



Government of
the Netherlands

The Netherlands Perspective on Clean Hydrogen

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The Netherlands

Presentation for the Hydrogen Webinar Series

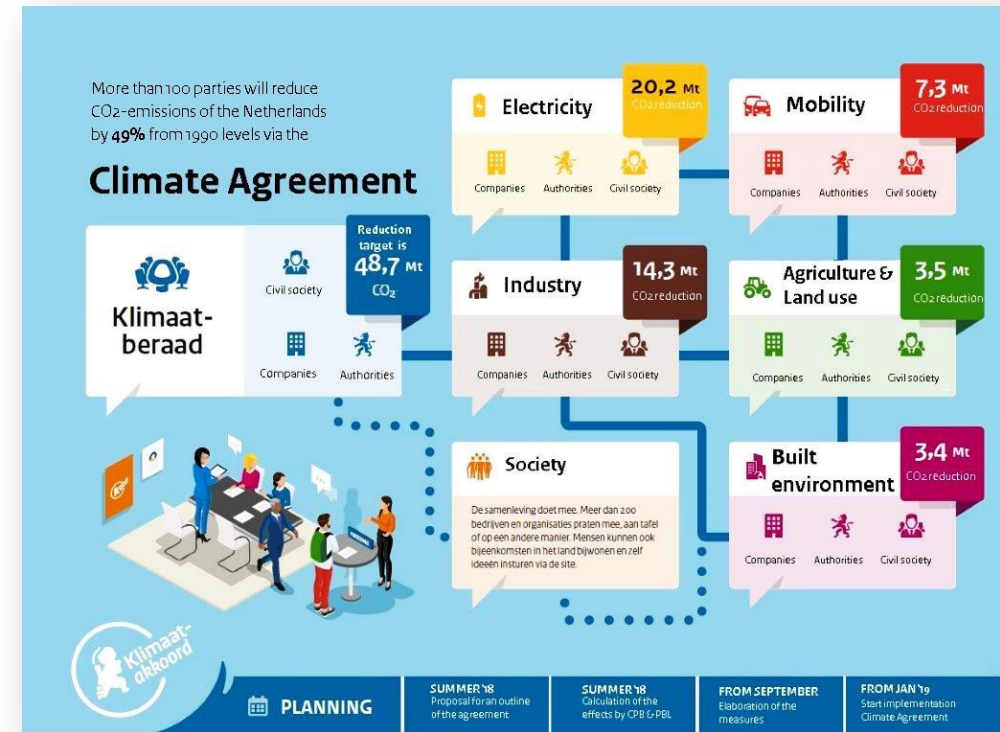
10 June 2020

Hydrogen – A common *element* of our energy future?

- Momentum currently behind hydrogen is unprecedented, with more and more policies, projects, and plans by governments and companies in all parts of the world
- Hydrogen can help overcome many difficult energy challenges
 - *Integrate more renewables*, including by enhancing storage options and tapping their full potential
 - *Decarbonise hard-to-abate sectors* – steel, chemicals, trucks, ships, and planes
 - *Enhance energy security* by diversifying the fuel mix and providing flexibility to balance grids
- But there are challenges: *costs* need to fall; *infrastructure* needs to be developed; *cleaner hydrogen* is needed; and *regulatory barriers* persist.

The Dutch Climate Agreement

- 49% CO₂ reduction in 2030 (48.7 Mton)
- 84 TWh of renewable electricity by 2030 (70 % of the mix)
- SDE subsidy scheme for CO₂ reduction techniques
- Phasing out coal in power plants by 2030
- CO₂ levy in industry above ETS
- All new cars in 2030 electric
- Prominent role for hydrogen:
 - **3 – 4 GW** of electrolysis capacity by 2030; **500 MW** by 2025
 - In 2025: 50 tank stations, 15.000 FCEVs en 3.000 heavy duty vehicles
 - Pilot projects to enable use of hydrogen for **urban heating** by 2030
 - Until 2030, the government will contribute €30-40 million extra **subsidy** annually for demonstration projects (DEI+)





National Hydrogen Strategy 2020

- Systemic role of clean hydrogen recognized in a zero-carbon energy supply
- NL unique start position for clean hydrogen
- Use strong momentum: adequate funding & regulation
- Opportunities for companies and regions
- International strategy: accelerate scaling-up
- Policy agenda with 4 pillars
- Joint public-private partnership: national H2 programme
- Financial support: € 70 mln subsidy (DEI+ & new upscaling instrument) + SDE++ for green and blue hydrogen production

