

Development of the National hydrogen transport network of the Netherlands

25 March 2022 - Creation of H2 Infra with Eur H2 Backbone

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Content

- Introduction Hydrogen Transport in the Netherlands
- Current development status



Starting point HyWay27

- **30 mrt '20:** approval of the Dutch Government H2 vision -> Publication of HyWay27 investigation.
- **30 jun '21:** publication of the HyWay27 report with conclusions and recommendations.
- **21 sep '21:** Government investment plan with financial government support of 750M€ to convert and building the National Hydrogen Transport network in the Netherlands.
- **Current period:** Preparation of the roll-out plan in close cooperation with the government. Roll-out plan in several phases to establish the National Hydrogen Transport network.

Process, publication & updates

Is a transport network for H2 necessary and if so, when?

- Yes, a transport network for hydrogen is needed. This is to efficiently connect users and suppliers to each other and to storage in a climate-neutral economy.
- A transport network is needed within and between regions even before 2030.

Can the existing natural gas grid be used for H2 and is it desirable?

- For interregional transport of hydrogen, the natural gas network can be freed up and made technically suitable.
- It is desirable to reuse the existing natural gas network because it is cheaper than building a new network, conversion: 1.5 billion.

What government intervention is needed to realize a transport network for H2?

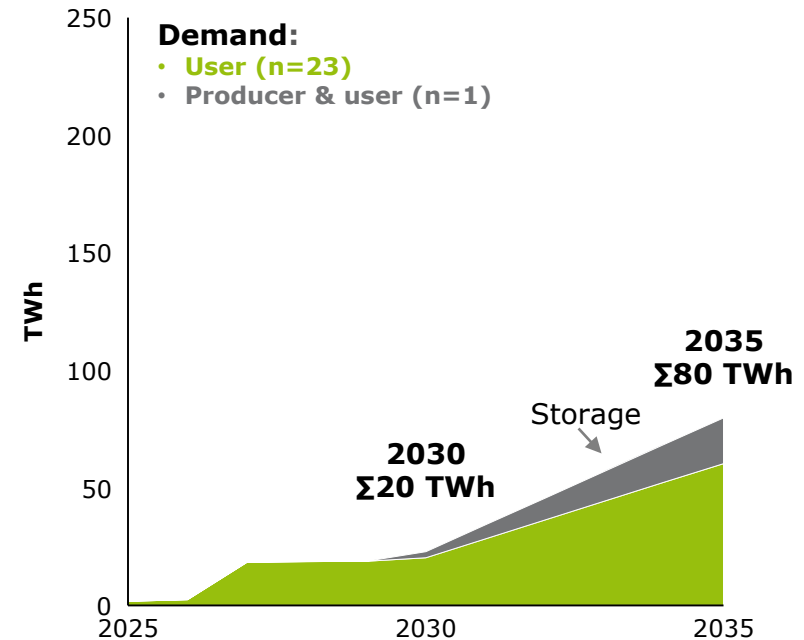
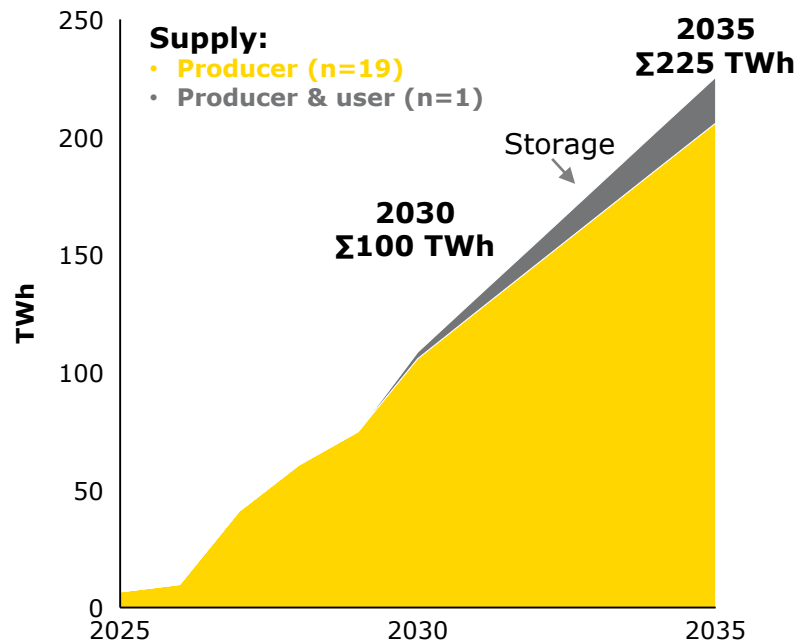
- Government intervention is needed aimed at the whole chain.
- Compensation for transmission grid conversions to offset some of the risks of volatility.
- Decision in principle to convert natural gas network (Recommendation).
- Formulate roll-out plan (recommendation).
- Determine the desired market structure for transport (recommendation).
- Bring financial support in line with ambitions.
- Integral plan to boost chain -> instruments/financial support.

