ETN October Workshop

The impact of recent developments on hydrogen availability

Berlin 12.10.2022

Dr Maximilian Kuhn, Advisor, Hydrogen Europe

Hydrogen Europe

Hydrogen Europe in numbers

400+ Members

We represent the whole value chain
from producers to end users

44+ Employees

103k+

Followers
on Social Media

We are the fastest growing association in Europe

Regulatory hurdels

"No other big economic bloc is trying to achieve its energy and industrial transformation by a complicated (and still in flux, hence unclear) mixture of regulation for direct and indirect electrification from renewables, unbundling regulations for hydrogen TSOs, support schemes and CO2 prices. This policy approach stems from regulatory path dependencies, is slowed down by seemingly eternal discussions among member states about the definition of green and low-carbon hydrogen and a navel-gazing approach that misjudges the rapidly changing realities outside Europe."
Noé van Hulst; Dr. Kirsten Westphal

The EU will have to shape the global market and attract climate neutral hydrogen and derivatives flows into the bloc by positioning itself as a true partner.

- The EU will need to rapidly fix the necessary, but not yet sufficient preconditions for a hydrogen technology and market ramp up: infrastructure and a regulatory framework.
- Adapt a regulation that is simple, coherent across all sectors and internationally inter-operable with schemes of other big players with regard to certification.
    - Set up a **hydrogen diplomacy** for long-term partnerships and engage on a mutual understanding of common value creation, **shared norms and mutual acknowledgement of certification schemes**.
    - Provide the **necessary funding / security guarantees** for building the hydrogen backbone and the corridors into the EU. The Global Gateway should serve the highways of climate-neutral molecules into the EU.
    - **Realize imports** to back up the creation of regional hydrogen hubs and market areas in Europe.
    - Clarify the role of the Hydrogen Bank and the Hydrogen Facility and use existing instruments to flesh out the EU's tool box such as H2Global. This will save time and avoid costly competition.
    - Allow for a stacking of support schemes for a transitional period of time, and allow hydrogen produced, transported under support schemes to be **counted under quota schemes**.
    - Select and fast-forward a handful of **large-scale projects** to Final Investment Decisions that can really kick-start the scale-up of low-carbon and renewable hydrogen.

https://illuminem.com/illuminemvoices/649c81be-b498-4d73-9fb1-03ebf4e0a872

Standardisation roadmaps for Hydrogen

Benefits of Standardization and certification:

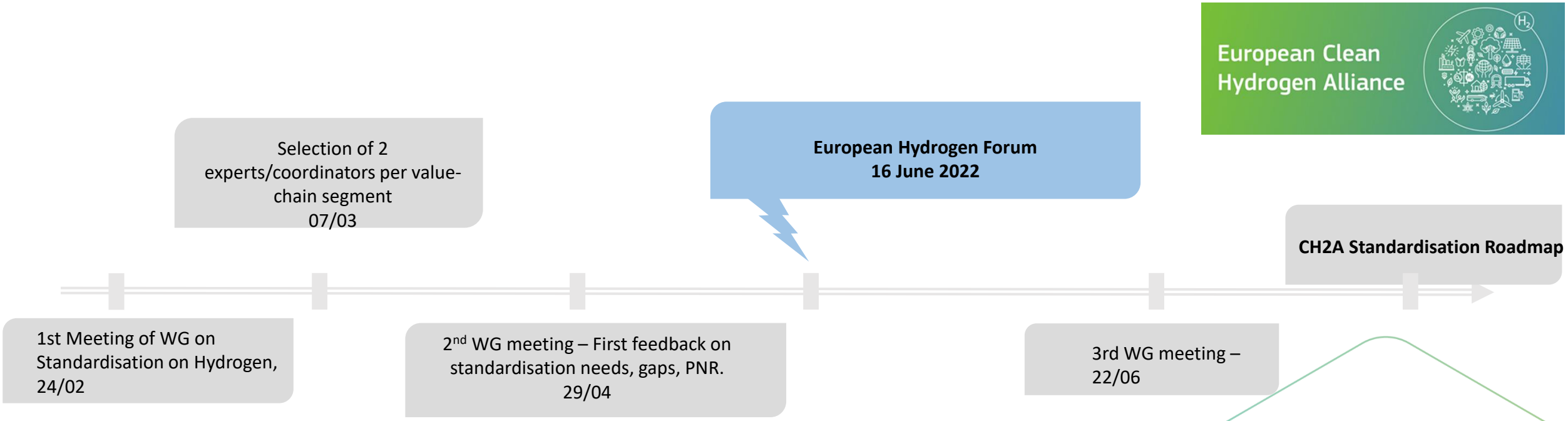
- Create new markets.
- Drive innovation and productivity.
- Influence marketplace rules.
- Secure market access.
- Protect and exploit the intellectual property.

Needs and Learnings:

- Early identification of standardisation needs is paramount.
- Sector-based approach to selection.
- Direct support by the government is essential (financing and advisory) and is increasingly being sought.

Figure 11. Number of Chinese, ISO and IEC Hydrogen Standards

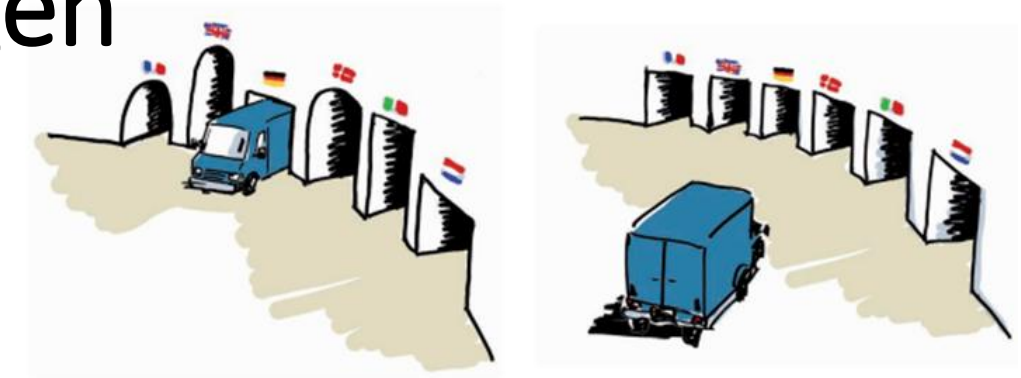
Source: China National Institute of Standardization



Roadmap

- Commitment to a set of standards is needed.
- Determination of the relevant Technical Committees for the development of the deliverables.
- Involvement of all relevant stakeholders of the whole value chain.
- Address knowledge/expertise is additionally needed.
- Timelines.

ECHA: Standardisation WG drafts a Roadmap on hydrogen



ECHA Standardisation WG is drafting a Roadmap on hydrogen standards, expected by the end of the year (please contact HE)

Actions required

- To check if information is complete;
- Add information on standardization priorities

Next steps

Deadline: 2022-09-15;
Presentation of the interim results at the Hydrogen Forum (26th of October - https://h2flagship.eu/b2b-forum-programme/#table_link)
Final roadmap ready for the European Hydrogen Forum most probably taking place on 5 December 2022 (tbc).

standarization topic / issue		2020	2021	2022	2023	2024	2025	2026	2027	2029
gas quality			prenormative work		harmonised standarization work					
safety aspects			prenormative work			harmonised standarization work				
gas/ hydrogen infrastructure										
hydrogen storage										
metrology										
environmental aspects										
emissions										
road vehicles										
railway										
aviation										
...										

H2 has become the centre of the political scene to fight climate change

Hydrogen: a carbon-free energy carrier to become the other leg of the energy transition

Global recognition of the role of hydrogen in the development of fully renewable energy systems.

