Lithuania‘s plans and goals in the hydrogen economy

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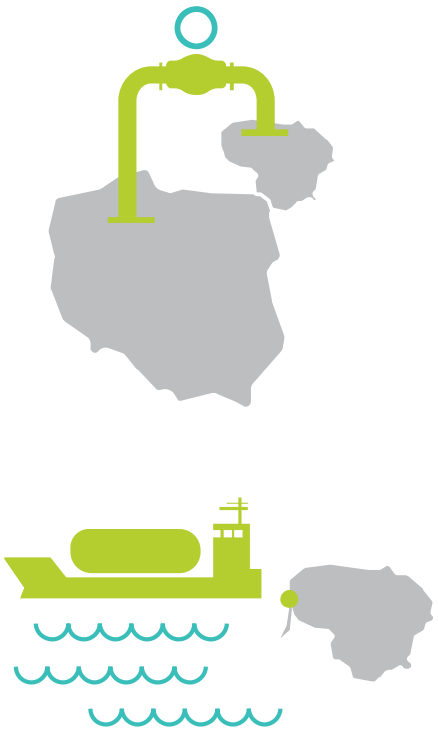
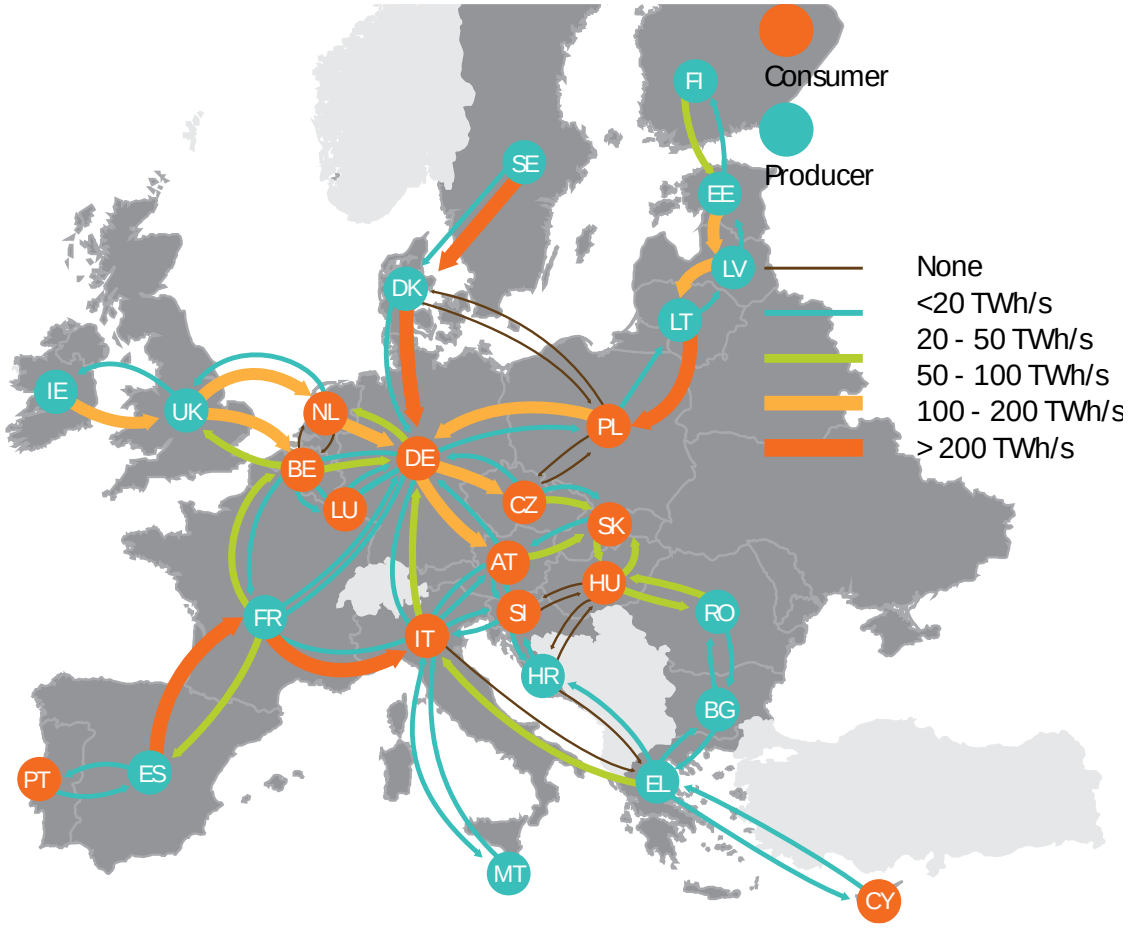
RES – LITHUANIA FUTURE GREEN HYDROGEN EXPORTER



- Plan – to invest in hydrogen technologies the identical *per capita* amount as Germany and France.
- Hydrogen usage priorities:
  - ✓ in transport and industry
  - ✓ for system balancing
- Pilot project to establish green hydrogen value chain:
  - ✓ 24 MW of electrolysers
  - ✓ 800 tons/yearly and 380 Kt by 2050
  - ✓ 170 hydrogen-powered public buses
  - ✓ 4 filling stations.
- Pilot Power-to-Gas projects initiated.
- Preparation of Draft Lithuania's Hydrogen Roadmap and Action Plan in Q4 2022.



