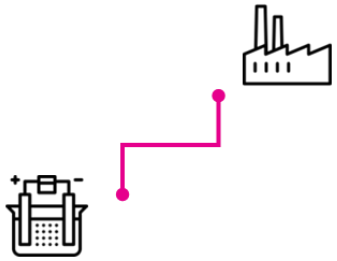
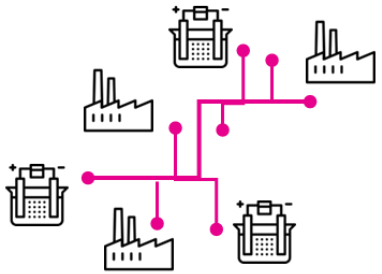
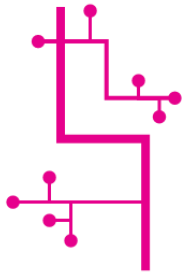
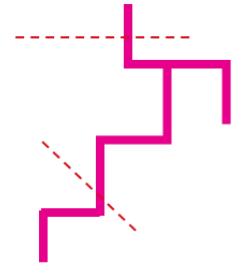
conexus BALTIC GRID

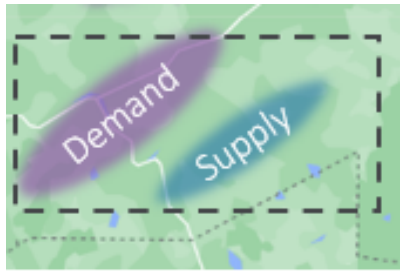
GAZ system

ONTRAS

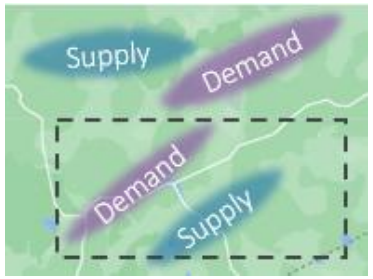
How can infrastructure support local business development?

Hydrogen infrastructure is developing on multiple levels at the same time

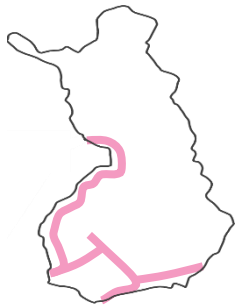
Parts of the hydrogen network			
			
Point-to-point pipe	Local hydrogen network (Hydrogen Valley)	National hydrogen backbone	Baltic Sea Region hydrogen network