Main objectives of hydrogen strategies:

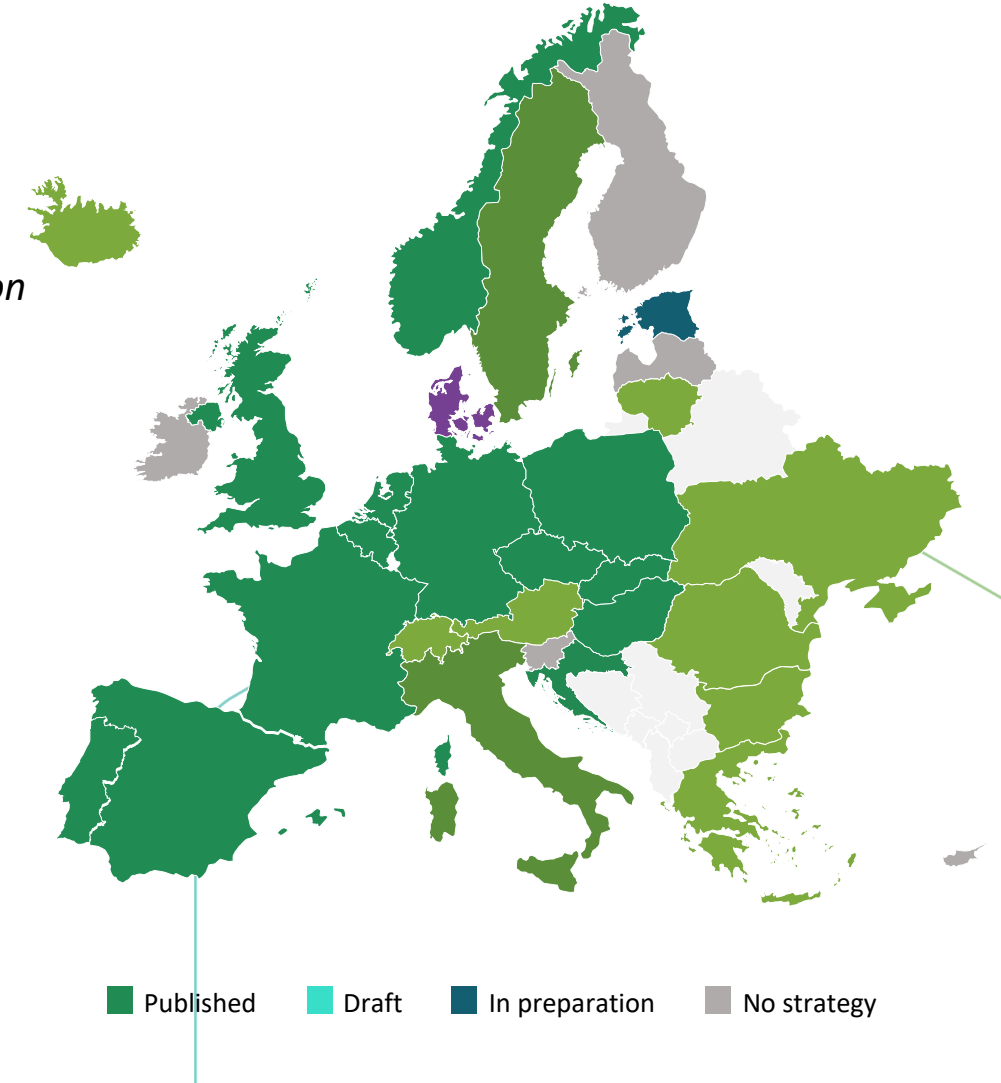
- *reduction of greenhouse gas emissions, in particular in sectors where reduction is most complex,*
- *diversification of energy supply,*
- *integration of renewable energies,*
- *promote economic growth,*
- *support national technological developments,*
- *security of supply and strategic reserves, and*
- *develop hydrogen for export and import.*

European Strategy for Hydrogen (2020): 2x40 GW

→ *By 2024: electrolyser capacity of 6 GW (1 M)*

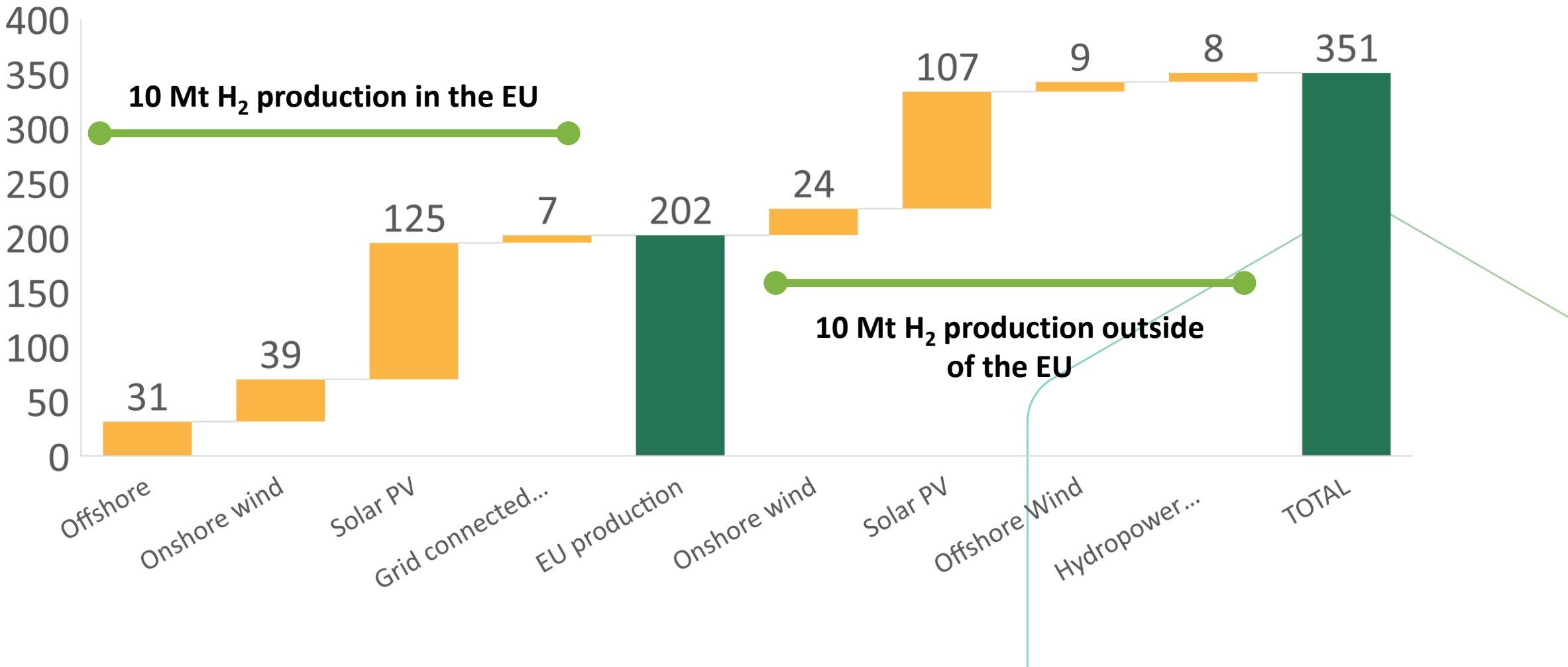
→ *By 2030: electrolysis capacity of 40 GW (10 Mt)*