Lithuanian Hydrogen Platform, Nov **2020**

Entry in force of Alternative Fuels Act, Jul **2021**

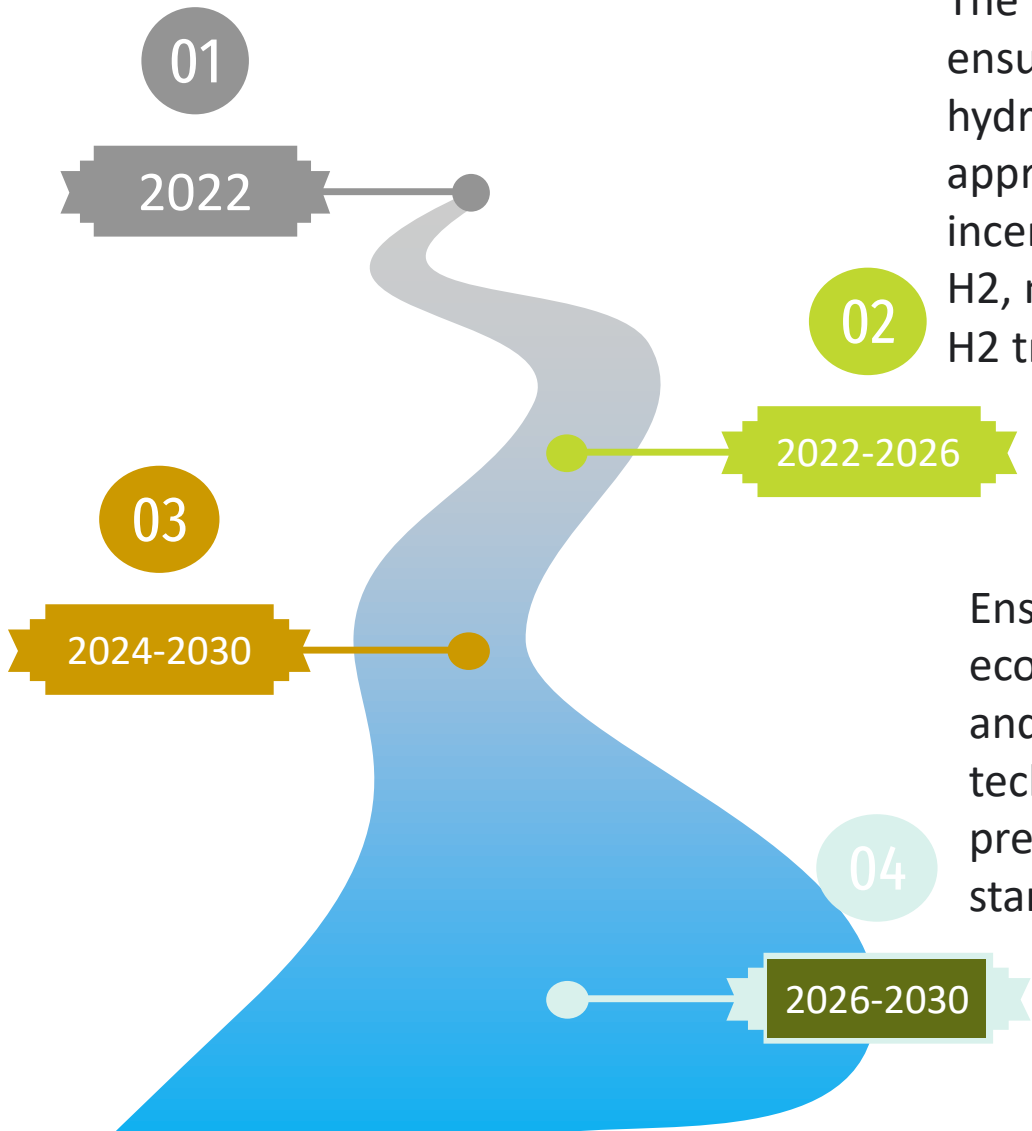
Lithuanian Hydrogen Development Roadmap to be approved in **2022**

Source: European hydrogen potential scenario (European Commission, 2020)

HYDROGEN ECONOMY DEVELOPMENT STAGES (LT CASE)

Guidelines and Action Plan for the Development of the Hydrogen Technology Sector in Lithuania have been prepared