Summary of the “Market consultation” in the Netherlands - 1 October 2020

- The questionnaire received **58 responses** from (future) hydrogen **producers, users** and **producers & users** across **all industries and regions** in the Netherlands.
- Respondents want hydrogen to **reduce carbon footprint** and envision it to **fulfill a substantial share** of their future energy usage.
- Users see **barriers and risks** mainly around **(burner) technology availability** and **sufficient hydrogen supply**, while producers also identify **access to renewable energy** as barrier.
- **Producers** are furthest in their **project status**, while many **users** have their projects still in the **idea phase**; nearly all respondents intend to **use the hydrogen backbone** for transport.
- This is reflected in expected volumes, where **producers** have a **clear and sizeable expectation** to produce and transport roughly **100 TWh** hydrogen in **2030**, while **users** plan to use roughly **20 TWh**; in **2035** this increases to **225k** and **80 TWh**, respectively.
- **30 bar** is the preferred pressure, for quality **producers** see the **highest specification** as best suited for their process, **users** the **lowest**.
- For connection equipment, compression and purification services, **users** look at **Gasunie** while **producers** prefer **themselves** or a **third party** to be responsible.

In 2030, producers expect to produce and transport roughly 100 TWh hydrogen, users expect to use roughly 20 TWh; in 2035 this increases to 225 and 80 TWh

Can you give a (non-binding) indication of the volume you expect to transport in the period 2026-2035?
n=43



Note: Respondents in 'producer & user' segment have been manually assigned to 'producer' or 'user' for this questions based on their hydrogen plans, to avoid double counting of volumes; Producer includes import. Source: Gasunie questionnaire hydrogen infrastructure responses; Monitor Deloitte analysis

In working: the proposed Roll-out plan

Phase 1 RFO 2025/26



Phase 2 RFO 2027/28



Phase 3 RFO 2030

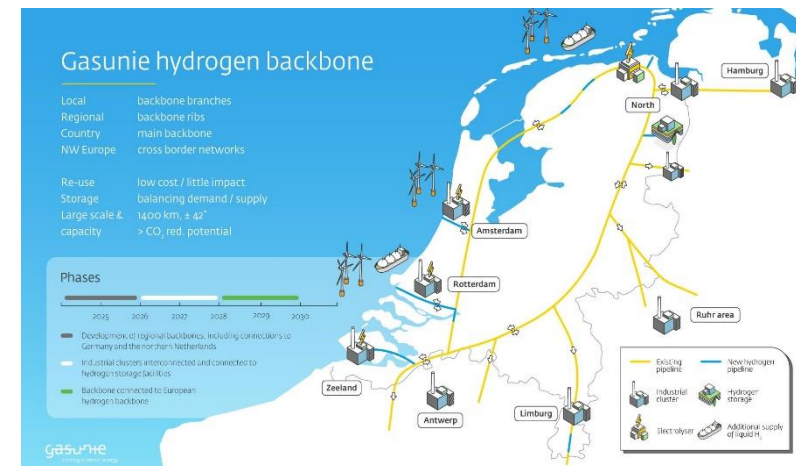


Design characteristics

- build-up largely from existing natural gas pipelines
 - around 10 – 15 GW excluding compression (-> 2035/40)
 - 25 -> 50 GW or more including compression (-> 2040)
- magnitude of investments 1,5 – 2,0 billion €, from zero to full load 2025 -> 2035/40
- initial government funding -> commercial contracts (tariffs to be “minor part of H₂ cost chain”)
- physical constraints & market requirements - design bandwidth of pipeline specifications