Context change in 2022



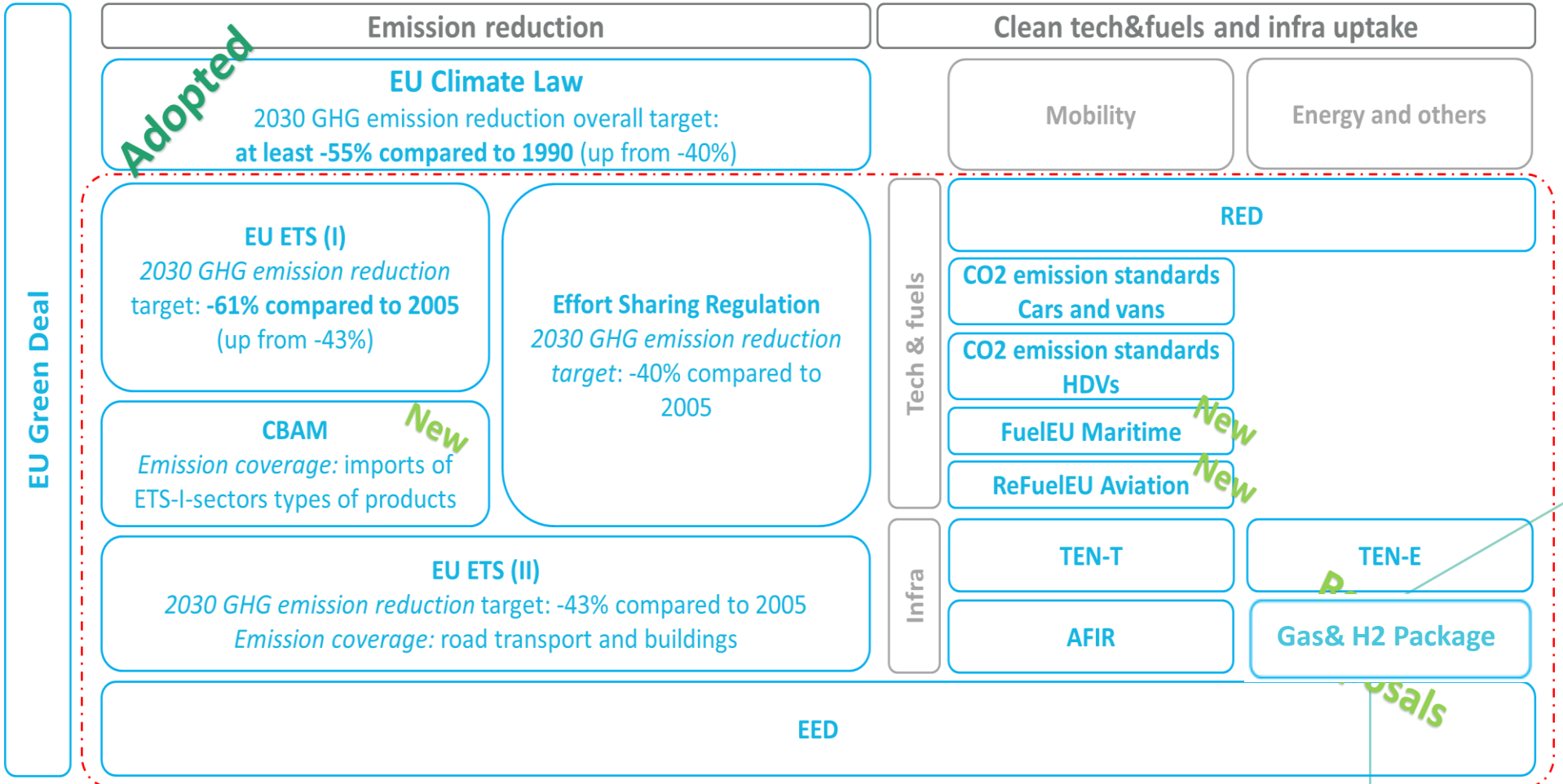
H2 Accelerator - Production scenario for 2030

Required electrolysis capacity (in GW)



The EU Policy landscape

Fit-for-55 legislative package and RePowerEU



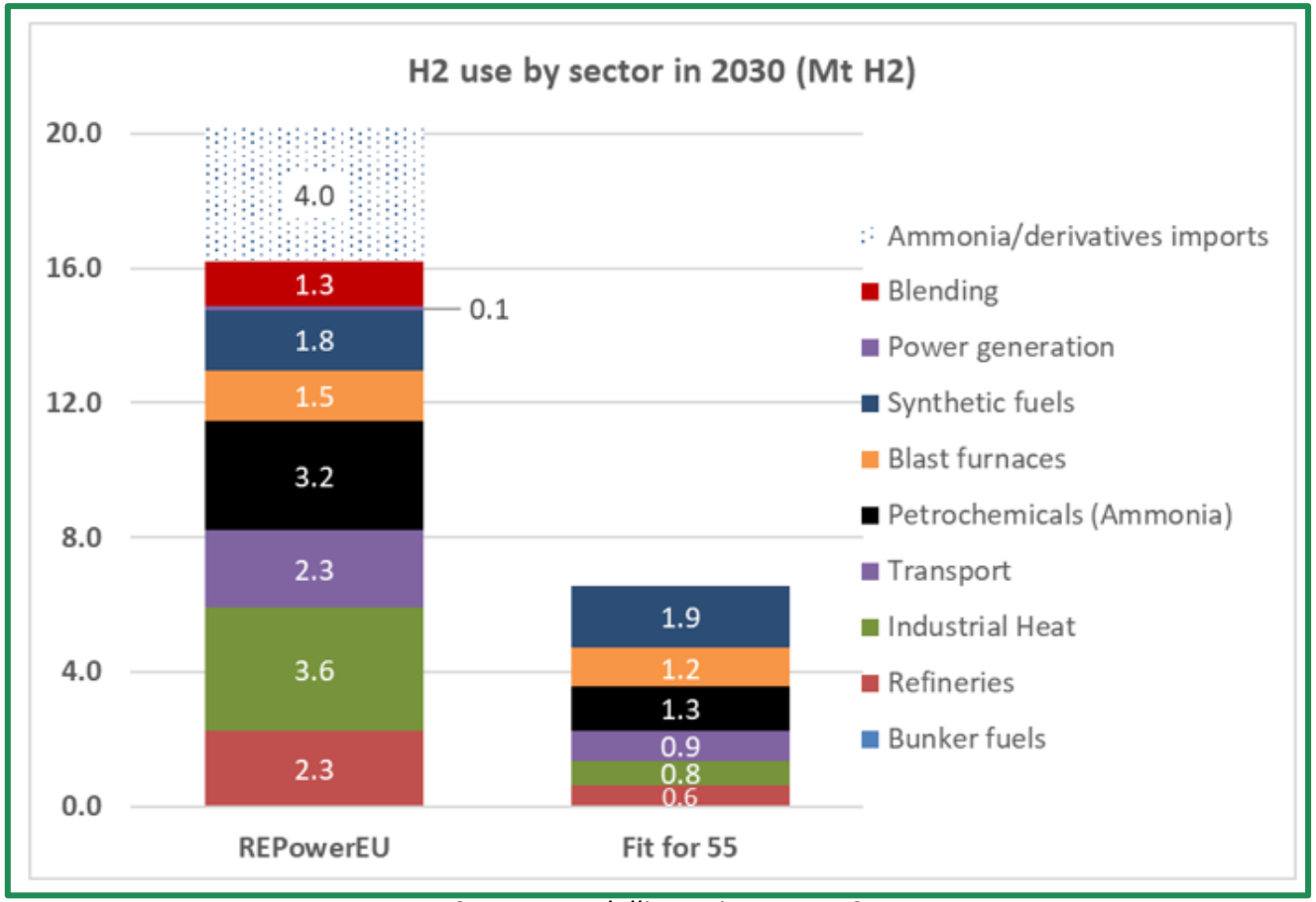
RePowerEU

- Gas diversification
- **H2 accelerator**
- Solar Strategy
- Permitting
- International energy partnerships
- Biomethane

Main energy and climate legislation and proposals relevant for hydrogen published or proposed in 2020 to 2022 (Source: Hydrogen Europe)

Increase H2 Demand: Industry & Mobility

EC calls upon Council and EP to align the sub-targets for renewable fuels of RFNBOs in RED II



Source: Modelling using PRIMES

75 % for industry (an increase from 50%)