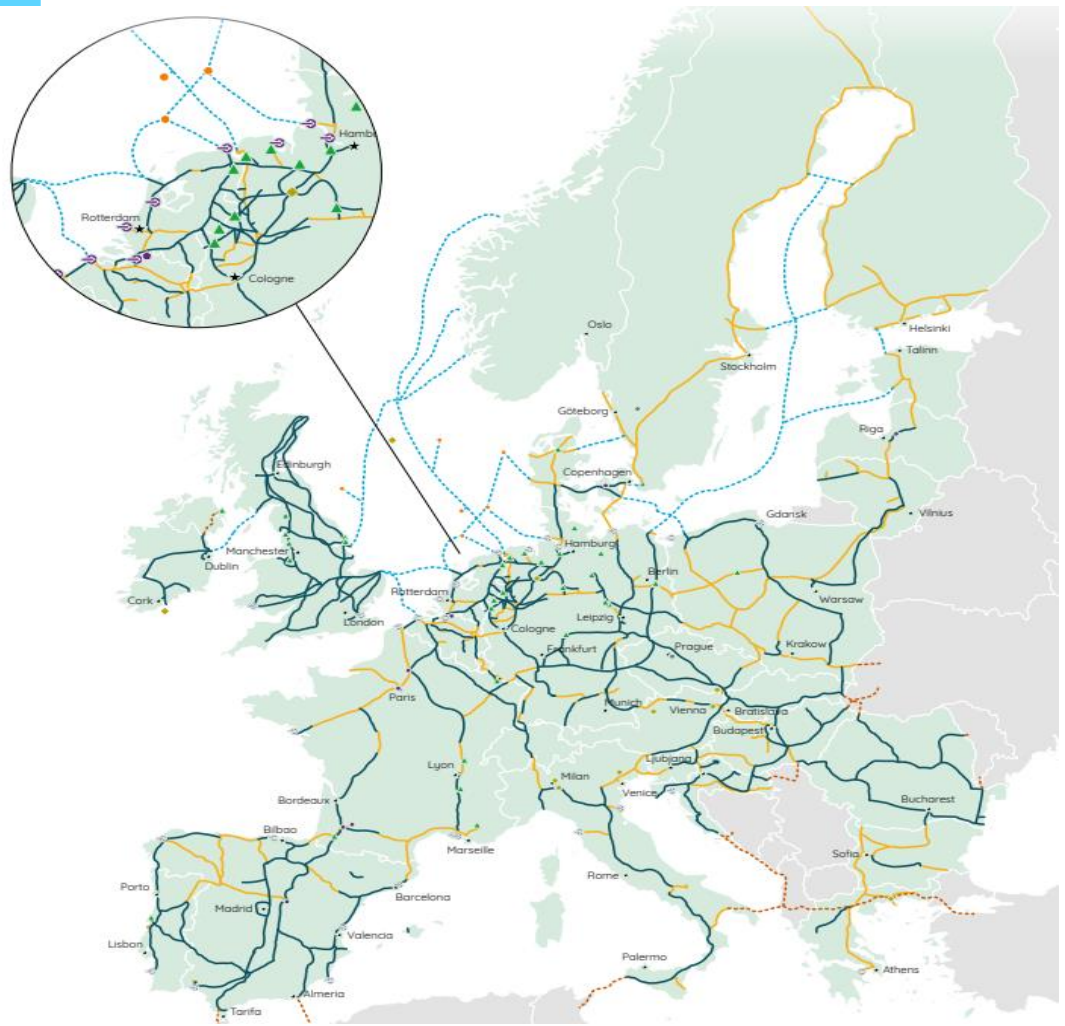
The production of green hydrogen and the establishment of the necessary infrastructure have been ensured



The necessary legal framework to ensure the development of green hydrogen has been developed and approved (sui generis i.e. tax incentives to encourage the use of H2, natural gas quality requirements, H2 transportation requirements)

Ensure the maintenance of the ecosystem required for the integration and development of hydrogen technologies (training of specialists, preparation of safety requirements, standards, strategic doc)

A VISION FOR A EUROPEAN H2 TRANSPORT SYSTEM (*ehb*)



Pipelines
- Repurposed
- New
- Subsea
- Import / Export
- UK 2030 pielines depends on pending selection of hydrogen clusters

Storages
- Salt cavern
- Aquifer
- Depleted field
- Rock cavern

Other
- City, for orientation purposes
- Energy hub / Offshore (wind) hydrogen production
- Existing or planned gas-import-terminal