Customer projects



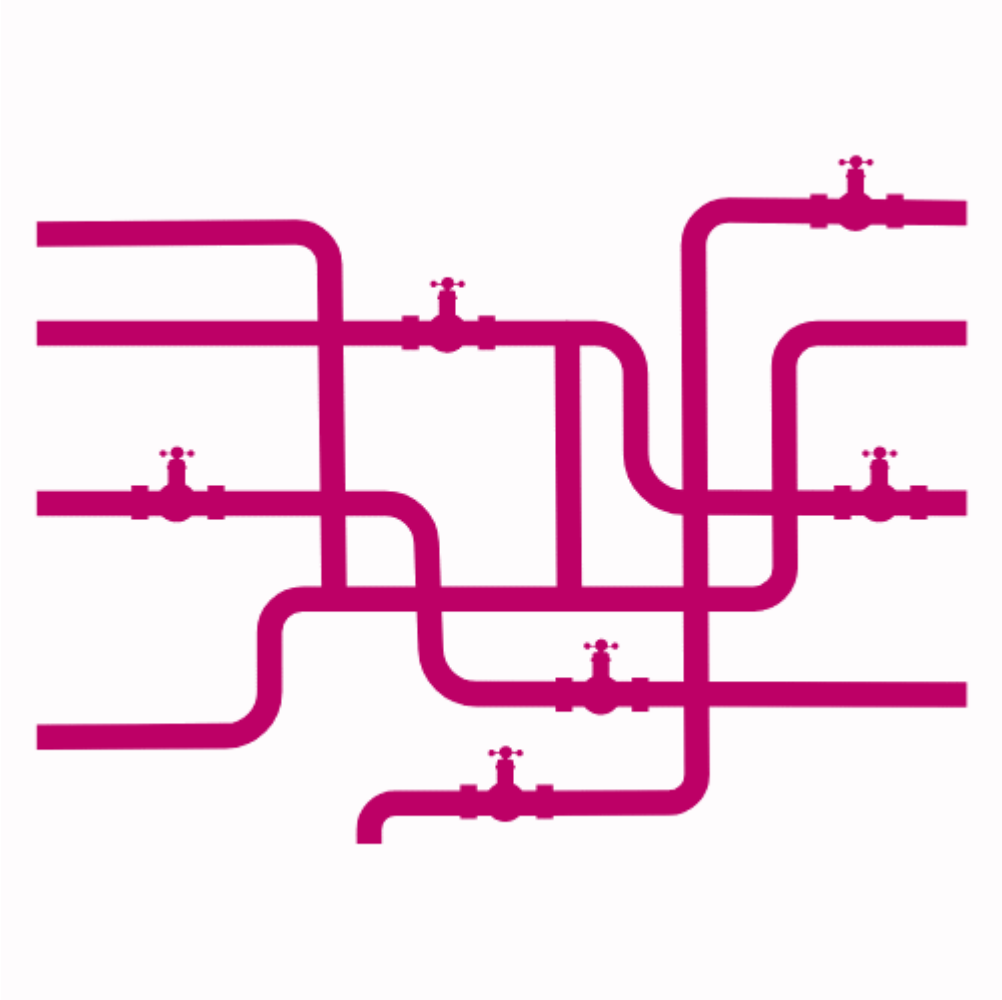
Regional development



National infrastructure development

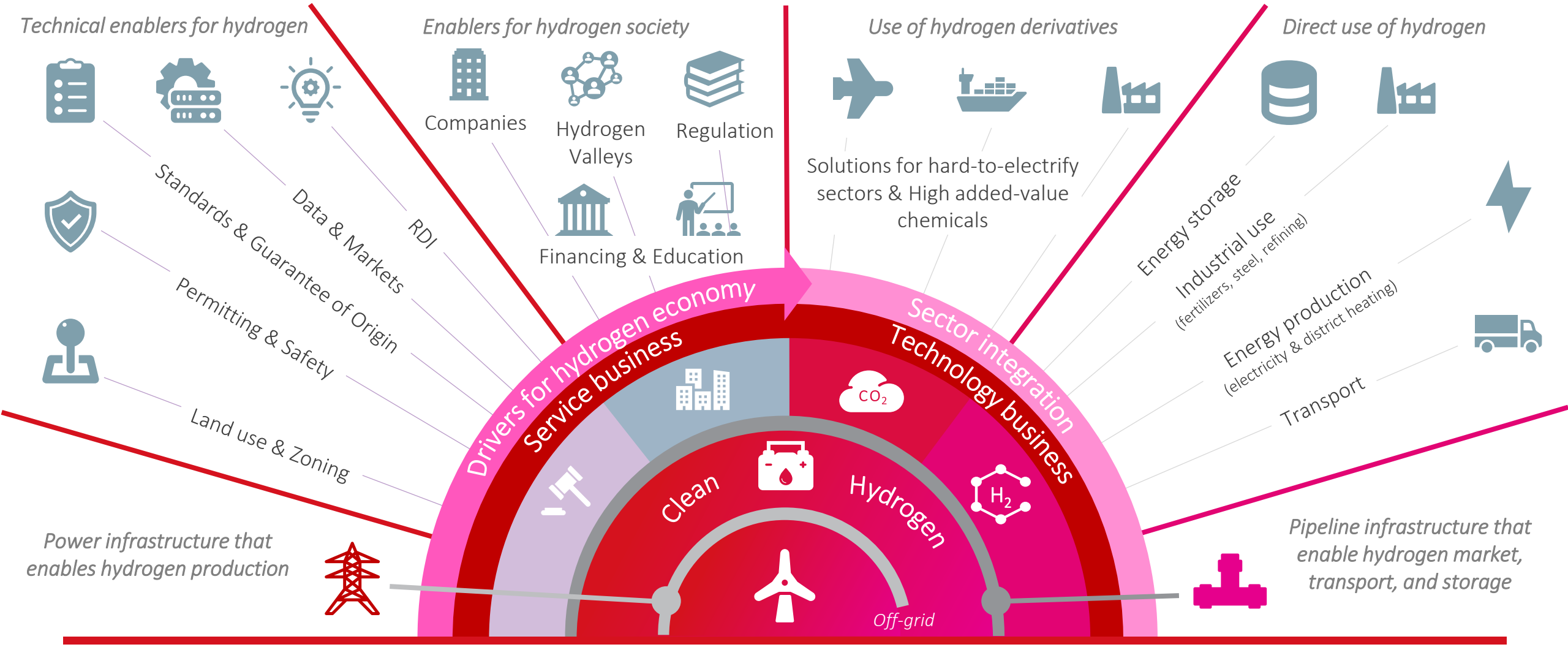
Baltic Sea infrastructure development

Hydrogen infrastructure enables market expansion, derisking of investments and flexibility for operation



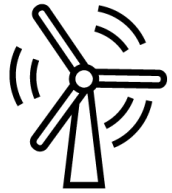
- Transmission pipelines enable
  - Efficient energy transportation
  - Establishes connection between multiple H2 producers, refiners and end users
  - Creation of an open market for hydrogen
  - De-risking of individual investments
  - Possibility for more economical upscaling of own business without the need to invest in local storage
  - Flexibility in the operation of chemical processes through storage (availability of European cavern storages through pipeline)
  - Balancing the electricity prices through ability to utilize stored H2 when the circumstances do not support online electricity / H2 production.

Energy infrastructure as an enabler for new H2 value chains



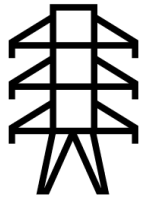
(Figure: Gasgrid Finland)