Policy Agenda



Legislation & Regulation

- Use of existing gas grid
- Market regulation and temporary tasks for network operators
- GoOs & certification
- Safety
- Location of electrolyzers



Cost reduction & Scaling up H2

- Support schemes for research, scaling up and rolling out (temporary operating cost support)
- Linking hydrogen to offshore wind energy
- Evaluation of blending obligation



Sustainability of final consumption

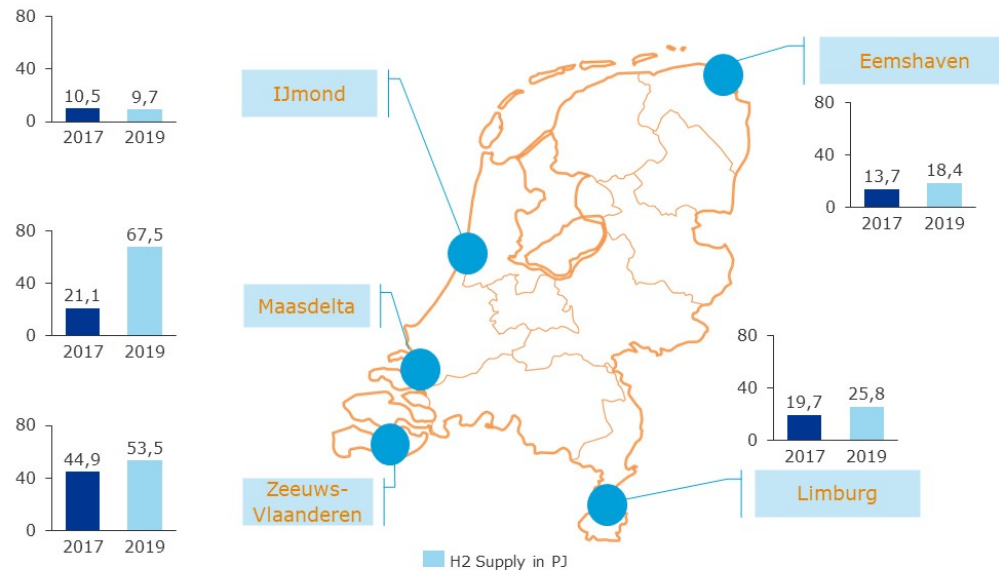
- Ports and industry clusters
- Transport (including synthetic fuels, REDII)
- Built environment (alternative to natural gas)
- Electricity sector
- Agricultural sector



Supporting and flanking policy

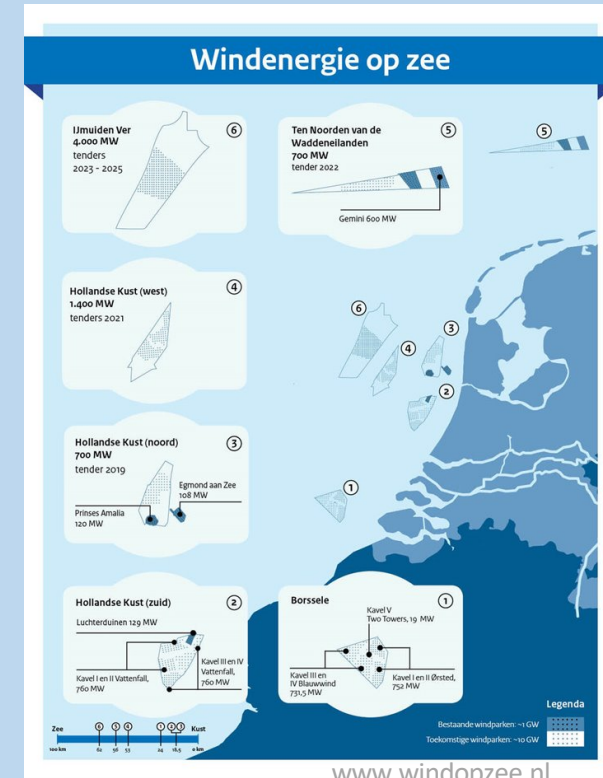
- International Strategy (IPCEI, Pentilateral Forum, North Sea cooperation, bilateral cooperation, EC)
- Regional policy (link to regional energy strategies)
- Research and Innovation

Drivers for Clean Hydrogen in The Netherlands



Source: DNVGL (2019) Filling the data gap: an update of the 2019 hydrogen supply in the Netherlands