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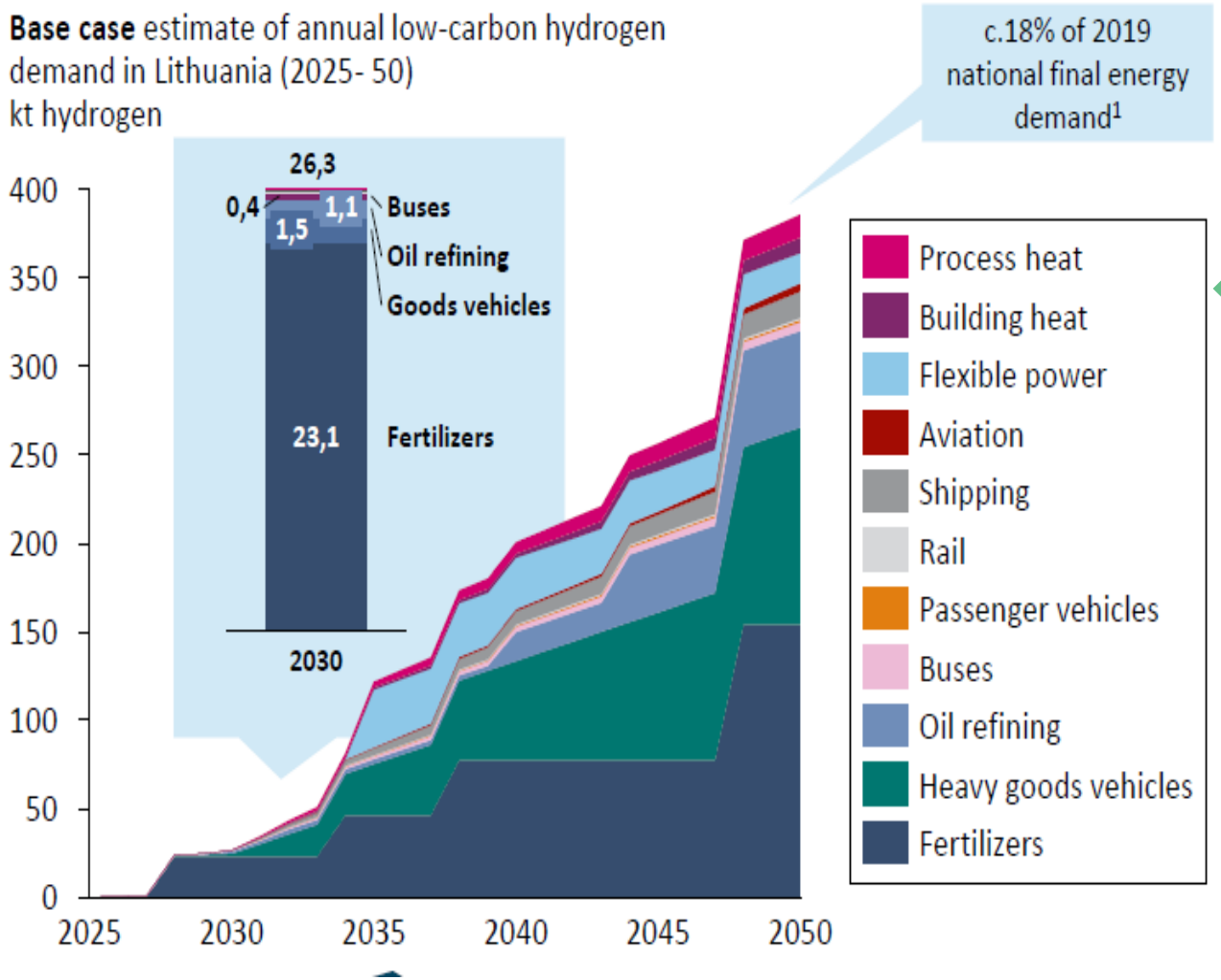
Source : European Hydrogen Backbone in 2040
from gasforclimate2050.eu

GREEN AND LOW CARBON H2 DEMAND 2025-2050



Based on the market survey and modelling results, demand for H2 is predicted:

- **26 kt (~1 TWh) by 2030**
- **380 kt (~13 TWh) by 2050**

The most important areas of demand:

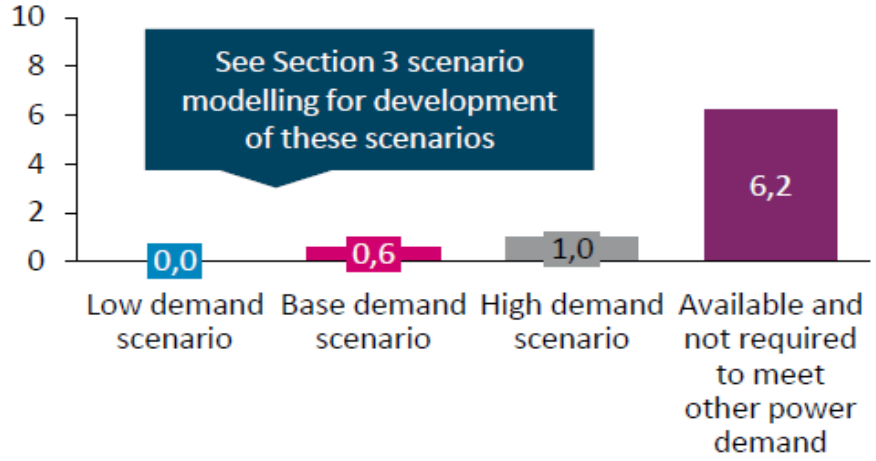
Industrial sector (Achema, Orlen)

Transport sector (heavy transport, trains, shipping)