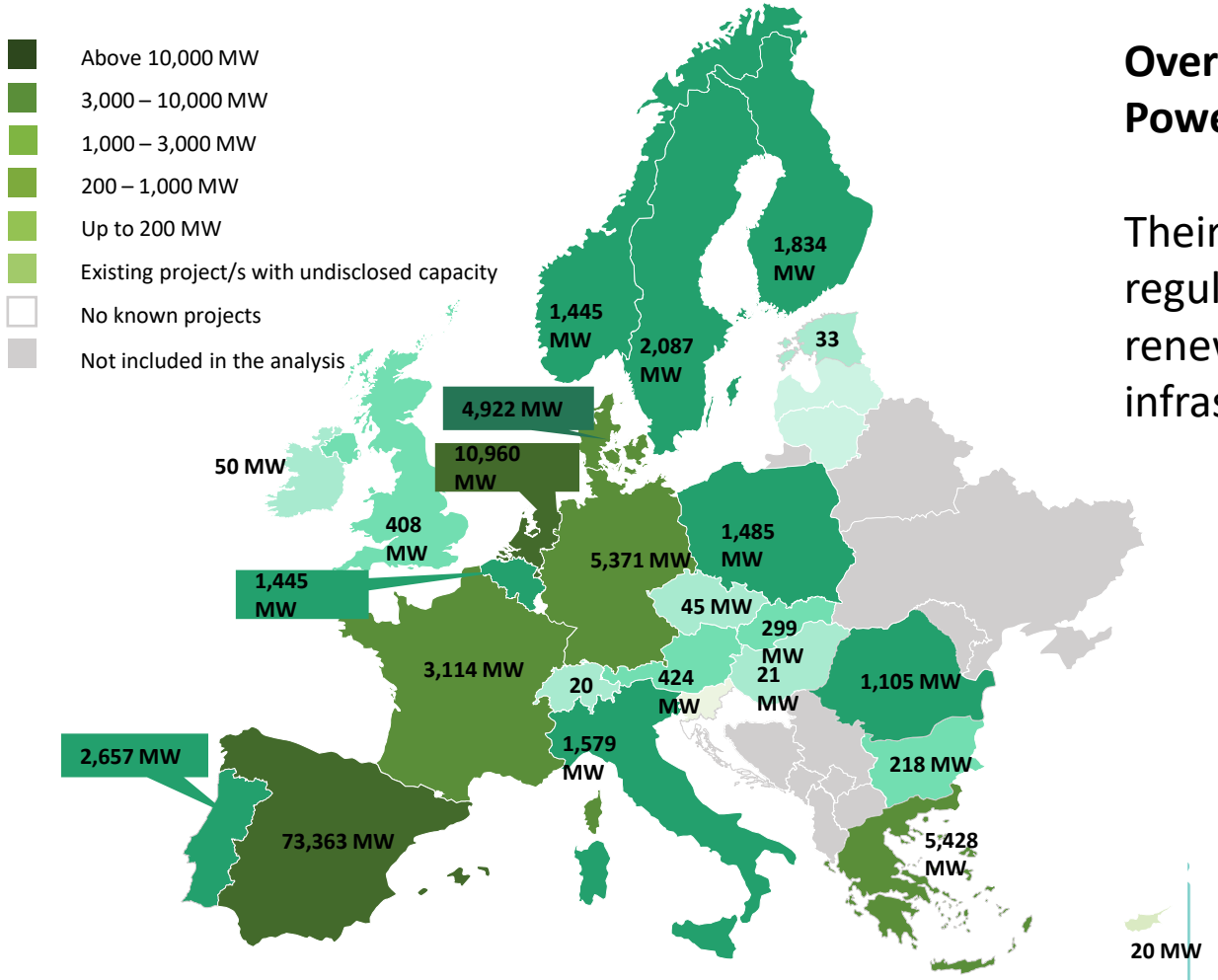
- Estimated demand by 2030: 8.4 mt (excluding refineries)
- 3.6 mt for industrial heat (x4)
- 3.2 mt in chemicals (x2.5)
- 1.5 mt in steelmaking (switch 30% steel production to hydrogen-based DRI-EAF)

5% for transport (an increase from 2.6%)

- Estimated demand by 2030: 6.4 mt (including in refineries) (x3)
- Increase the share of zero-emission vehicles
- Adopt proposals on Alternative fuels
- Adopt a legislative package on greening freight transport by 2023

Countries' 2030 project pipelines fulfil national goals

Map of cumulative PtH additions by country 2021 - 2030 (MW)



Over 110 GW of already identified Power-to-Hydrogen Projects in Europe

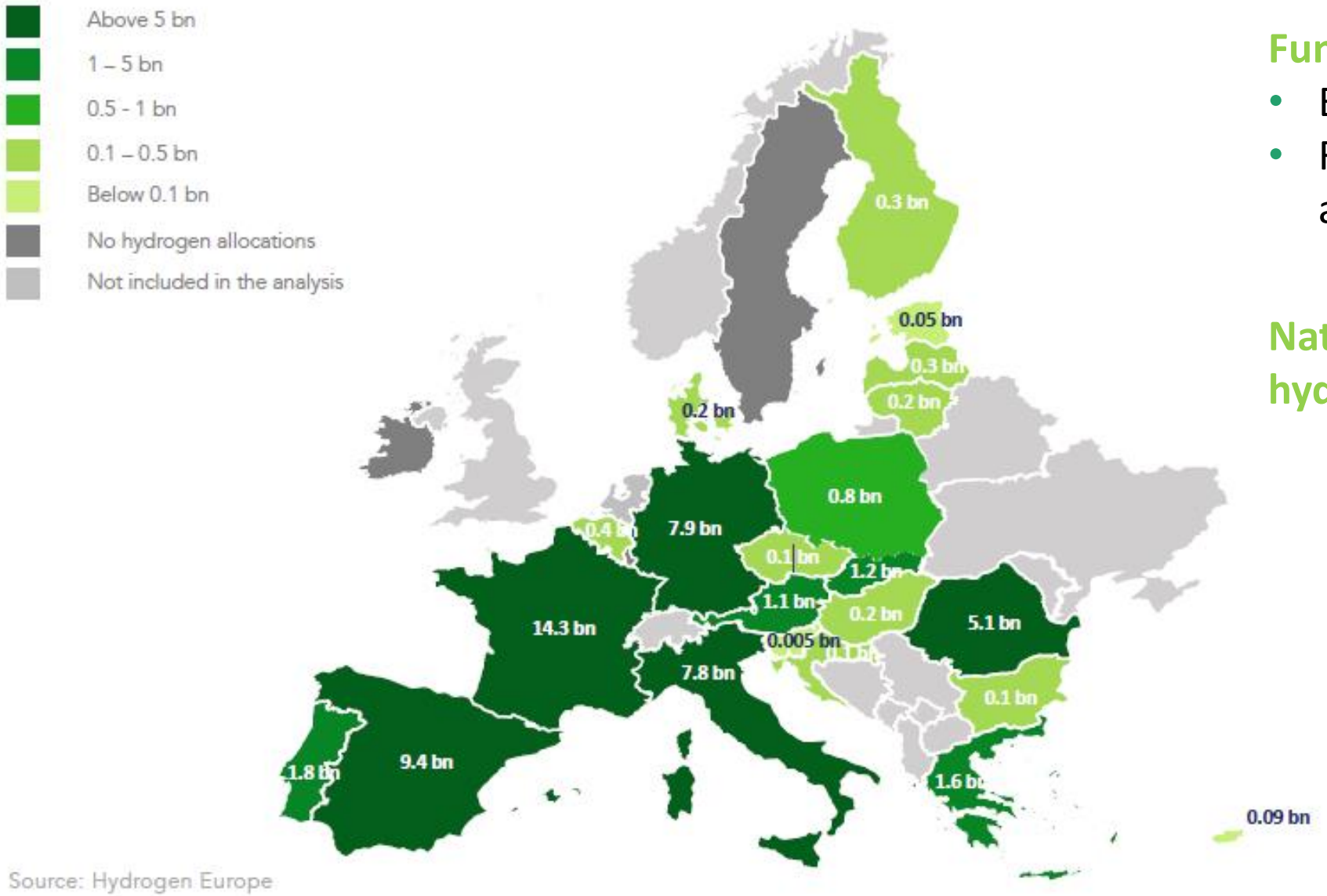
Their viability is strongly linked to the regulatory framework, definition of renewable hydrogen, binding targets and infrastructure availability

Notes: Displayed electrolyser capacities reflect projects that have an official starting date by 2030. There are numerous other projects with unknown starting dates that could be finished by 2030, but are not included in this analysis. Numbers represent industry ambitions and include projects from concept stage to construction and not all planned projects might be realized. While Spain has numerous sizeable projects, there is a single project with multiple phases contributing 67 GW of the planned PtH capacity in Spain by 2030. Projects refer to either individual projects or project phases with separate investment decisions.