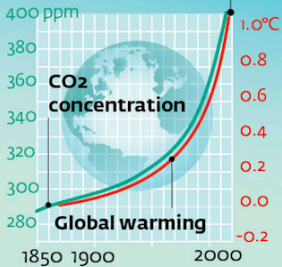
Existing hydrogen production, 175 PJ per year
(10% of national natural gas consumption used
in SMR)



Large offshore wind potential, 11.5 GW in 2030;
>> 40 GW possible

Moving towards 2030 and 2050 with hydrogen

The earth has warmed up by 1.1°C since 1850

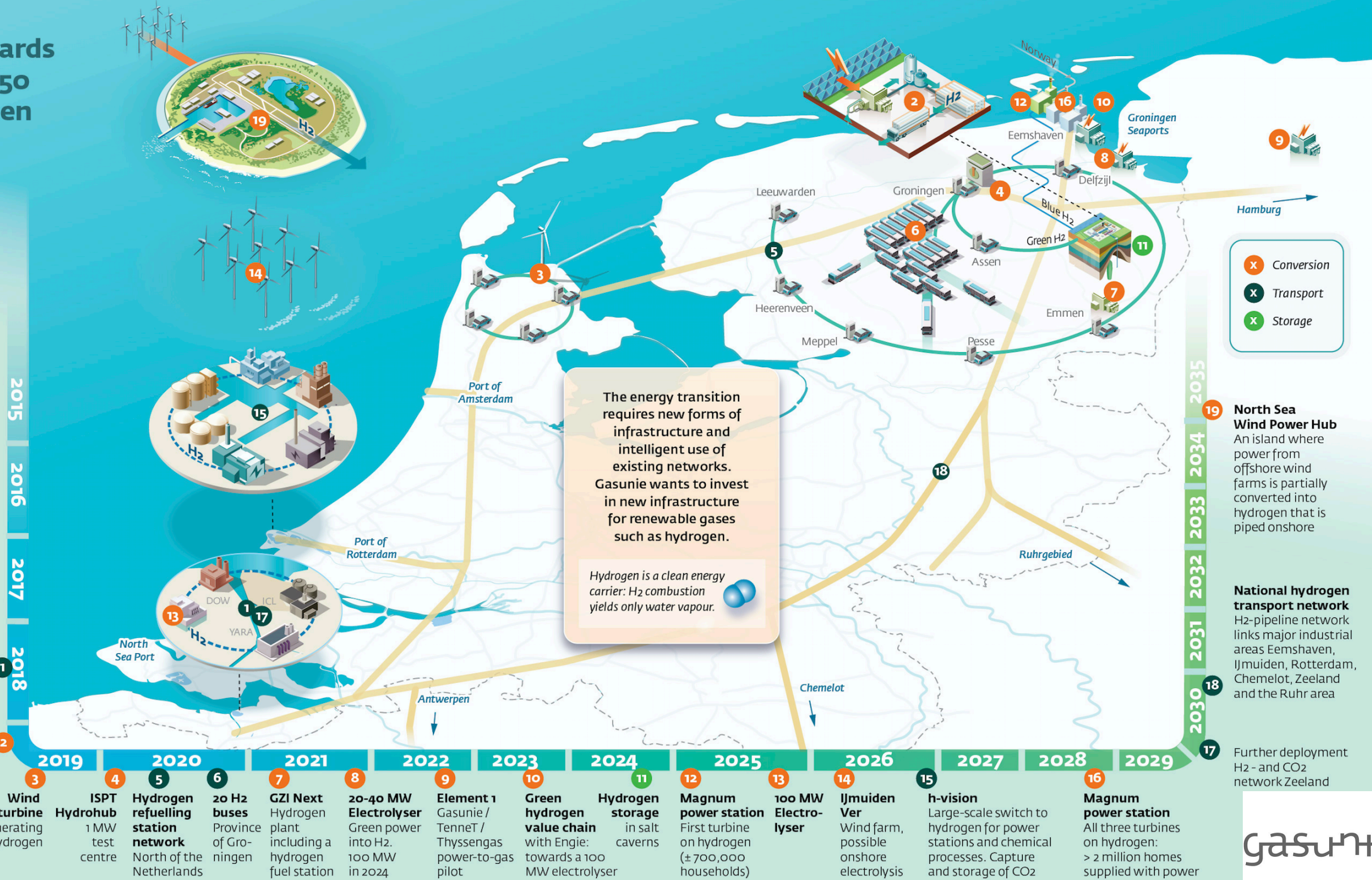


If we do nothing the global temperature will rise by another 4°C by 2100

22 April 2016 Paris Agreement
Global warming set at a max. 2°C. This requires CO2-reductions in the Netherlands of:
• 40-50% by 2030
• 85-100% by 2050
Hydrogen as a fuel and as a raw material can help to achieve CO2-reduction targets