Billion-scale investments in Finland by 2040



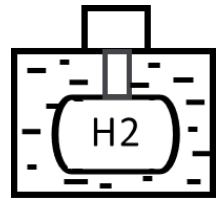
Power production
EUR 36 – 60 billion

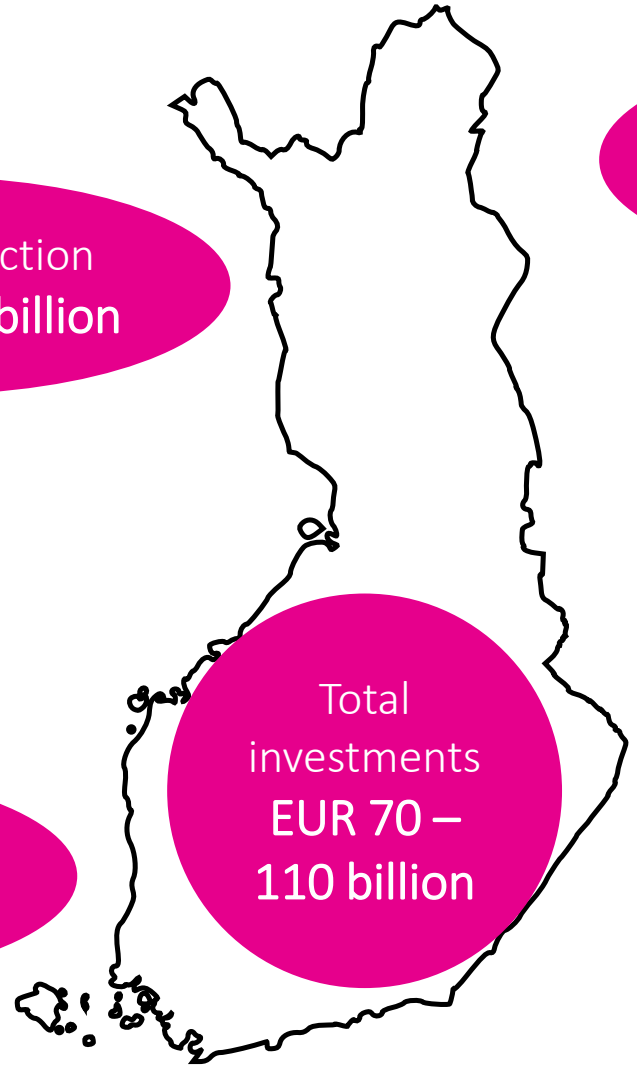
Power grid
EUR 4 – 5 billion



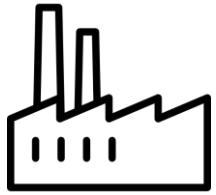
Hydrogen production
EUR 8 – 14 billion

Hydrogen storage
EUR 2 - 5 billion



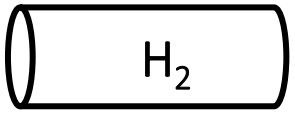


Total investments
EUR 70 – 110 billion



Hydrogen refining*
EUR 10 – 20 billion

Hydrogen transport
EUR 5 billion



* Most investments will realize by 2030
Source: Confederation of Finnish Industries. Green investments in Finland. Data Dashboard.

Source: Gasgrid & Fingrid. (2023). Energian siirtoverkot vetytalouden ja puhtaan energiajärjestelmän mahdollistajina. Available at: Energian siirtoverkot vetytalouden ja puhtaan energiajarjestelman mahdollistajina - Loppuraportti

The future of hydrogen will be created together

Sara Kärki
SVP, Hydrogen development
sara.karki@gasgrid.fi

Meeting the growing market for e-methane and biogas in the Nordics

Tommy Mattila

Vice President,
Industry and Traffic, Gasum

Meeting the growing market for e-methane and biogas in the Nordics

Tommy Mattila

Gasum

A range of products and services to our customers – We help them reduce their carbon footprint

Natural gas
Liquefied
natural gas LNG

Biogas,
Liquefied biogas LBG

Power

Solutions
for maritime
transport

Gas filling station
network
for transport

Circular economy
solutions

Energy market services

- Portfolio Management and Brokering Services
- Balance Services in the Wholesale Physical Electricity Market
- 24-h Control Room Services
- Marketing analyses and reporting services
- Guarantees of Origin Services for electricity and alternatives