Source: Hydrogen Europe - Data as of 16/09/2021

Funding and Policies

EU policies and incentives



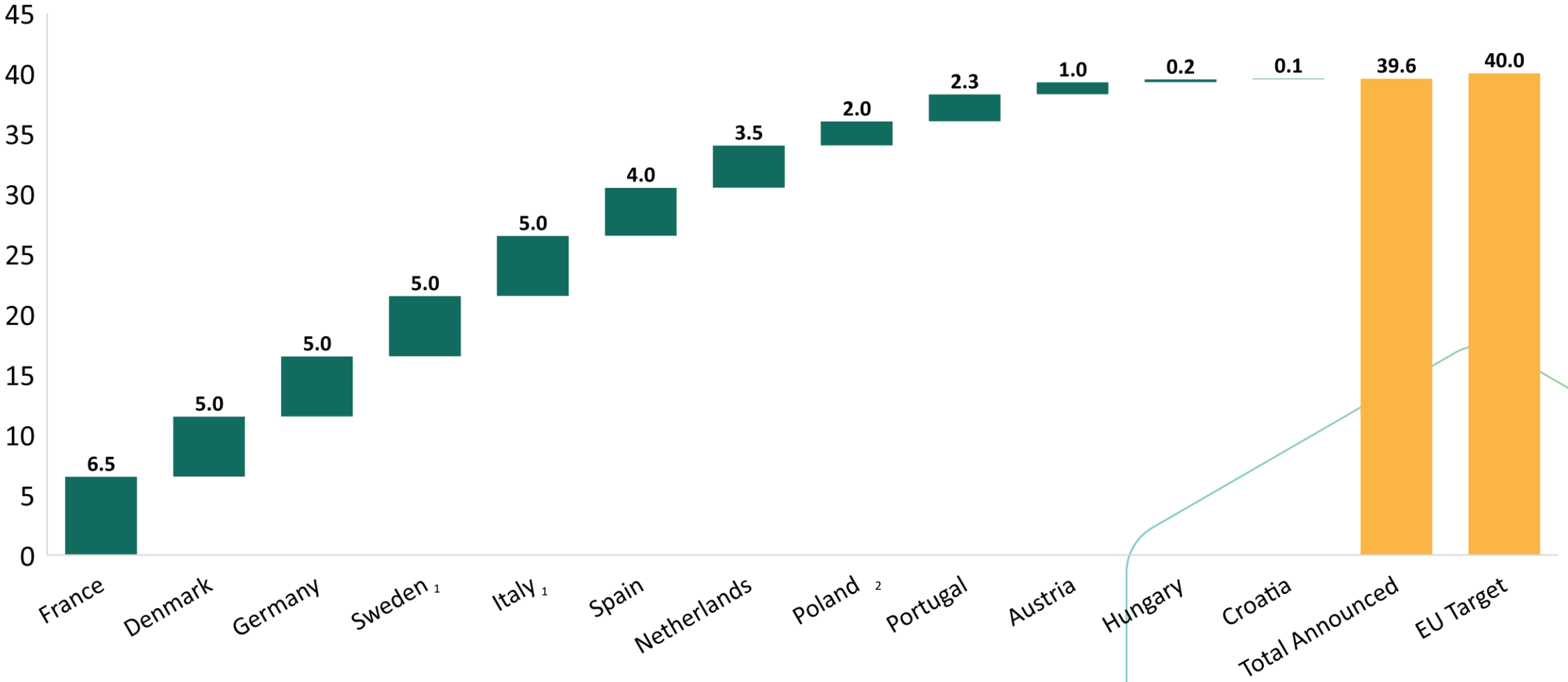
Source: Hydrogen Europe

Funding opportunities

- EU funding opportunities
- Recovery and Resilience facility and national plans

National policies and incentives on hydrogen technologies

Electrolyser capacity commitments by 2030 amount to 39.56 GW

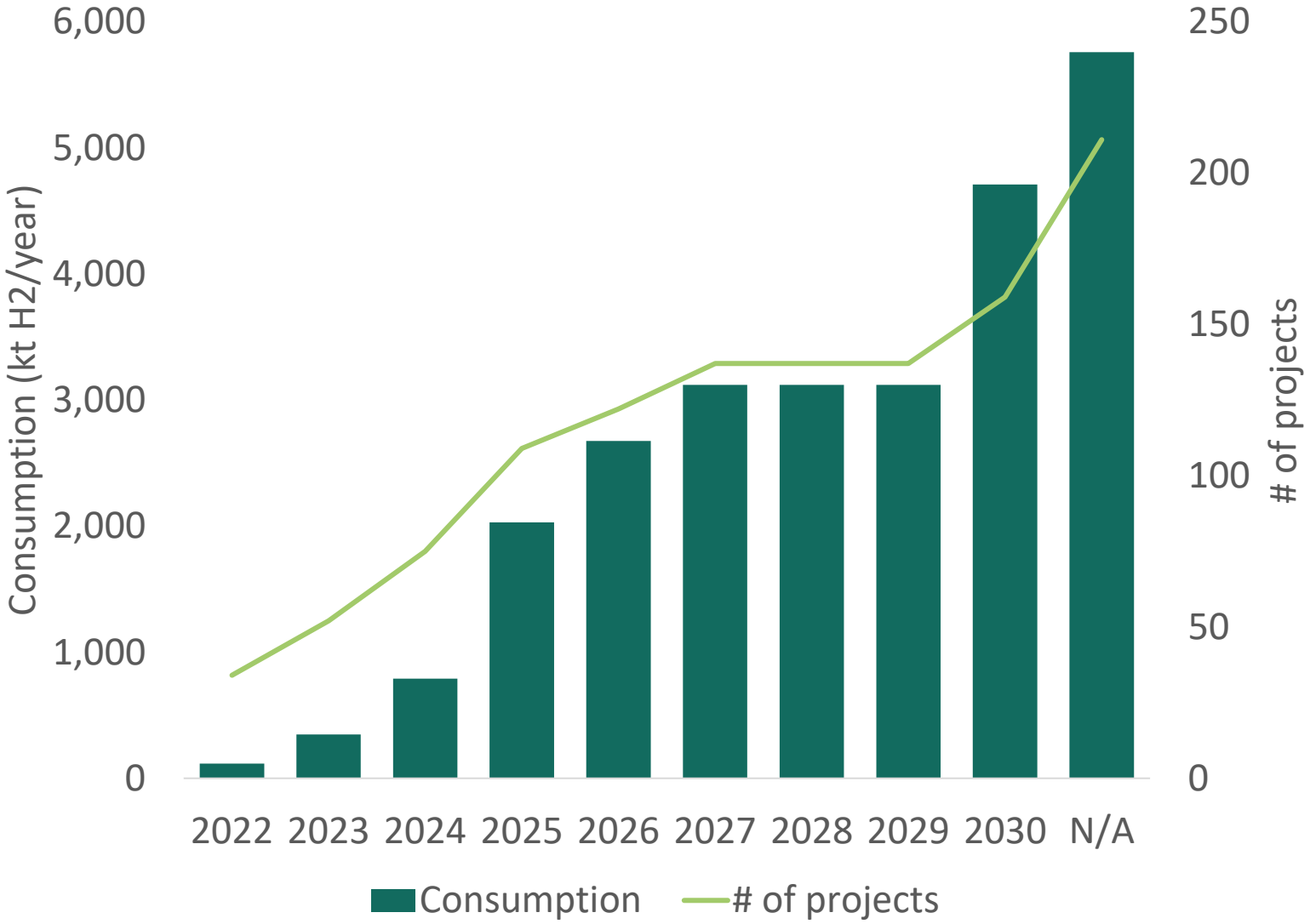


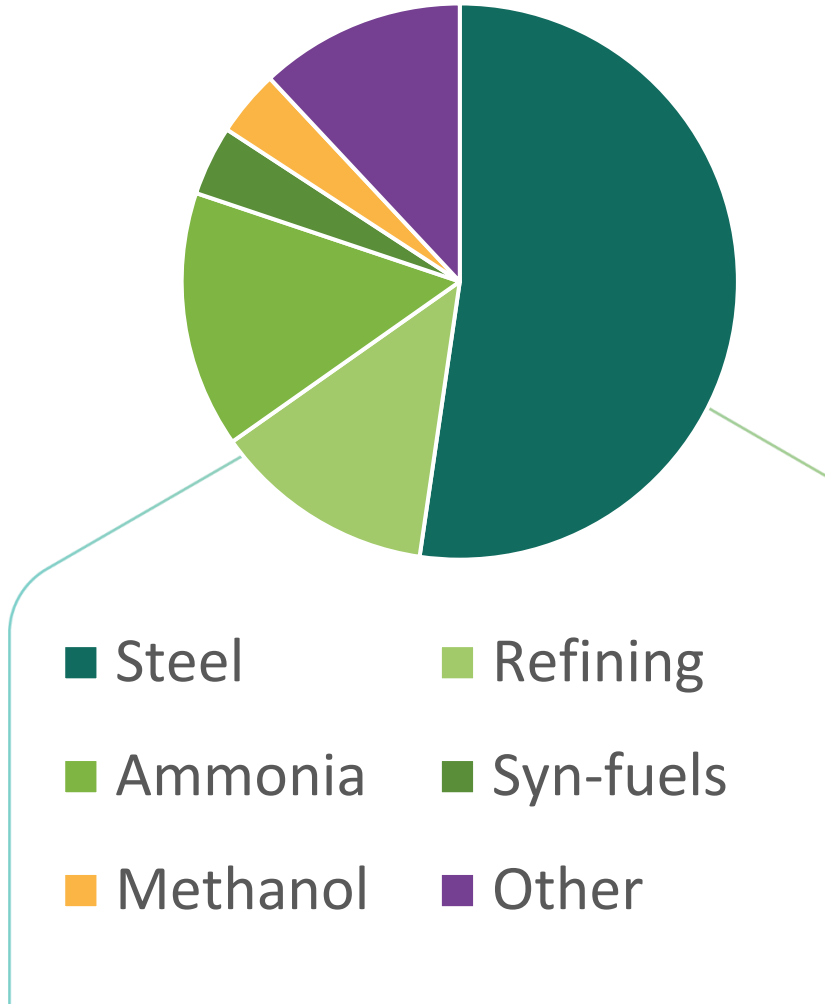