Hydrogen pipeline
Linking hydrogen industries in Zeeland and the Delta region

Pilot project HyStock
Converting solar energy into hydrogen in Zuidwending



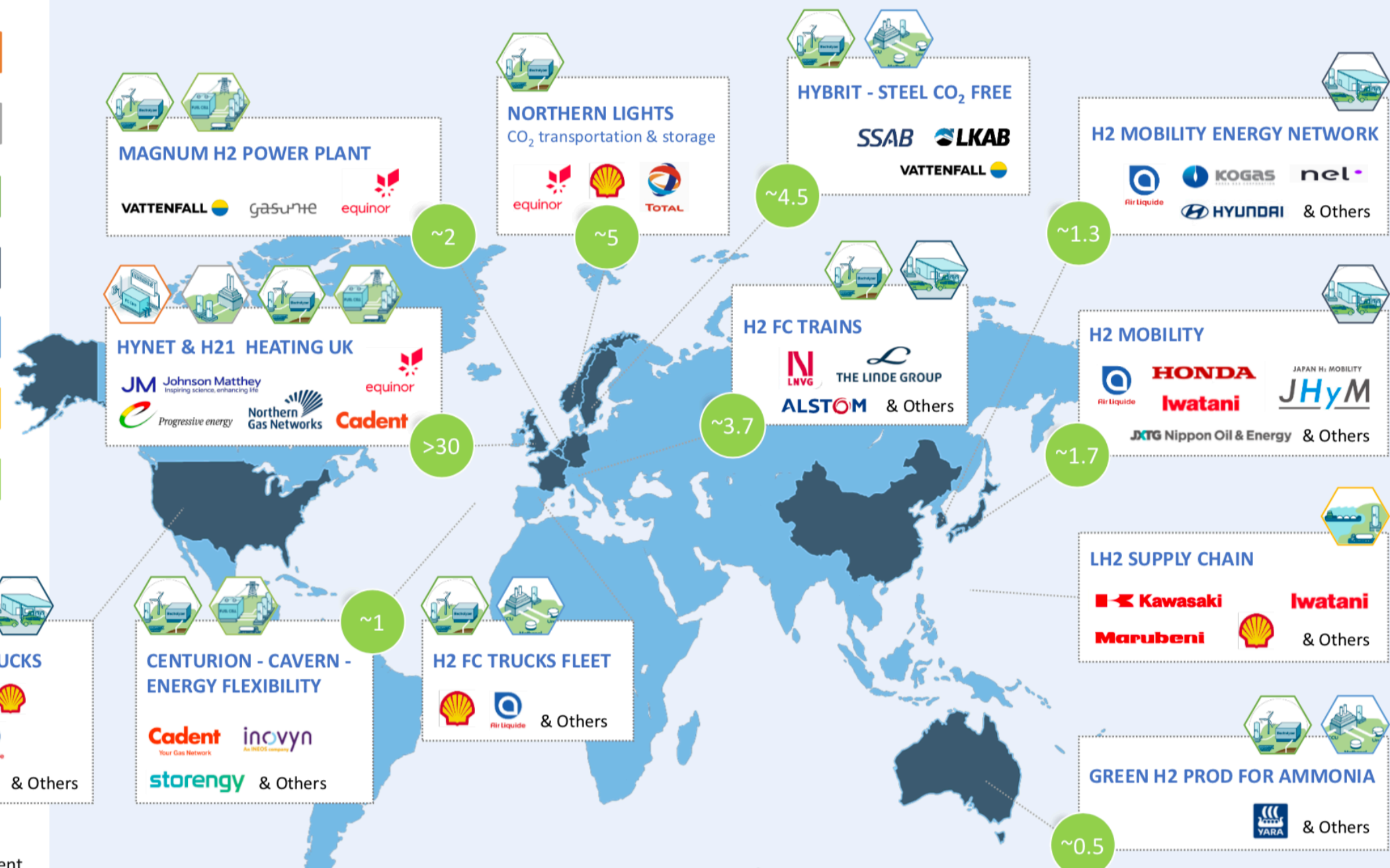
X Conversion
X Transport
X Storage

North Sea Wind Power Hub
An island where power from offshore wind farms is partially converted into hydrogen that is piped onshore

National hydrogen transport network
H2-pipeline network links major industrial areas Eemshaven, IJmuiden, Rotterdam, Chemelot, Zeeland and the Ruhr area