Development of the National hydrogen Transport network

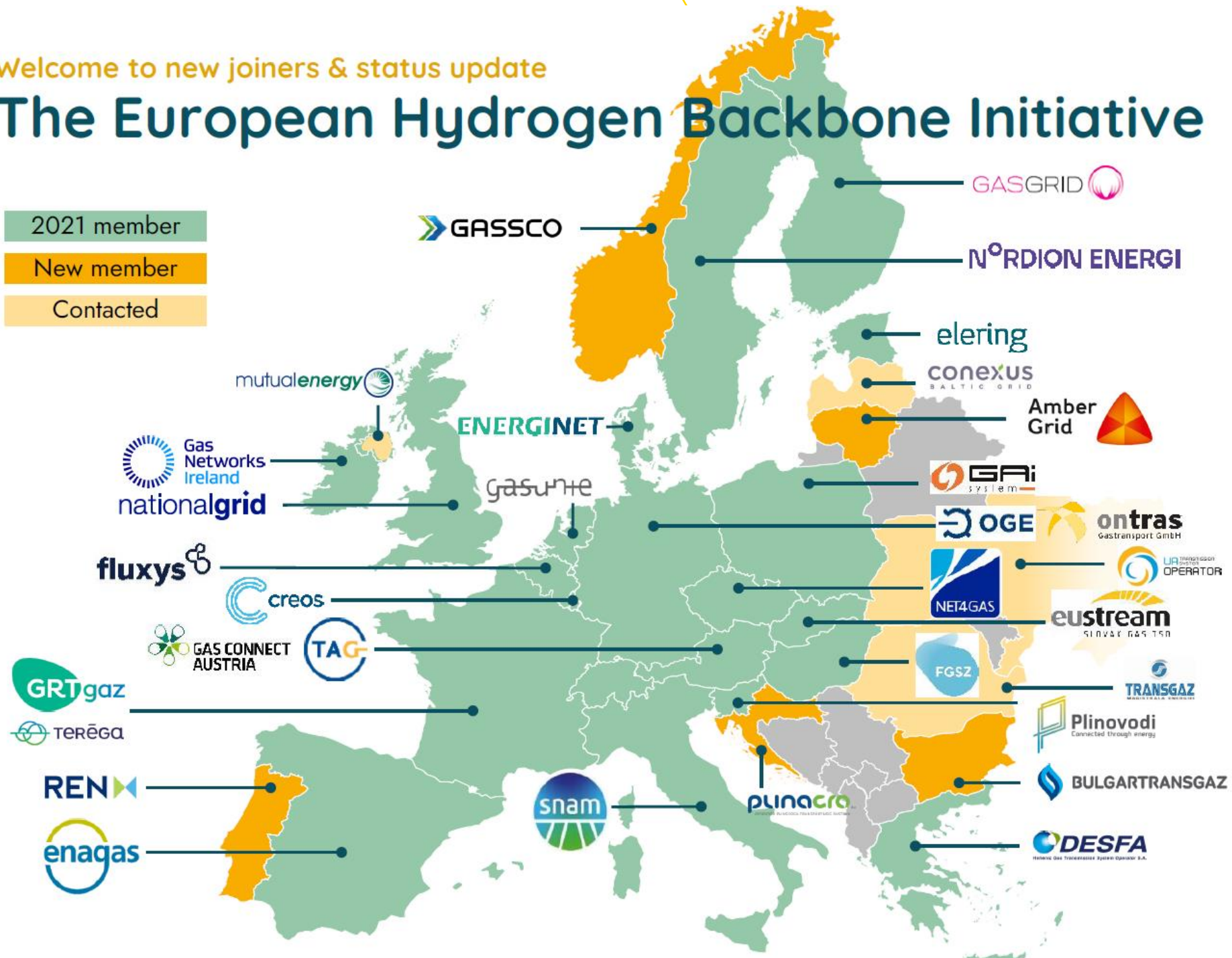
- The Dutch government has asked Gasunie to develop a national infrastructure for hydrogen transport in the Netherlands.
- Good progress is made in the engineering/design of the hydrogen backbone.
- Market interest is growing. Expressions of Interest are being submitted. In several regions market parties are requesting to work towards final transport and connection(s) contracts.
- These recent developments call for uniform national contract conditions on a non-discriminatory basis of third-party access.
- Through a consultation, scheduled for this spring, Gasunie aims to develop the contractual framework for hydrogen transport and connections to the transport system so that these services take into account the needs of the market.
- Prior to the official national consultation for the transport and connection agreements, Gasunie wishes to consult parties that are at the forefront of hydrogen development on the transport and connection agreements.