Included countries are the only ones with specific targets for planned electrolyser capacity.
When the target is a range, the median value of that range was used.
[1] Target is provisional and subject to change in the final version of the national H2 strategy.
[2] Polish target is for low-carbon emission sources, including electrolysers.

Source: Hydrogen Europe

Last update:
28/07/2022

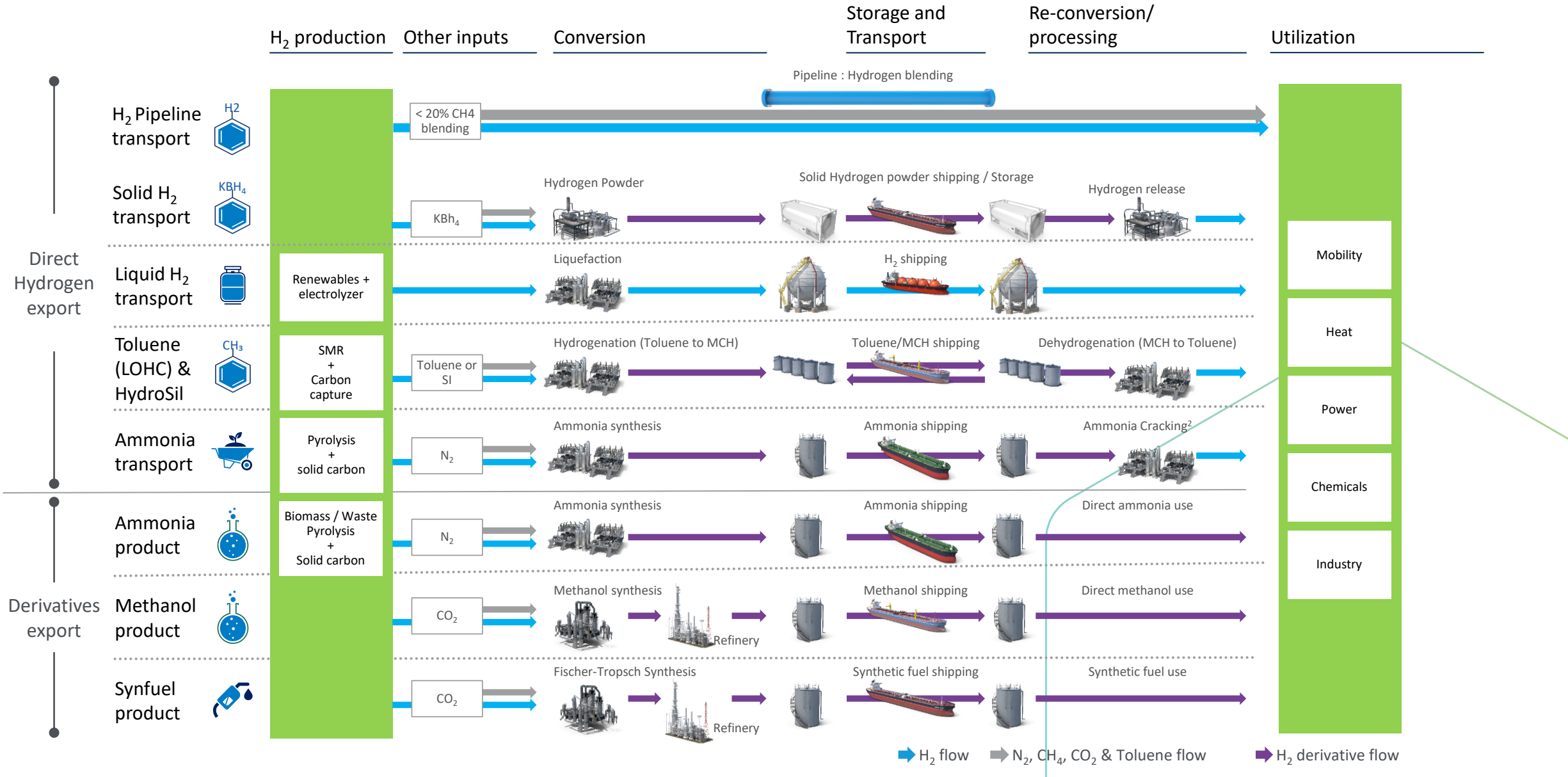
Planned consumption of clean H2 in industry