Further deployment H2- and CO2 network Zeeland

- Building heating
- Power generation
- Production
- Mobility
- Feedstock
- Distribution
- Storage



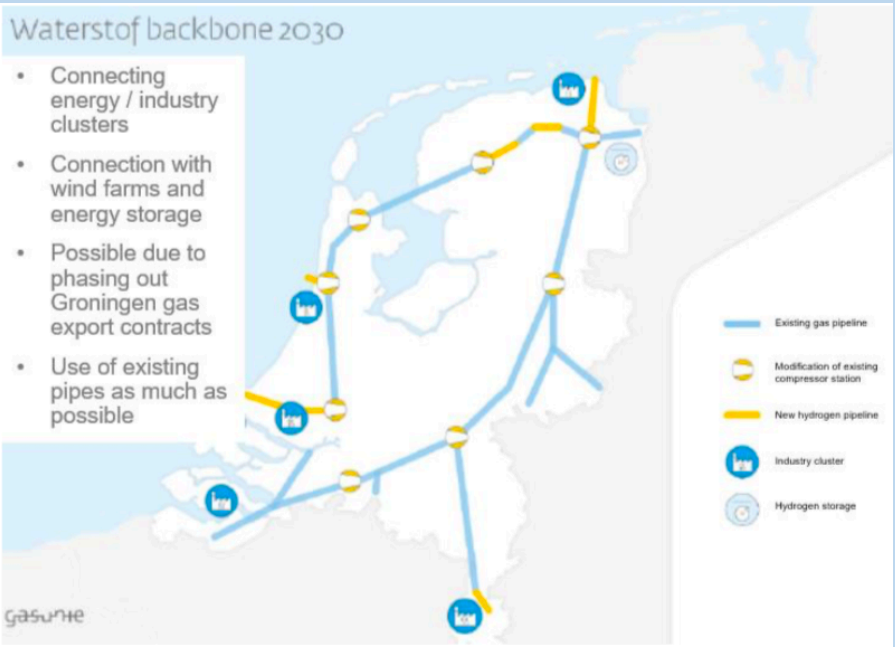
X Foreseen CO₂ abatement of project at scale (Mt)

SOME KEY ON GOING LARGE « FLAGSHIP » PROJECTS

Infrastructure Initiatives



Large-scale offshore wind integration beyond 2030



Creating hydrogen backbone through partial conversion of existing natural gas network



Exploring an integrated energy infrastructure including electricity, hydrogen, and methane

H₂ Valley Support for 20 Million Euro (Call Jan. 2019)

6 proposals received and 1 selected to start the grant preparation



<https://www.youtube.com/watch?v=L27dkYyg04g>

HEAVENN KEY FACTS:

- North Netherlands (Gronningen / Delfzijl / Emmen)
- Total project circa 90 million Euro
- 31 partners (public + private)
- Project supported by 65 parties (Nat. + Int.)
- Electrolysis for green H₂ production,
- H₂ Mobility: buses, passenger cars and trucks
- H₂ Refueling stations
- E-Kerosene for aviation
- H₂ for an inland water transport barge
- Domestic Heat applications
- Underground H₂ storage (Hystock)

Project goals HY3

- Analyze the feasibility of a **transnational green hydrogen** infrastructure in the border area of the Netherlands and North Rhine-Westphalia
- Examine the **potential of GHG-reduction** and increase of the renewable energy deployment in the industry sector by a transnational green hydrogen infrastructure
- Examine **possible business cases** for future green hydrogen infrastructure by using transnational (Dutch-German) hydrogen production and existing transportation and storage facilities
- Examining **industrial interest** in green hydrogen infrastructure and potential **field of applications** as well as potential synergies with hydrogen applications in other sectors
- Describing the existing **regulatory framework** in the context of green hydrogen production, transport, storage, trading and usage and examining the framework that would be needed to establish transnational green hydrogen infrastructure as well as respective business cases