WE ARE DEVELOPING THE NORTH-WEST EUROPEAN GAS ECOSYSTEM AND PROMOTING SUSTAINABLE DEVELOPMENT

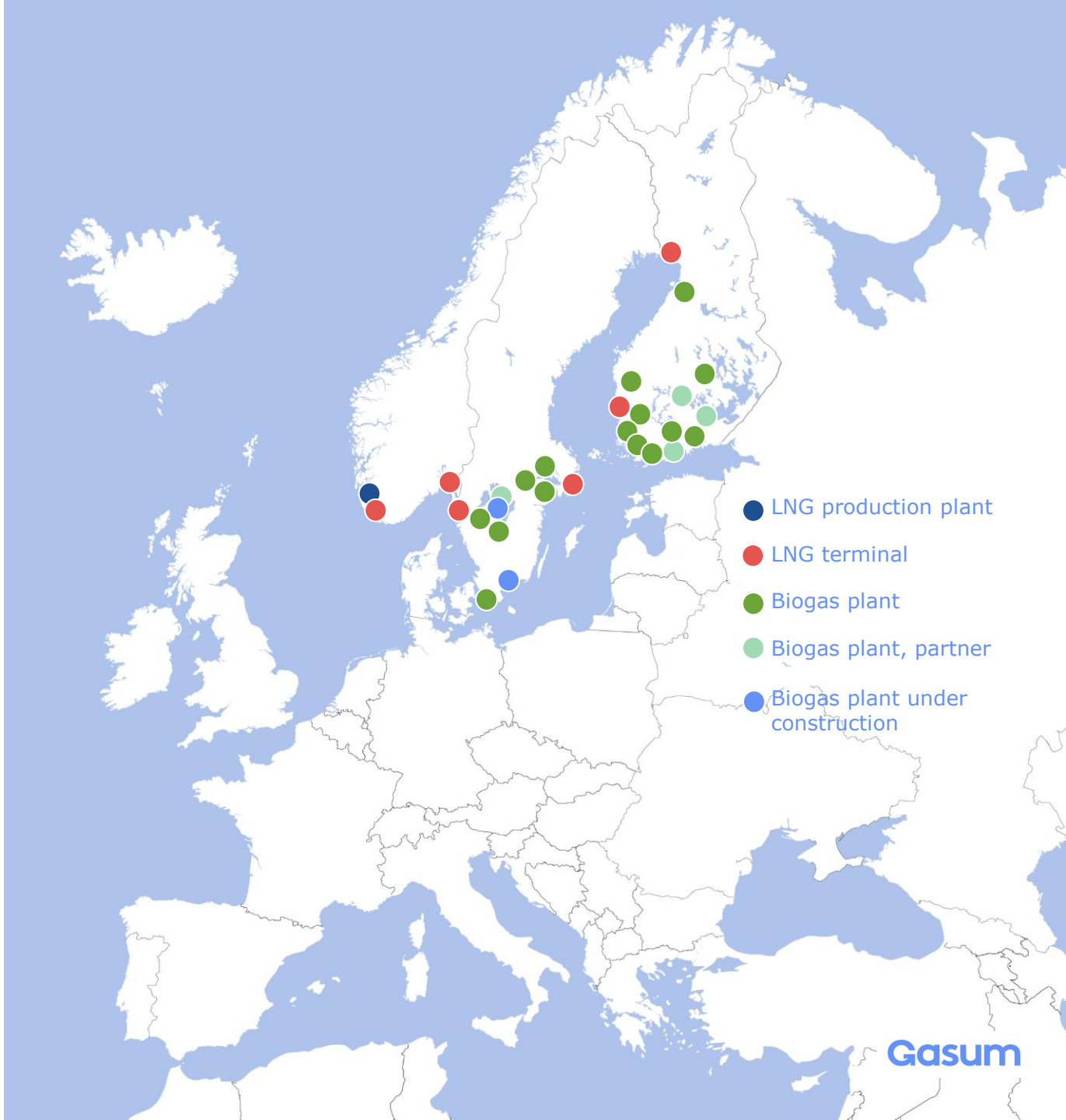
6 LNG terminals

5 Bunkering and feedering vessels

17 Biogas plants
1 Under construction (Götene)
3 Partner plants

Over 100 gas filling stations

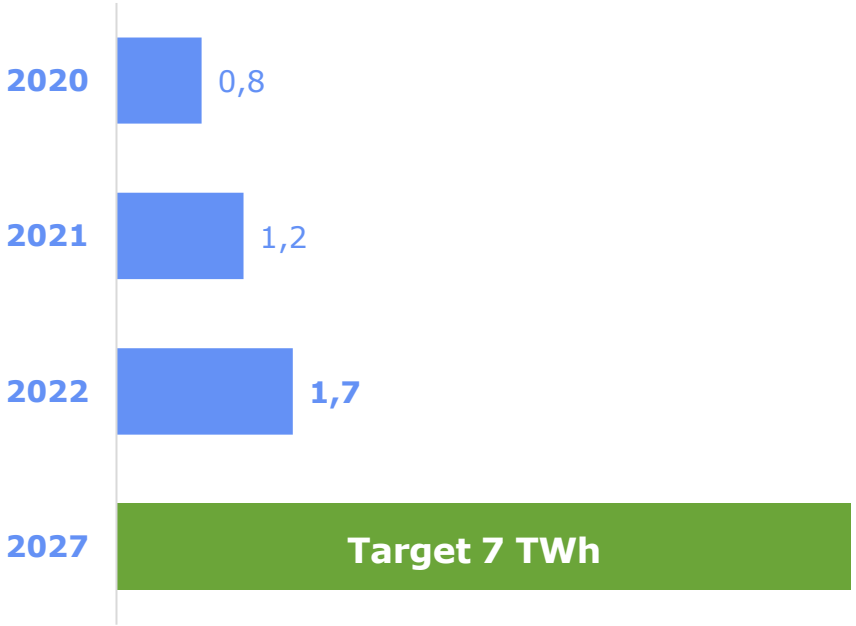
*18 Gasum biogas plants + 3 partner plants

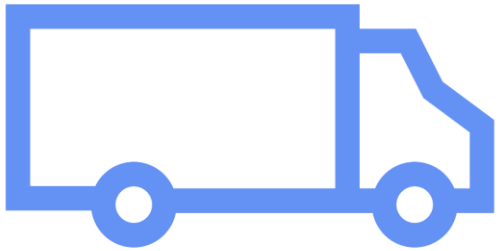


Gasum's Biogas 2022 in numbers:

1.7 TWh

of biogas delivered to customers including **775 GWh** of Gasum's own production. That's **65,700** times around the globe in a gas-powered car or **170,000** homes heated for a year.





1 million tons

of different types of waste (biowaste, manure, sewage sludge) managed through biogas production process.

That's

20,000 truckloads

of waste.