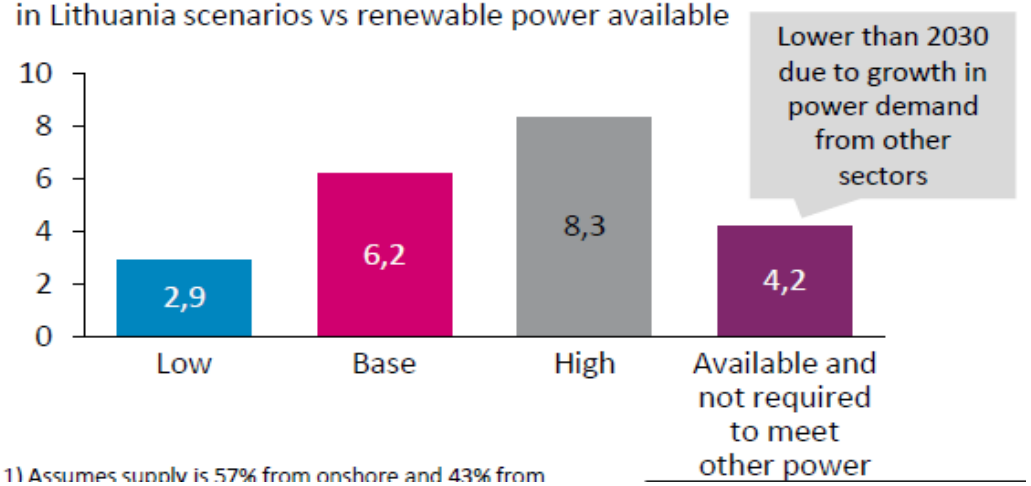
Production of electricity and thermal energy

DEMAND AND SUPPLY OF RES ELECTRICITY FOR H2

2030 GW wind power[1] required for hydrogen demand in Lithuania scenarios vs renewable power available



2050 GW wind power[1] required for hydrogen demand in Lithuania scenarios vs renewable power available



lote: 1) Assumes supply is 57% from onshore and 43% from

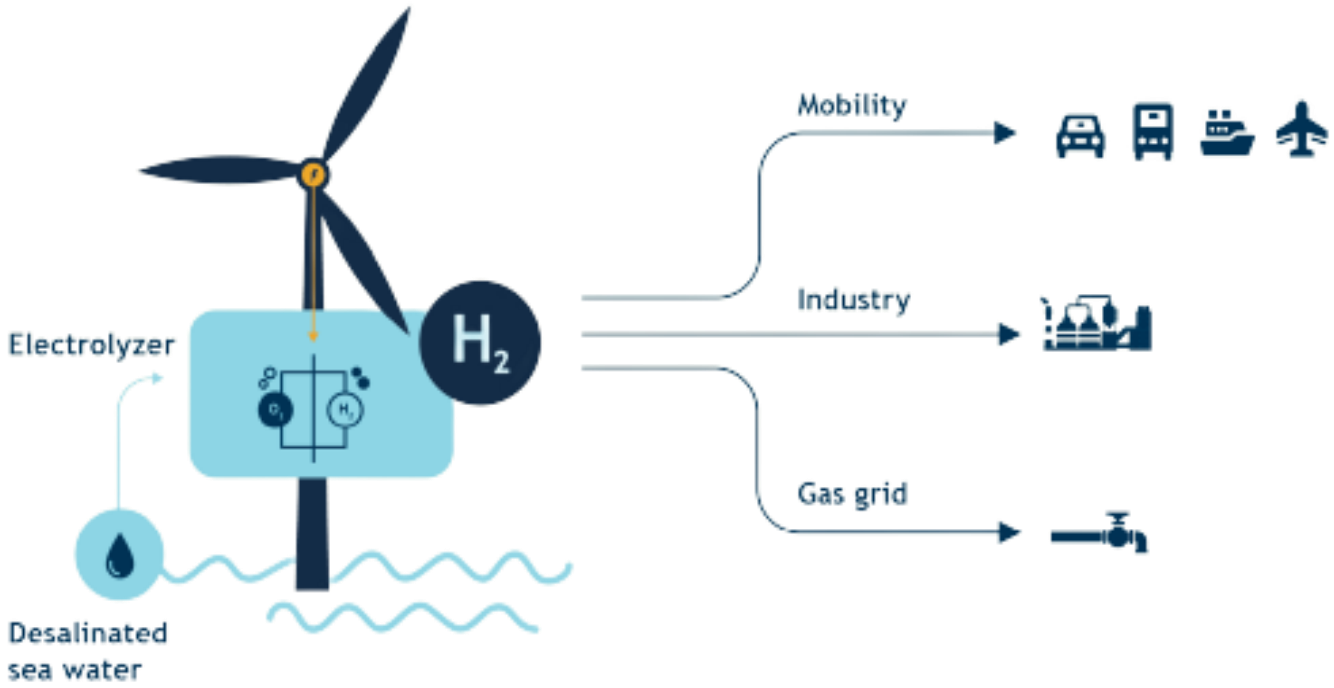
- In 2030, the supply of RES electricity for H2 production will be **more than sufficient**, but in order to meet the goals of decarbonization of the industrial, energy and transport sectors in the period 2030 and 2050, and to cover H2 needs, which will require either:
- **additional RES electricity generation capacity**
- **import RES electricity from other countries**
- **Import raw hydrogen from other countries**

HYDROGEN AND OFSHORE WIND

Future offshore wind project in the Baltic Sea together with onshore wind will generate massive energy peaks

Green hydrogen is seen as a key tool to balance these energy peaks and become a significant energy source after 2030

Transport, industry and energy generation – main areas for green hydrogen use



WHERE WILL HYDROGEN BE USED?