Die Landesregierung
Nordrhein-Westfalen



Bundesministerium
für Wirtschaft
und Energie



Ministerie van Economische Zaken
en Klimaat

NorthH₂

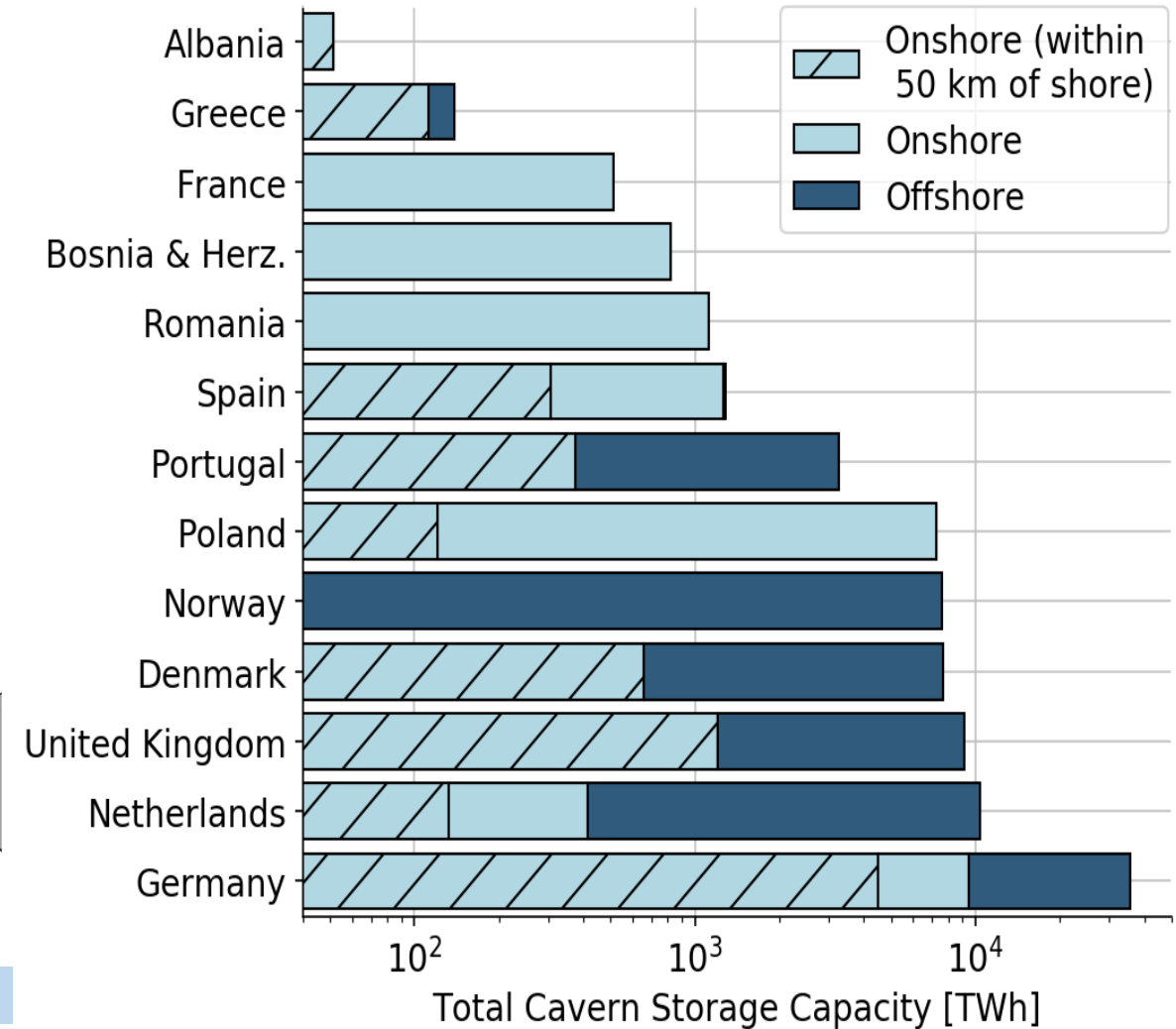
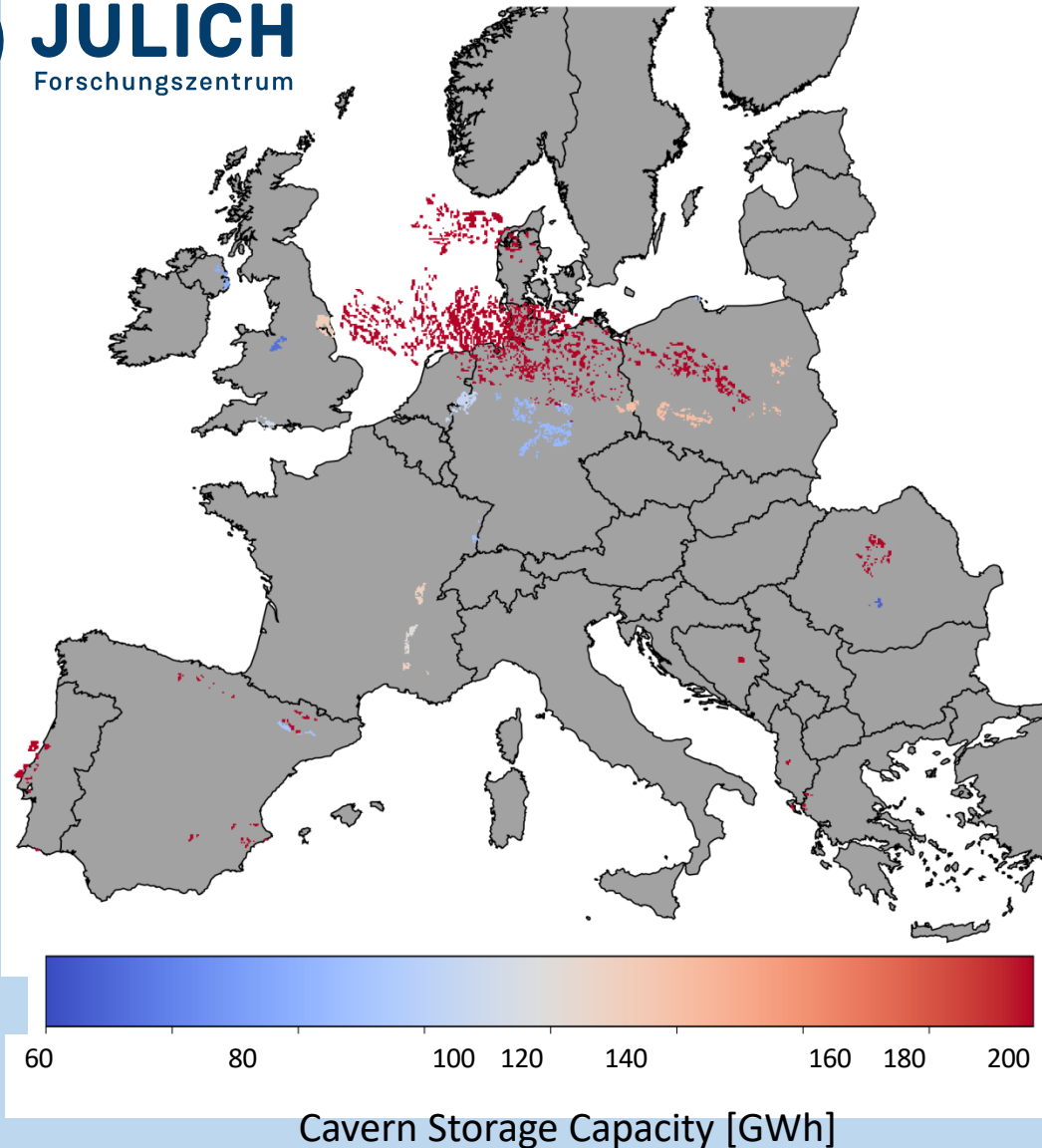
Europe's largest green hydrogen project starts in Groningen