At the same time, we produced

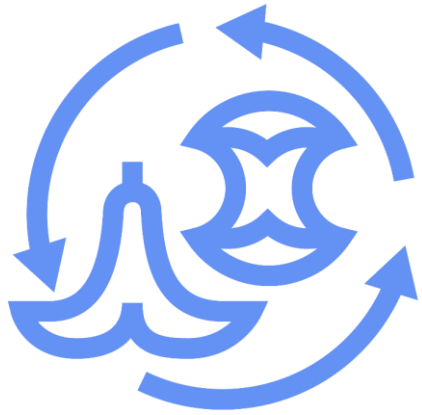
940,000 tons

of recycled nutrients.

444,000 tons

of CO2eq emission savings for our customers with biogas. This equals the carbon footprint of about **65,000** average EU citizens.

Our goal is to reach a cumulative reduction of **1.8 million tons** of carbon dioxide emissions by 2027.

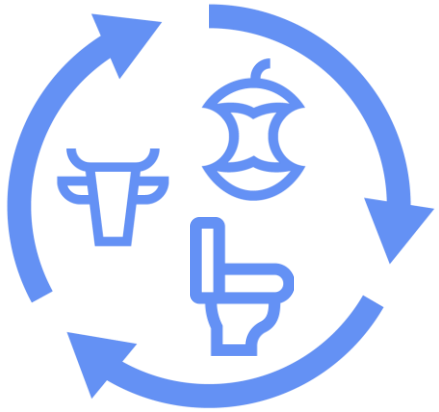


Terminology

	Gaseous form	Liquid form
Fossil gas	Natural Gas Compressed Natural Gas, CNG (for vehicles)	Liquefied Natural Gas LNG
Biogas (Anaerobic and Gasification)	Biogas, biomethane Compressed Biogas, CBG (for vehicles) Bio-SNG, Bio-Synthetic Natural Gas (from biomass gasification) Renewable Natural Gas (US)	Liquefied Biogas LBG Bio-LNG
E-fuels Power-to-Gas	e-Gas, e-methane Synthetic Natural Gas, SNG	e-LNG LSNG (Liquefied Synthetic Natural Gas)

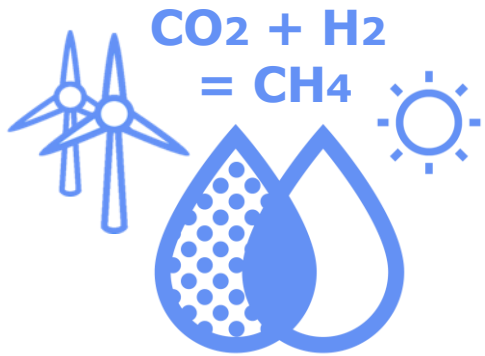
Renewable and sustainable methane

Sustainable methane can be produced through different processes



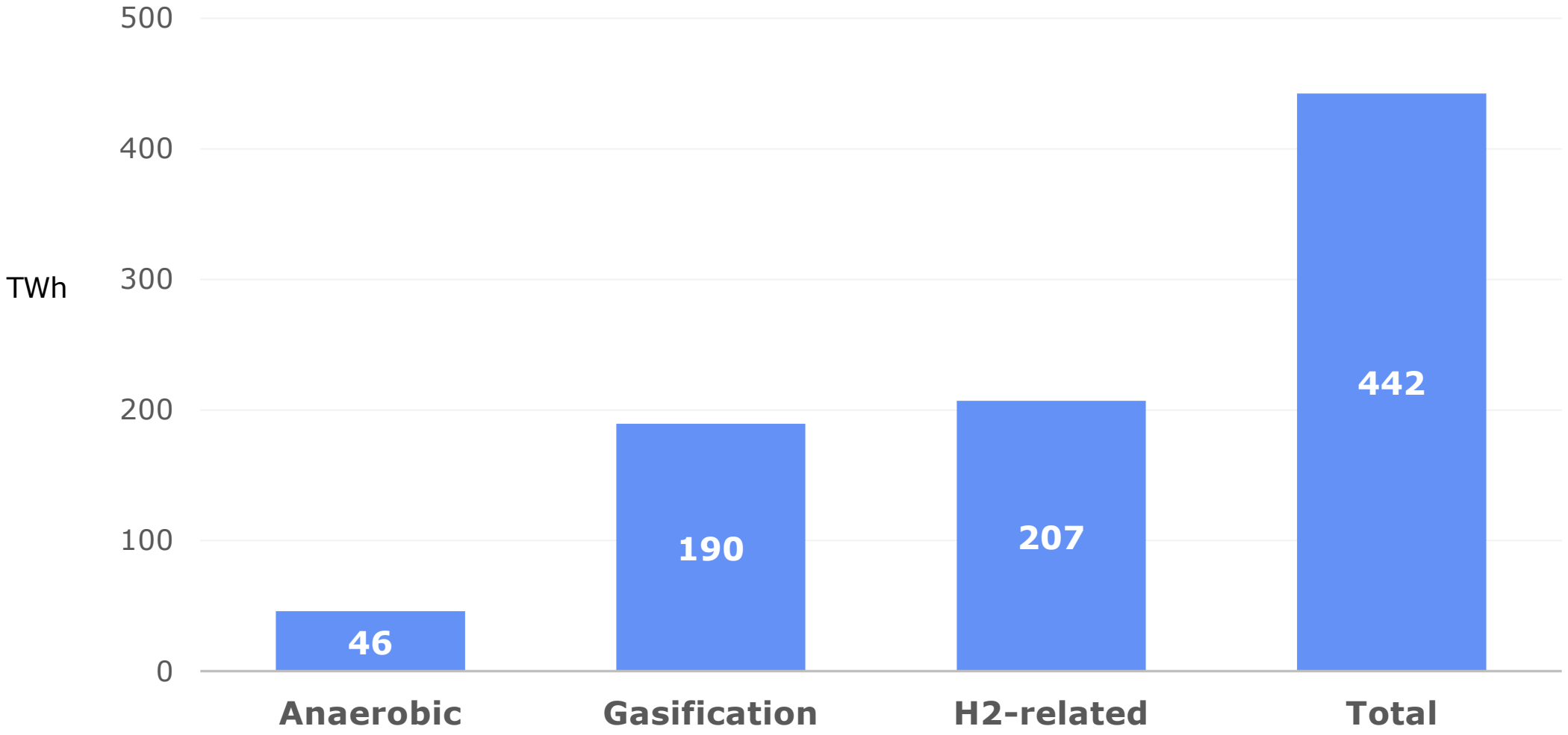
Anaerobic digestion
Traditional biogas production from waste feedstock