- **Fertilizer production**, where hydrogen is a feedstock for ammonia

- **Oil refining**, where hydrogen is a feedstock

- **Buses**, where batteries are less feasible or less economical

- **Heavier passenger vehicles**, such as SUVs

- **Heavy goods vehicles**, particularly over longer distances

- **Rail**, as an alternative to electrification on less busy routes

- **Marine**, as a precursor to ammonia or e-methanol

- **Aviation**, as a precursor to e-kerosene

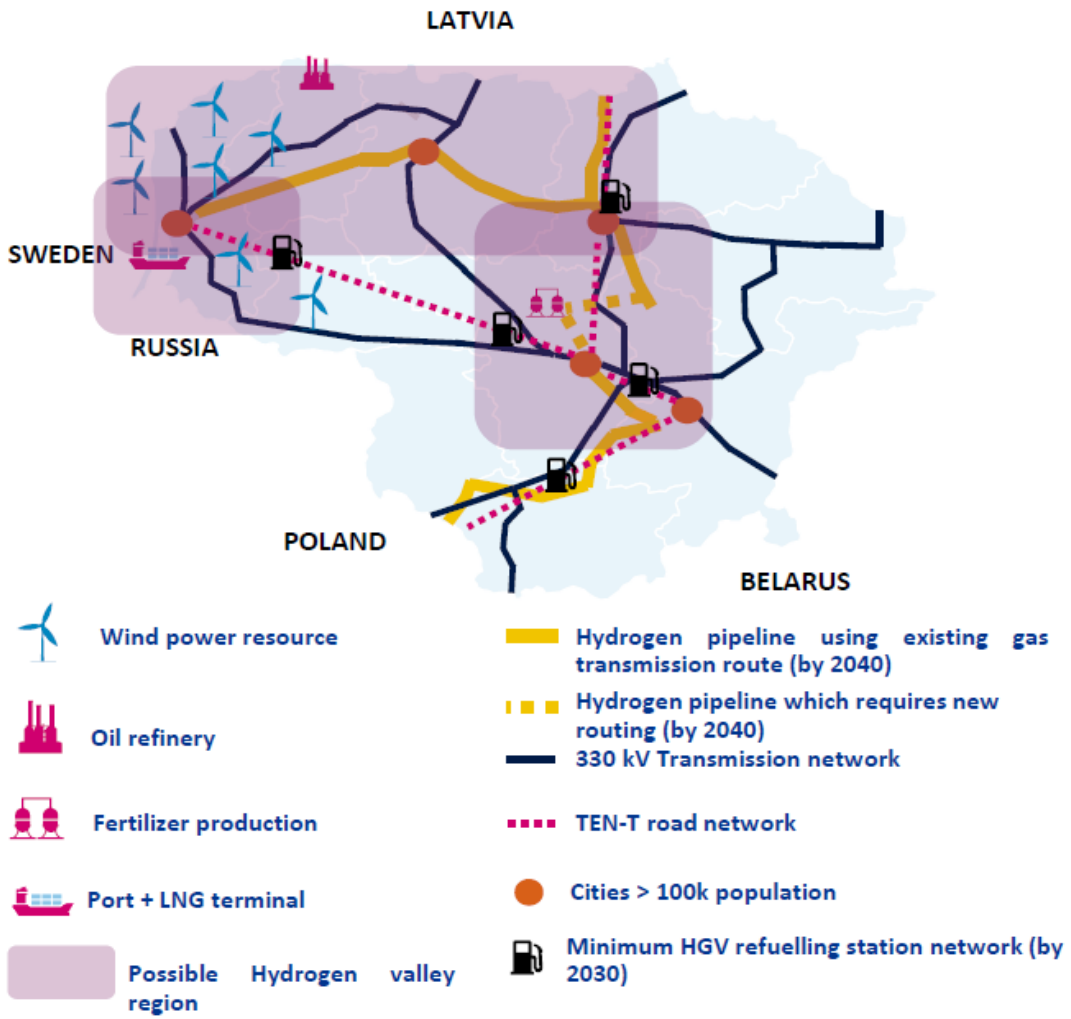
- **Flexible power**, to deal with seasonal peaks served by gas turbines