A consortium of Gasunie, Groningen Seaports and Shell Nederland has launched ambitious NorthH2 green hydrogen project

NorthH2 vision:

- Energy from source to customer – from renewable power to green hydrogen distribution – where different partners can collaborate on achieving the scale to realise this ambition.
- New wind farms in North Sea feed a mega-hydrogen facility in Eemshaven, possibly complemented with offshore hydrogen production.
- The ambition is to generate around 3 to 4 GW of wind energy for hydrogen production before 2030, possibly 10 GW around 2040.
- Green hydrogen production of 800,000 tonnes, avoids around 7 megaton CO₂ emissions annually.
- Gasunie infrastructure transports green hydrogen to industrial customers in the Netherlands and Northwest Europe.
- A large green hydrogen buffer provides the necessary flexibility because solar and wind energy are susceptible to fluctuations.

Availability of storage potential of Salt Caverns



Onshore: 23.2 PWh (7.3 PWh Constrained)
Offshore: 61.8 PWh

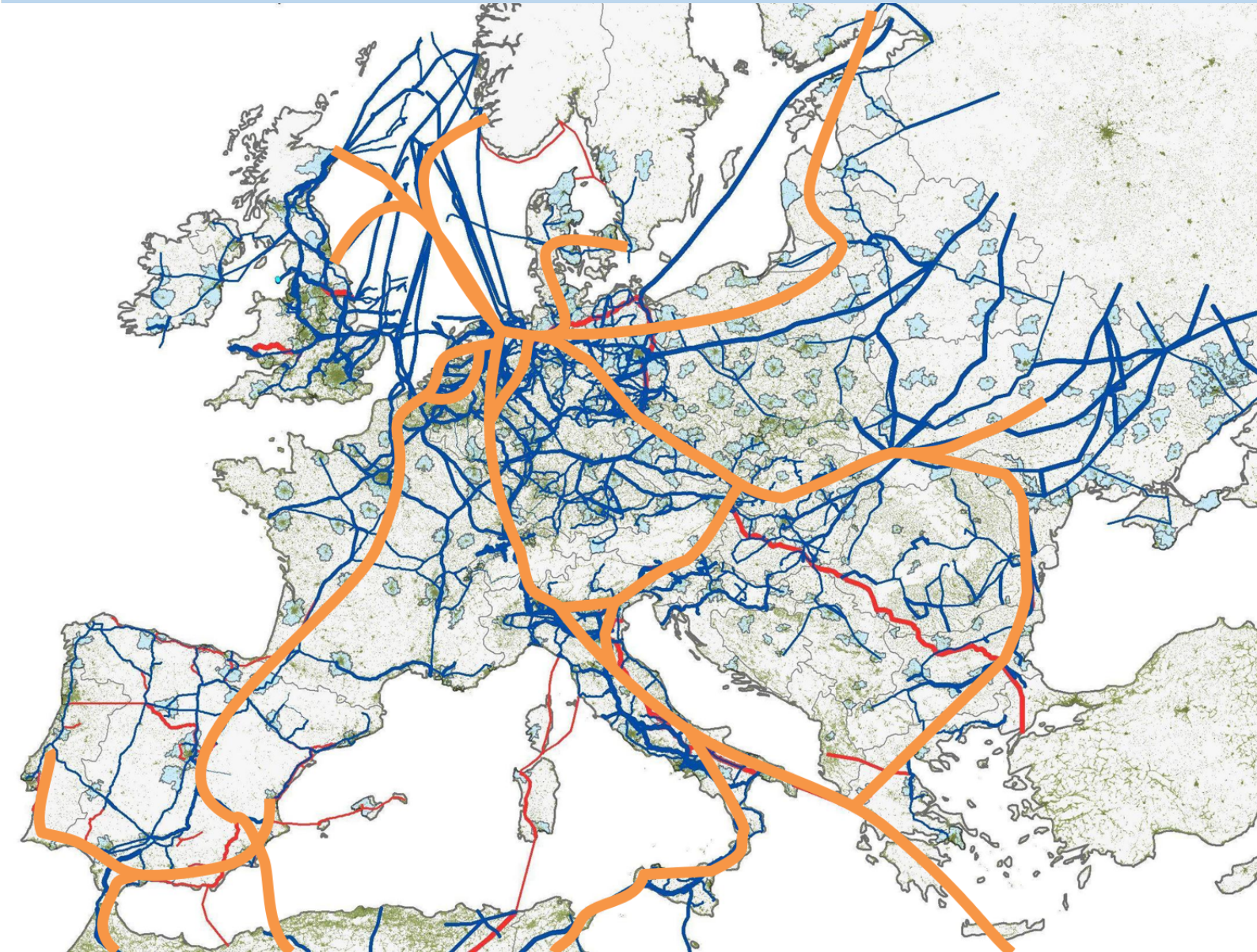
European Hydrogen Infrastructure

- Unlock the offshore-onshore wind resources in North Europe
- Unlock the solar and wind resources in South Europe
- Unlock the solar and wind resources in Northern Africa
- Connect to large scale hydrogen storage, e.g. salt caverns
- Supply chemical, petrochemical and steel plants
- Supply electricity balancing plants
- Supply hydrogen fuelling infrastructure
- Supply regional hydrogen distribution grids



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European Hydrogen Backbone





Key Elements of EU Hydrogen Strategy

- EU Hydrogen strategy in 2020 (priority new EC)
- Ambitious targets for clean hydrogen market: blending in gas grids (5-10% gas replaced by clean hydrogen in 2030), transport
- Common standards, guarantees of origin (CertifyHY), flexible and hybrid market regulation
- Build strong EU presence in clean hydrogen value chain
- Boost EU clean hydrogen R&D (Mission Innovation)

European Commission: The European Green Deal

- Energy System Integration Strategy (June 2020)
- Decarbonisation of gas sector
- Review of regulatory framework energy infrastructure (incl. TEN-E)
- 1st commercial applications of breakthrough technologies like clean hydrogen & fuel cells in key industrial sectors by 2030
- IPCEI projects for new innovative value chains (like clean hydrogen)
- Clear pathway from 2025 onwards towards zero-emission mobility (TEN-T, Alternative Fuels Infrastructure Directive)