Gasification
Dry woody or lignocellulosic biomass and solid waste to methane



Power to Gas process (P2G)
Methanation of green hydrogen using bio-CO_2

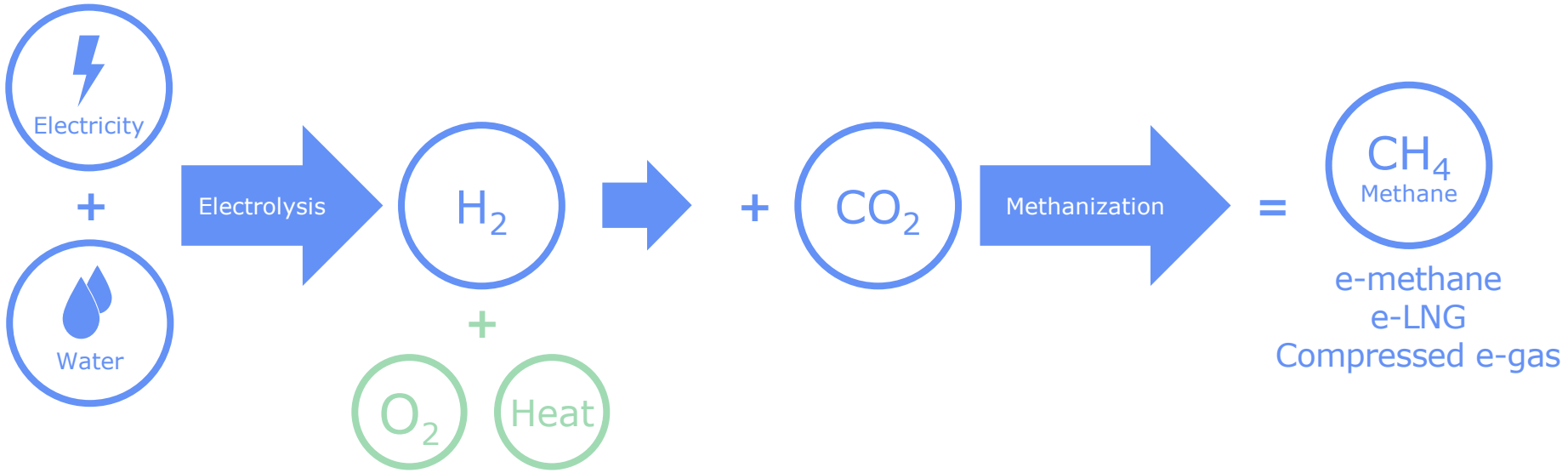
Nordic potential for renewable methane



Sources:
Gas for climate, Biomethane potentials in EU report, GAIA; Nordic H2-potential according to bio-CO2 availability

e-methane

P2G – one of the ways to produce e-fuel



When produced according to EU sustainability criteria, synthetic renewable methane (e-methane, e-LNG) is one of the **Renewable Fuels of Non-Biological Origins (RFNBO)**

E-methane – why Finland?

Nordic countries, especially Finland, have excellent potential for synthetic renewable methane production in the European context:

- ✓ Good wind resource and zoning & permitting supporting wind power development
- ✓ Strong electricity grids
- ✓ Biogenic CO2 from the forest value chains (pulp mills and bioenergy production) as well as waste-to-power plants
- ✓ Excellent clean water availability
- ✓ Potential to utilize waste heat in district heating networks
- ✓ Access to European gas grid (depending on the location) and existing LNG infrastructure enabling local distribution and export

RFNBO & E-fuels – Gasum approach

Synthetic renewable methane (e-methane / e-LNG) is one of the Renewable Fuels of Non Biological Origins (RFNBO)

Different methane products are complementary and can use existing infrastructure

- e-methane is 100% drop-in fuel and can be blended with fossil and biomethane. Enables optimization of the use by the customer depending on the regulation
- e-methane can use the same existing logistics chain – pipelines, liquefaction facilities, terminals, ships, trucks