- **Building heat**, in cases where biomass may not be an option

- **Industrial process heat**, where electrification may be less attractive

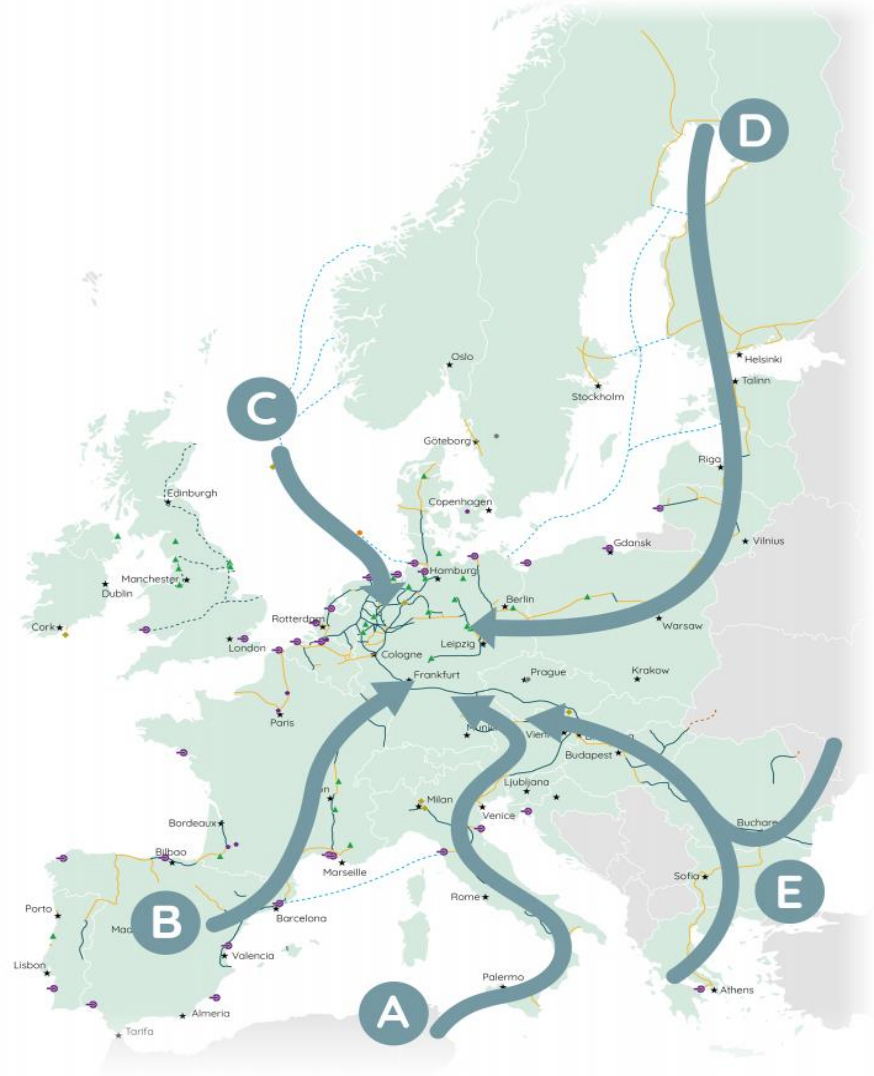
- The 11 directions of use of H2 have been identified, which become clear after the meetings of market participants;
- The objectives of decarbonization shall be assessed;
- Competition with other fuels and energy carriers shall be assessed;
- Assess the centralized need (2 main users) and the cost of installing the infrastructure;
- Evaluation of the experience of 10 countries

DEVELOPMENT/ADAPTATION OF H2 DEDICATED INFRASTRUCTURE



- **Actions:**
- By 2030, the existing gas infrastructure is adapted to transport the mixture of H2 and methane.
- Develop the gas network for the transportation of pure H2 for both national needs and for import/export.
- Analyze technical solutions for the inclusion of Klaipėda LNG Terminal infrastructure in the H2 value chain.
- Look for the most economical solutions for H2 storage (ammonia, methanol, synthetic methane, liquid H2).

FIVE POTENTIAL HYDROGEN SUPPLY CORRIDORS TO MEET EUROPE'S ACCELERATED 2030 HYDROGEN GOALS



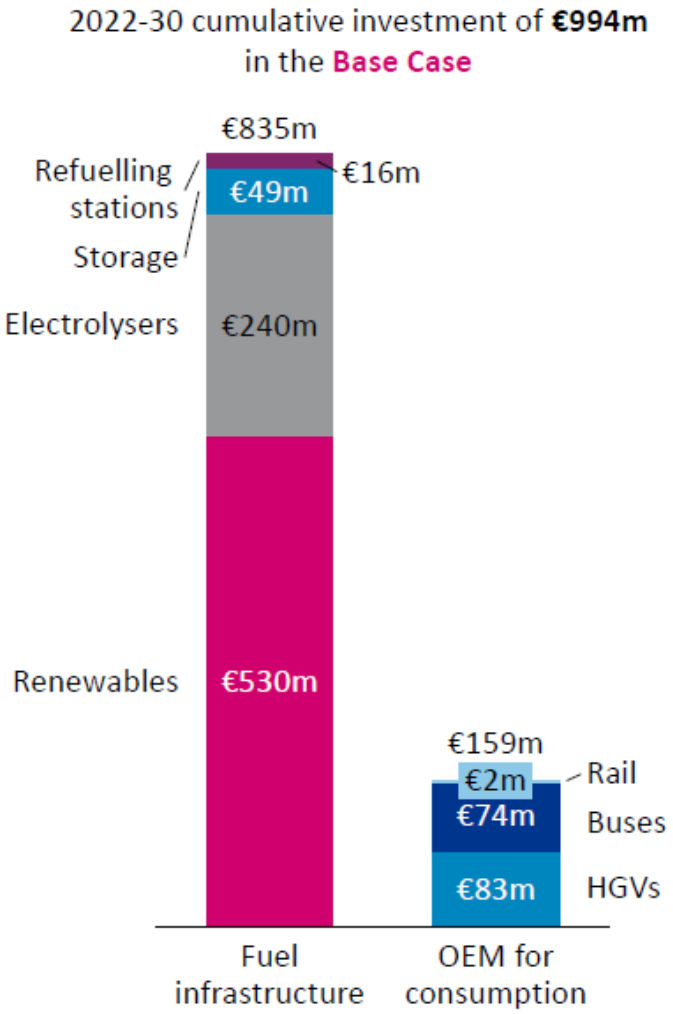
The five hydrogen supply corridors are:

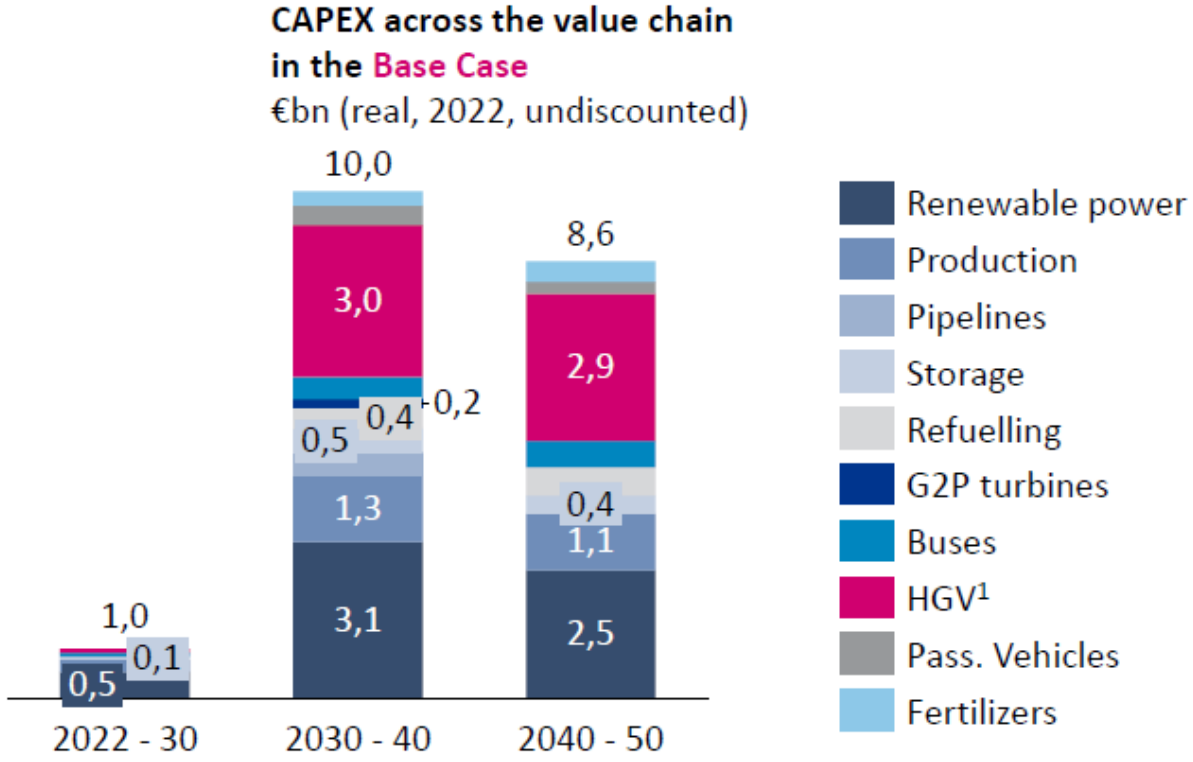
- Corridor A: North Africa & Southern Europe
- Corridor B: Southwest Europe & North Africa
- Corridor C: North Sea
- Corridor D: Nordic and Baltic regions
- Corridor E: East and South-East Europe

- To deliver the accelerated 2030 hydrogen demand & supply targets set by the REPowerEU plan
- To transport large volumes of low-cost hydrogen supply to demand centres
- The members of the EHB initiative recommend to the EC to consider the establishment of hydrogen supply corridors by 2030 as front-running infrastructure as a political objective, in order to ensure the fulfilment of REPowerEU targets

Source : European Hydrogen Backbone in 2040 from gasforclimate2050.eu

THE NEED FOR INVESTMENT





By 2030, combining public and private investment will require almost EUR 1 billion. Eur
Investment needs of EUR 18.6 billion between 2030 and 2050 Eur

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400 MEUR AND 400 MW H2 GENERATION CAPACITY BY 2030

Produce/ Convert Hydrogen	Move Hydrogen	Store Hydrogen	Transport Applications	Non Transport Applications	Hydrogen Support Services
Electrolysis	Cylinders	Refuelling Station & Storage	Vehicle Management	Domestic Heat	HSEQ
Micro Gas to Hydrogen	Road Tankers	Surface Bulk Storage	Commercial Vehicles	Industrial Heat	Training & Marketing
SMR	Pipelines	Subsurface Storage	Small Vehicles	Power Generation	Finance & Legal
Biomass	Bulk Ships		Specialised Vehicles	Chemical Feedstock	Policy & Regulations
Fuel Cells	Ferry with Road Vehicles		Return to Base Vehicles		Other Services
			Non Road Transport		

Questions?

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