Welcome to new joiners & status update

The European Hydrogen Backbone Initiative

- 2021 member
- New member
- Contacted



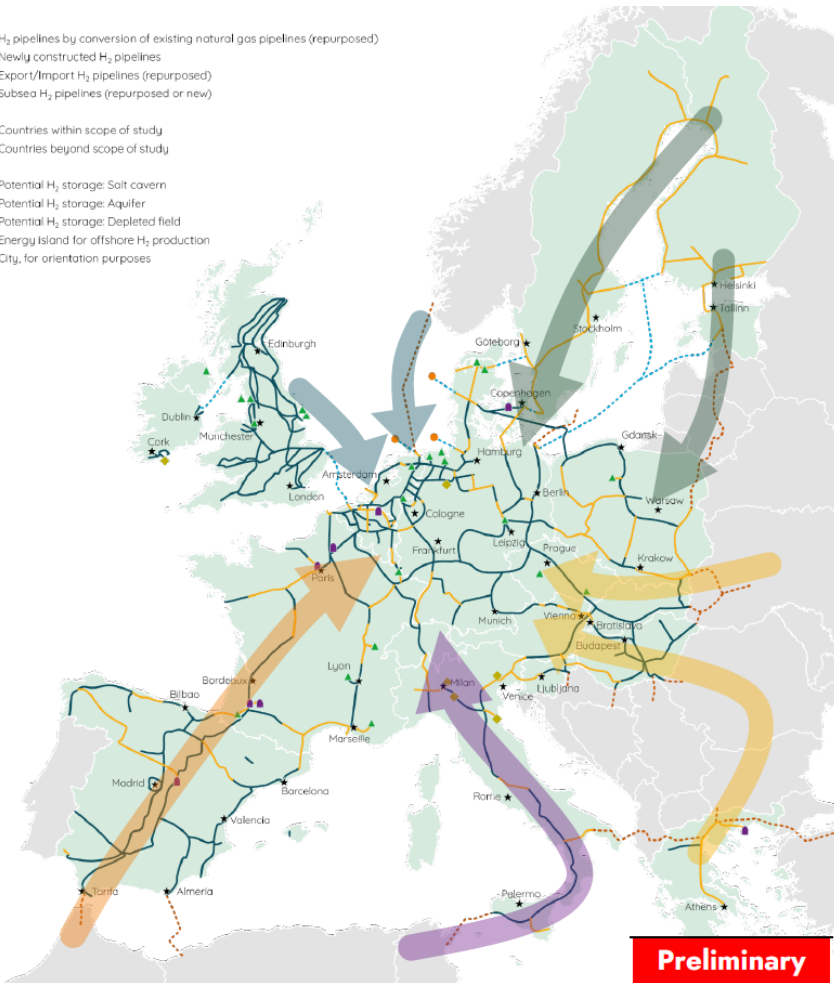
Supply and import corridor scoping

Overview of supply and import corridors

1. Algeria, Italy
2. Morocco, Spain, Portugal
3. North Sea
4. Nordic and Baltic regions
5. East and South-East Europe

Plus injection & withdrawal branches in neighbouring countries

- H₂ pipelines by conversion of existing natural gas pipelines (repurposed)
- Newly constructed H₂ pipelines
- Export/Import H₂ pipelines (repurposed)
- Subsea H₂ pipelines (repurposed or new)
- Countries within scope of study
- Countries beyond scope of study
- ▲ Potential H₂ storage: Salt cavern
- Potential H₂ storage: Aquifer
- ◆ Potential H₂ storage: Depleted field
- Energy Island for offshore H₂ production
- ★ City, for orientation purposes



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