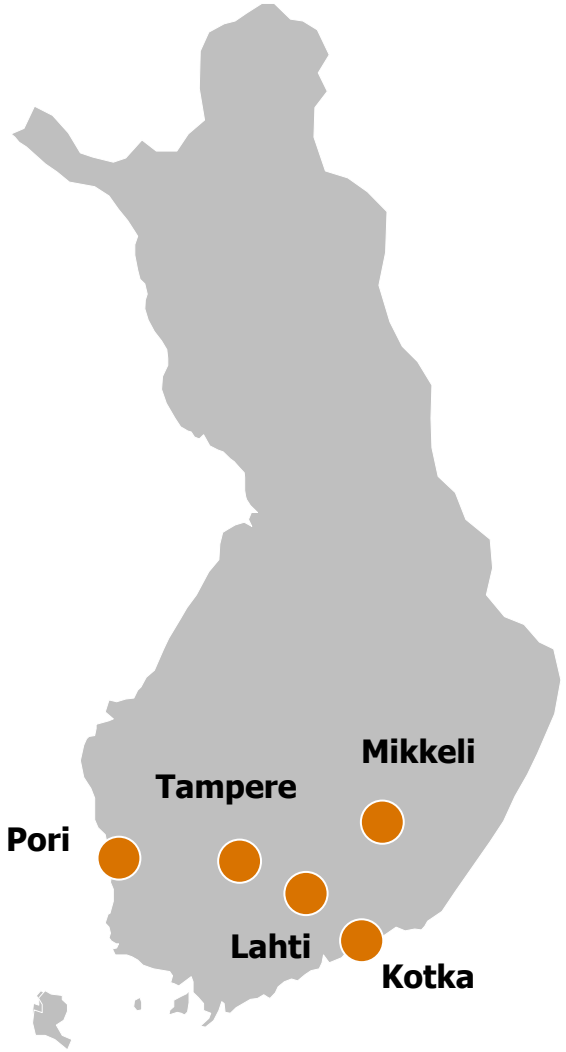
Gasum entering the market via e-methane, production ramp-up with project development partners

Ren-Gas portfolio overview

Announced Contracts To-Date

Power Plant	Project Location & Utility Partner	Technical Details	Timeline & Progress
	Tarastenjärvi, Tampere TAMPEREEN sähkölaitos	60 MW methane capacity 35,000 tons methane p.a. 600 GWh heating p.a.	EIA and permitting Production 2026
	Kymijärvi, Lahti LAHTI ENERGIA	60 MW methane capacity 35,000 tons methane p.a. 600 GWh heating p.a.	EIA and permitting Production 2026
	Pursiala, Mikkeli ESE	20 MW methane capacity 12,000 tons methane p.a. 200 GWh heating p.a.	EIA and permitting Production 2027
	Korkeakoski, Kotka Kotkan Energia	60 MW methane capacity 35,000 tons methane p.a. 200 GWh heating p.a.	EIA and permitting Production 2026
	Kaanaa, Pori POHJOLAN VOIMA	20 MW methane capacity 12,000 tons methane p.a. 200 GWh heating p.a.	Full feasibility study Production 2027

Locations



What about the customers ?

Trends are shaping the business environment more than ever before

Drivers	MARITIME	INDUSTRIES	TRAFFIC
Regulations and Global Standards	IMO targets in overall CO_2 emission reduction (from 2008 level) - 40% by 2030 -70% by 2050 **EU** ETS, FuelEU Maritime	Global sustainability development goals by United Nations EU ETS Paris Agreement (+1.5 ^{0}C) Domestic legislation Voluntary self regulation	EU target for non ETS sector, CO2 emission reduction; 40% by 2030 Domestic targets Voluntary Municipal targets
Customers	**Consumers demand and prefer more and more green alternatives** Requirement for greener maritime operations originating both from **logistics buyers** and cruise passengers	Requirement from end-consumers for true and growing sustainability in products	Requirement for greener transports originating from logistic buyers due to increasing pressure for sustainability
Capital Markets	Future solutions and more sustainable business do not happen by themselves**.** **Investments are allocated to more sustainable projects**		

Logistics buyers are willing to pay more for greener transportation

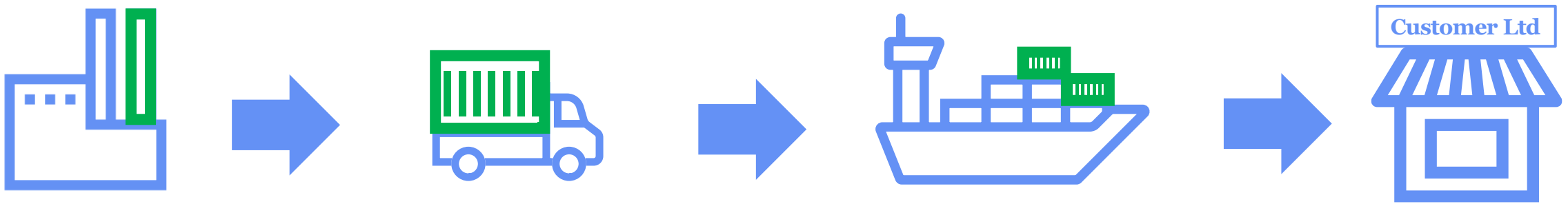
78%

71%

According to studies conducted by Volvo Trucks and BCG, **78%** of road and **71%** of maritime transportation buyers are willing to pay more for greener logistics services (up to 20% more)