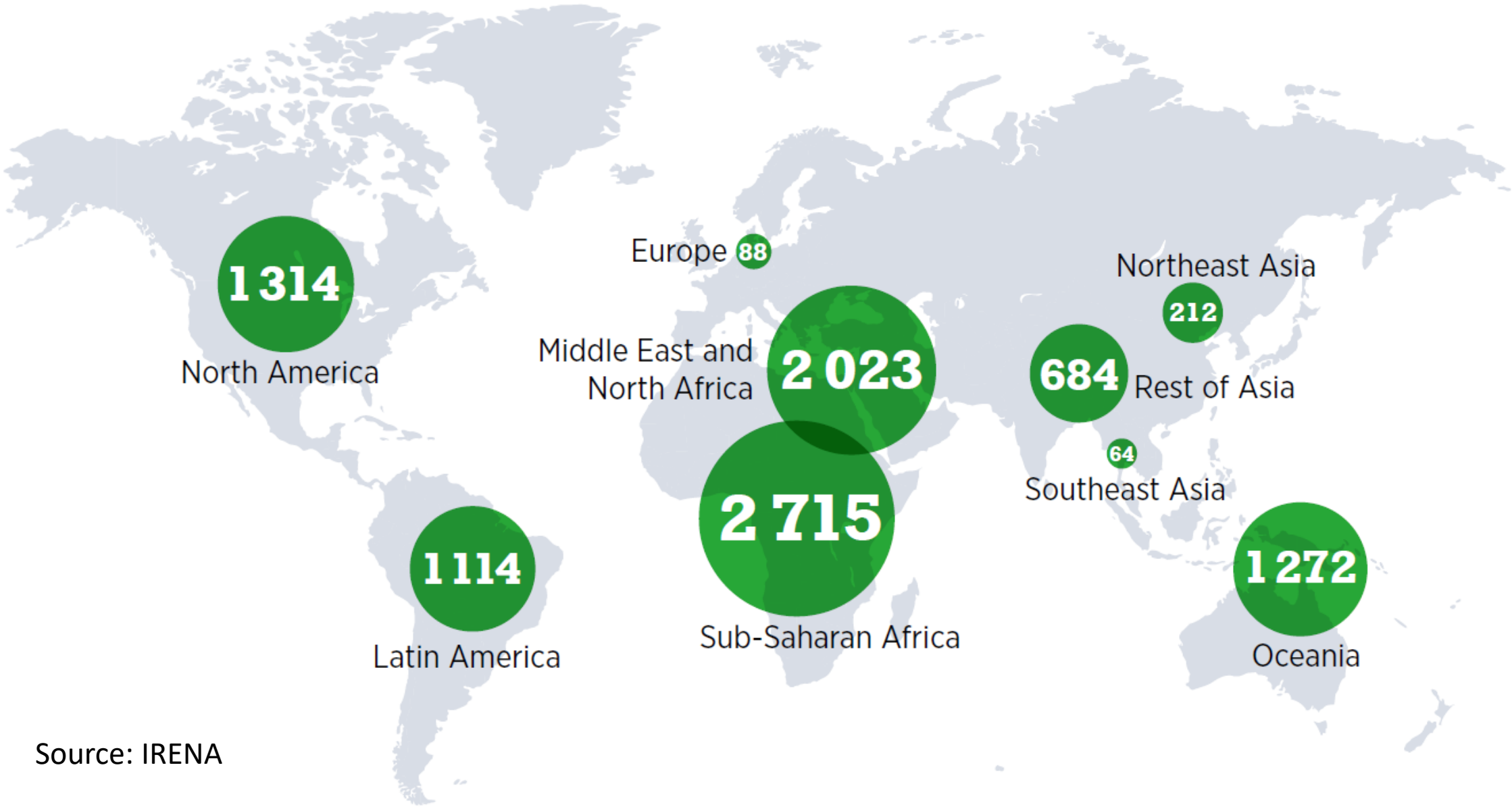


Source: Hydrogen Europe

H2 long-distance export pathways



Technical potential for producing green hydrogen under USD 1.5/kg by 2050, in EJ

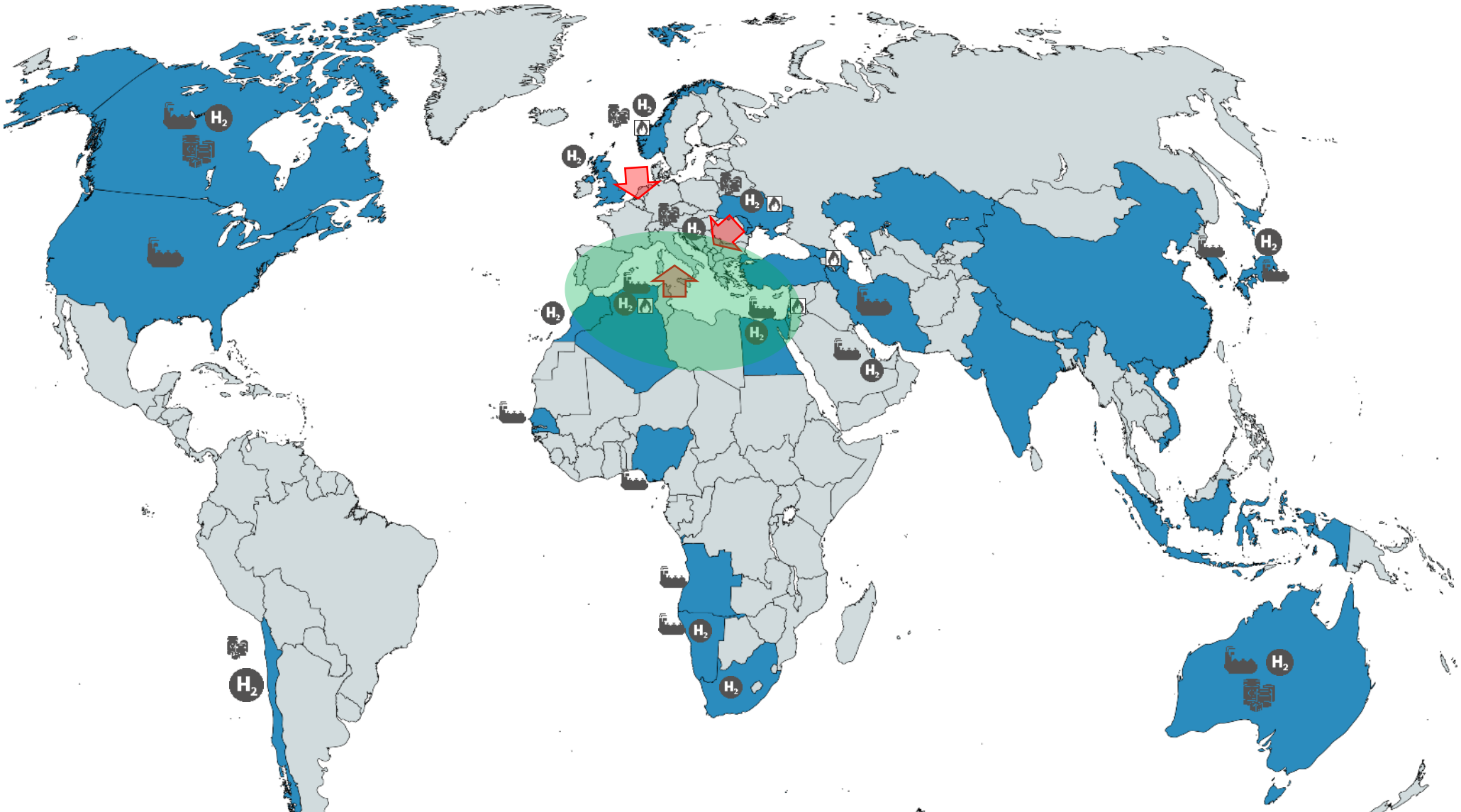


Source: IRENA

Pillar 2 of Repower EU - Diversifying energy imports

The EU's external energy engagement on H2 after REPowerEU

Hydrogen Europe



- Bilateral negotiations
- Importing corridors
- Hydrogen
- Gas (pipeline)
- LNG
- Raw Materials

OTHER INITIATIVES

- Global Hydrogen Facility
- H2 transactions in €
- EU Energy Platform

Infrastructure planning for hydrogen infrastructure (incl storage)

Hydrogen Europe

20 million tonnes of hydrogen by 2030

Annual generation capacity required: ca. 25 GW by 2025

Cumulative installed base: ca. 100 GW by 2030

-> Far beyond RFNBO target: 7.5 million tonnes by 2030

-> Joint electrolysers' declaration: annual target of 17.5 GW

Our vision

Pipelines

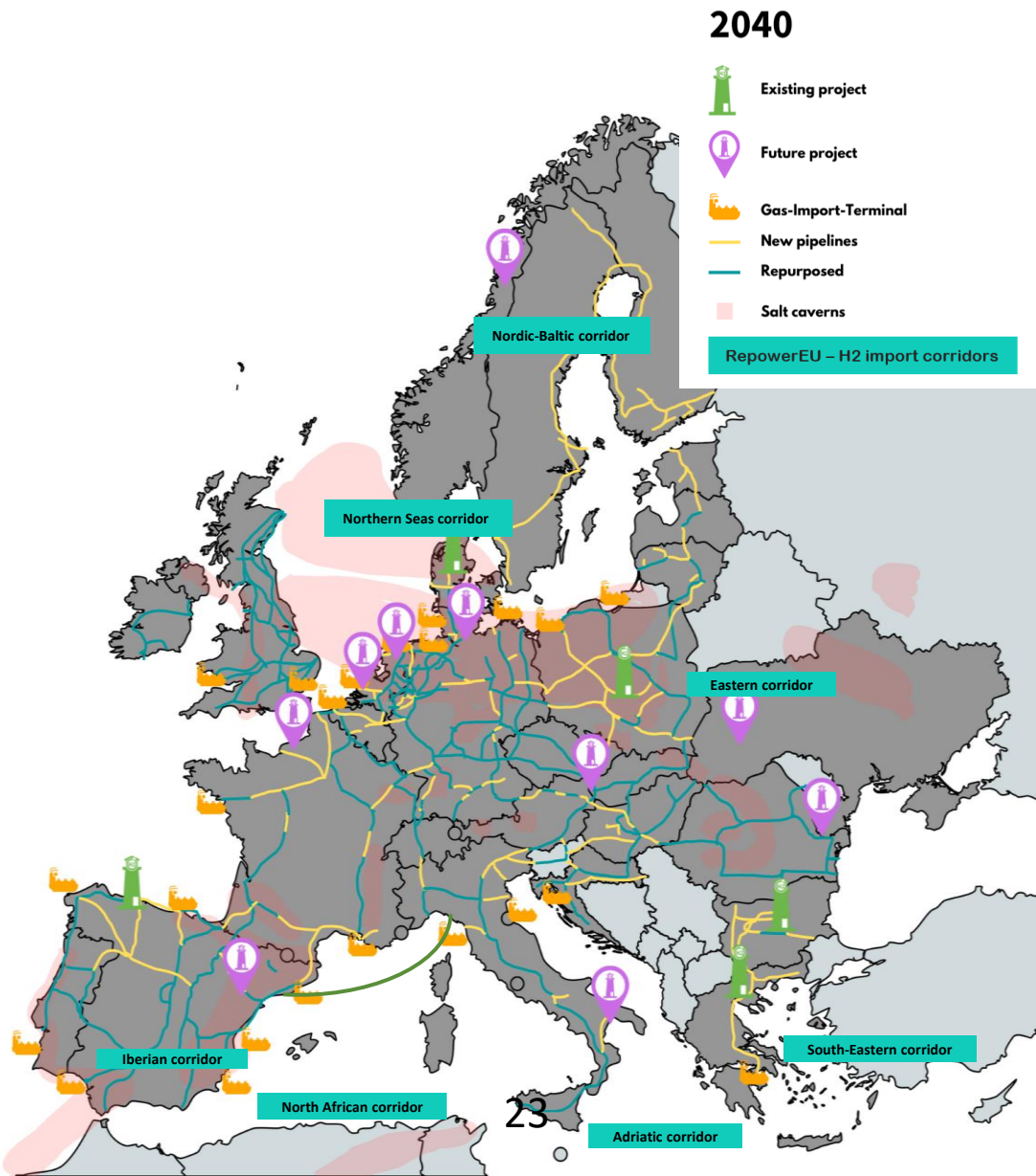
- 2-4 crossing the Mediterranean (each 10-20 GW, 4-7 Mton of hydrogen); 2-3 connecting North Sea (each 10-20 GW, 3-5 Mton of hydrogen).

Import by (mainly) ammonia shipment

- 2-3 Mton hydrogen = 11-17 Mton ammonia

Strategic reserve capacity in 2030 according to the Gas Storage Regulation → 90 days strategic reserve = around 5 million tonnes

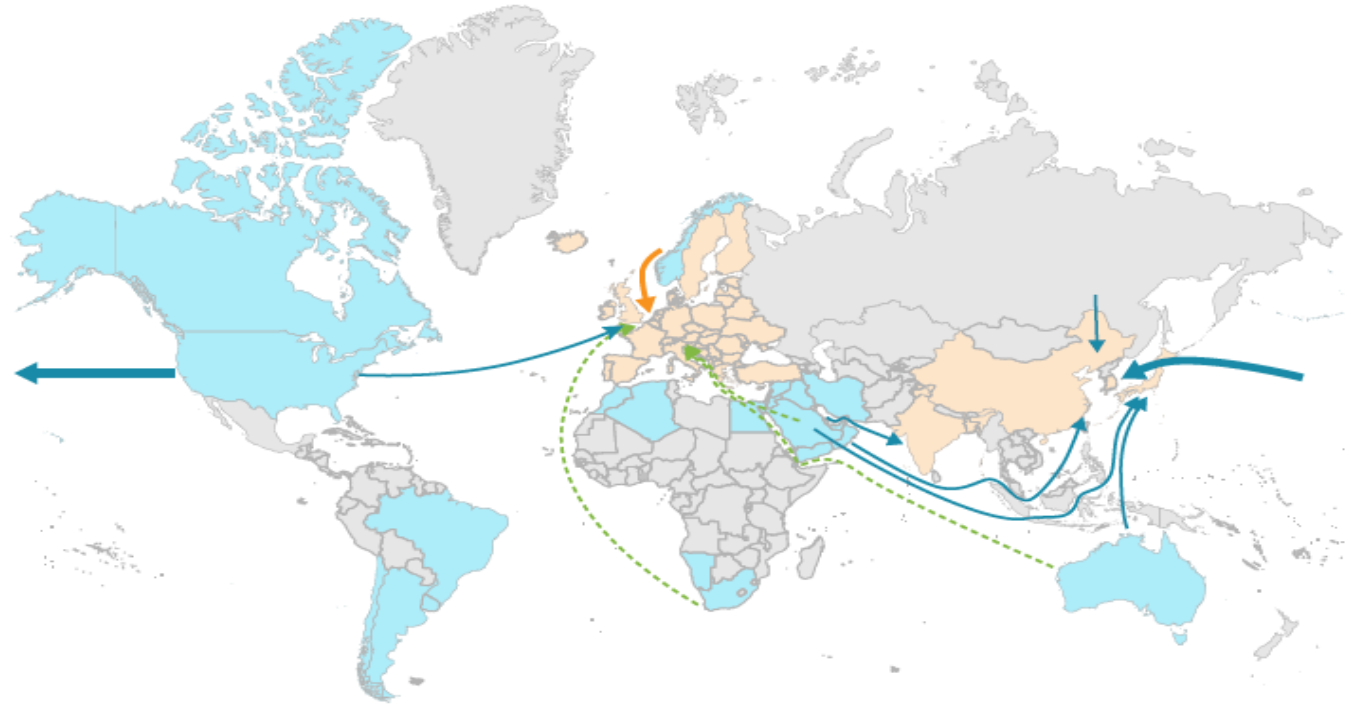
ENNOH to actively promote development & operation of infrastructure through TEN-E priority corridors (BEMIP, HiWest, HiEast) and ensure integrated network planning



Geopolitics of Hydrogen

Hydrogen trade flows and H2 diplomacy

Major flows of hydrogen and derivatives, million tons hydrogen equivalent in 2030



Hydrogen Council: *Global Hydrogen Flows: Hydrogen trade as a key enabler for efficient decarbonization*.

System efficiency

The role of hydrogen as an energy vector for political and climate targets

The energy (in)efficiency question

Both e-fuels as well as **Hydrogen** face some energy inefficiency narrative …

… but this narrative breaks down immediately after one starts to think about full decarbonisation od society.

There are at least several reasons …

System efficiency	All electrification is not feasible (without large RES curtailment)
Resource efficiency	Not enough space and resources in Europe
Energy vector (efficency)	RES imports are needed – in form of Hydrogen and derivates

Value of Hydrogen

Hydrogen Europe

Hydrogen is a key enabling technology required for the emergence of a decarbonized ecosystem, as it provides an essential bridge between variable electricity supply options (dedicated RES and grid withdrawals) and the dynamics of hydrogen demand.

More precisely, five values of hydrogen can be identified, each corresponding to a set of services that hydrogen brings to the entire energy system, including from a cross-sectoral perspective:

Arbitrage value	Separation of "cheap / expensive" electricity price hours
Insurance value	Storage for time-shifted use to ensure sufficient volumes available to end-uses subject to uncertain demand levels (e.g. H2 turbines, H2 heating technologies).
System value	Sector coupling for "transport" beyond the electricity grid avoid over-investments in other infrastructure elements, across the entire energy sector
Kick-start value	Ability to store helps to optimally size investments in RES capacity in order to comply with transition targets, thereby facilitating the emergence of an hydrogen ecosystem.
Environmental value	Hydrogen as a energy vector helps avoid CRM and electric redispatch, stress on the electricity grid and avoids RES curtailment.

Thank You

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