Source: Volvo and Boston Consulting Group

Different types of Methane --> shared value chain and applications (Industry, Traffic and Maritime



Fulfilment of the customer demand for cleanest possible transportation of the bought goods. (Scope 3)

Impact: True green logistics and manufacturing
Ability to differentiate among competitors by offering sustainably transported goods
Customer satisfaction

We have chosen Gasum's biogas

essity

outokumpu

SSAB

forchem
RESPOL GROUP

UDDEHOLM

Orkla

Arla

postnord

bring

LIDL

HKSCAN

DESTINATION GOTLAND

MSC CRUISES

VIKING LINE

WE ♥ GAS

Panel discussion

2024 MARCH 11–14
VAASA, FINLAND

ENERGYWEEK.FI

#ENERGYWEEK

Moderator

Kjell-Owe Ahlskog

Owner and Managing Director,
Alcea Oy

Panel topic: Business opportunities in the hydrogen value chain

Herkko Plit
Founder and CEO, P2X Solutions Oy

Tommy Mattila
Vice President, Industry and Traffic,
Gasum

Sara Kärki
Senior Vice President / COO,
Gasgrid Finland Oy

Paula Erkkilä
CEO,
Ostrobothnia Chamber of Commerce

ENERGYWEEK.FI

#ENERGYWEEK

WELCOME NEXT YEAR!

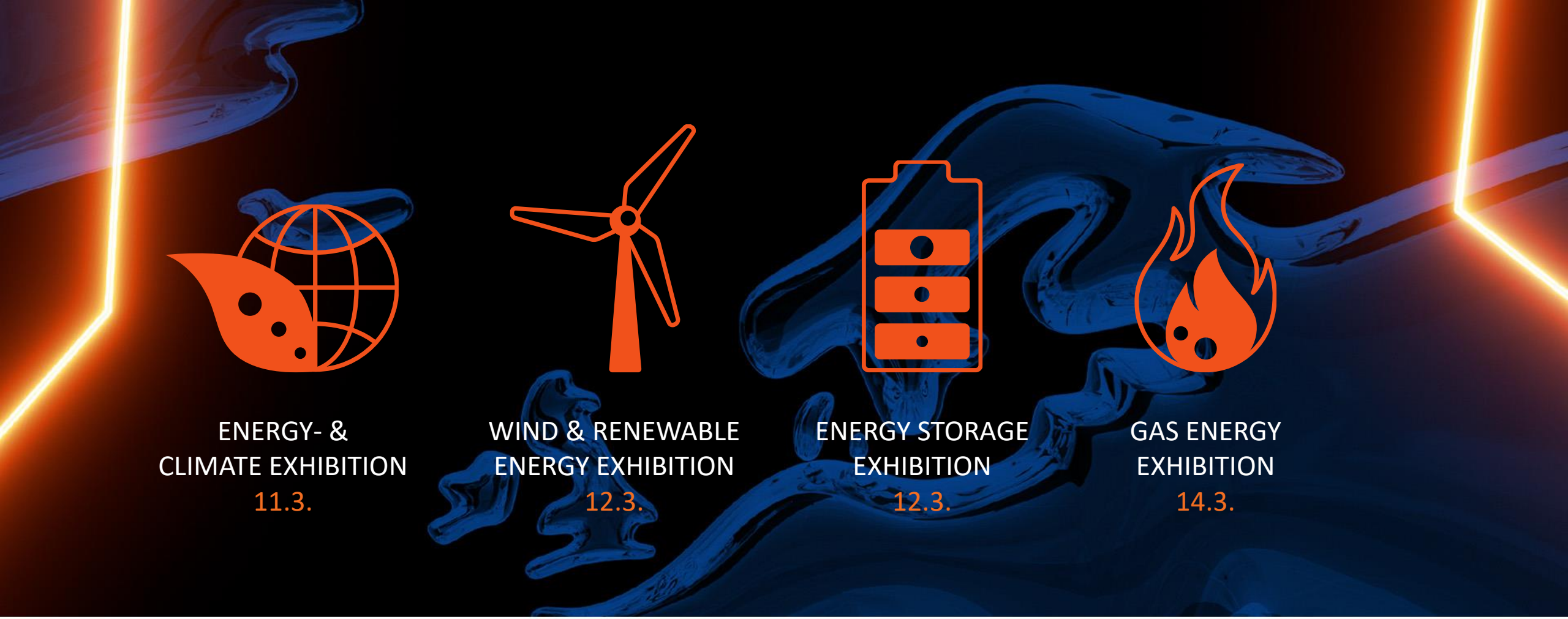
EnergyWeek

March 17th to 20nd 2025

ABB Danfoss EY Hitachi Energy MERINOVA TECHNOLOGY CENTRE EXPO OSTROBOTHNIA CHAMBER OF COMMERCE VAASA VASA VAASAN SÄHKÖ VAMK VASEK Vaasan yliopisto VEO Wapice WESTENERGY WÄRTSILÄ

ENERGYWEEK.FI

#ENERGYWEEK



ENERGY- &
CLIMATE EXHIBITION
11.3.

WIND & RENEWABLE
ENERGY EXHIBITION
12.3.

ENERGY STORAGE
EXHIBITION
12.3.

GAS ENERGY
EXHIBITION
14.3.

ENERGYWEEK.FI

#ENERGYWEEK