



Hydrogen
Europe

The Hydrogen Roadmap Europe Study
Jorgo Chatzimarkakis, Secretary General

HyENET, Brussels, 26 June 2019



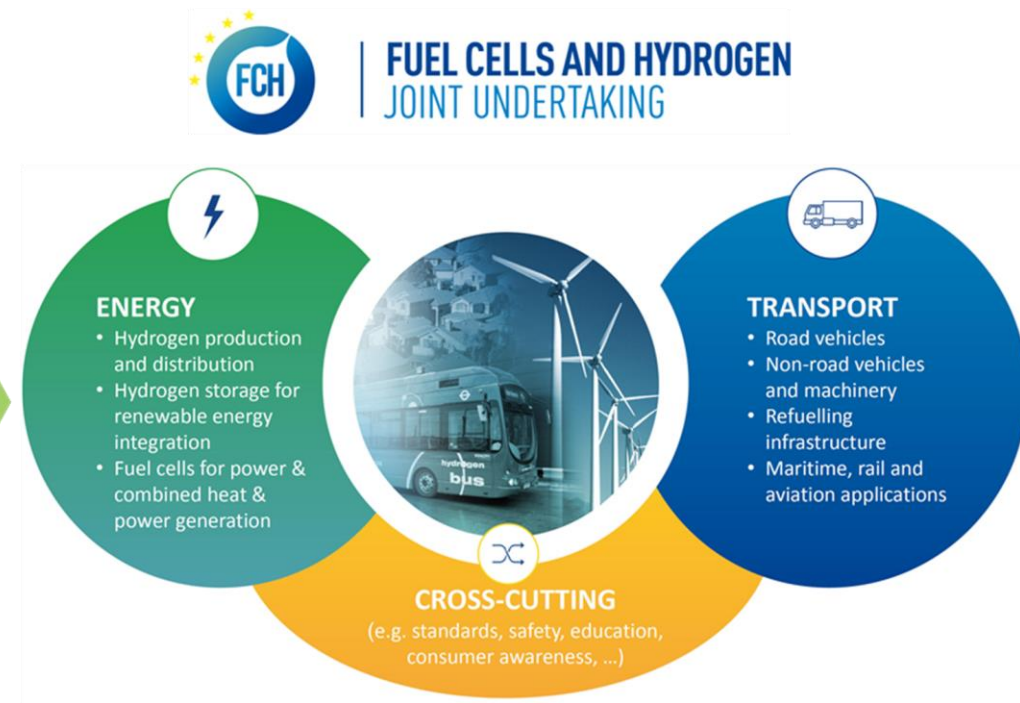
Fuel Cells & Hydrogen Joint Undertaking





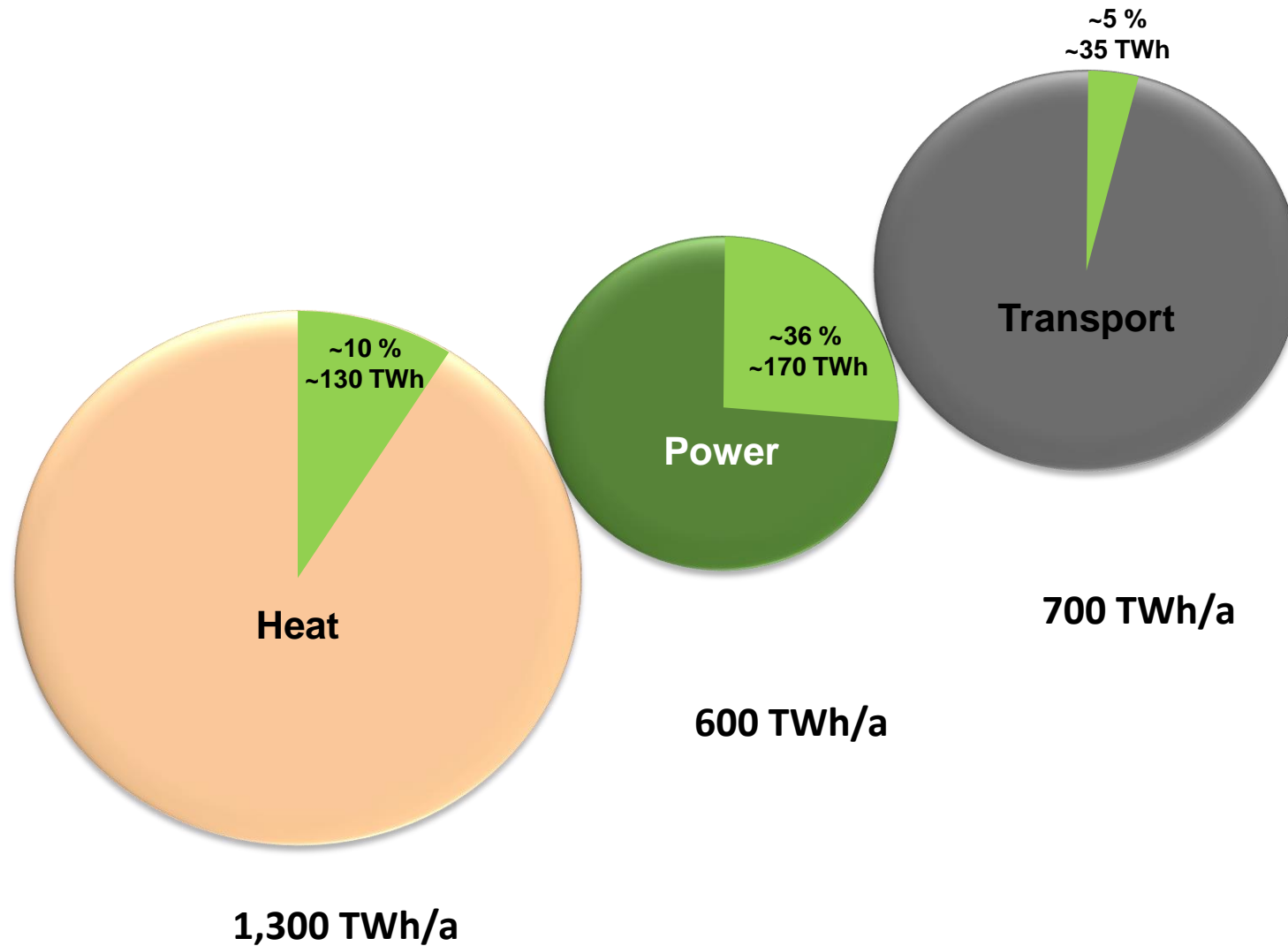




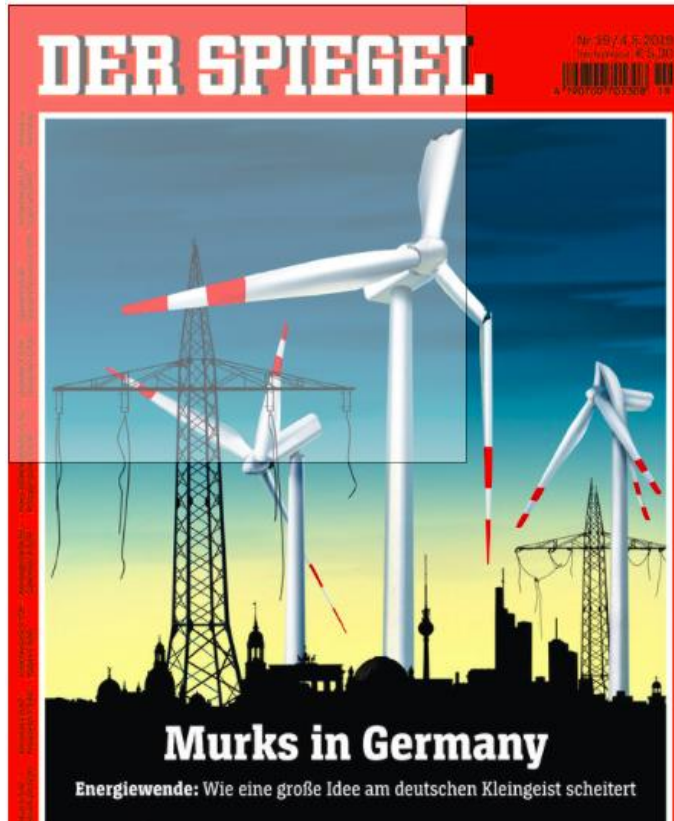


A portfolio of clean, efficient and competitive solutions based on fuel cells and hydrogen technologies in energy and transport

Renewable shares



Power grids are efficient – but too small



**Germany decided 10 years ago
to build new power grid**

Planned: 7.700 km

Realised: 950 km

Built in 2017: 30 km

Left: 6.720 km

Bloomberg

Hyperdrive

Sweden's Electric Car Boom Is Under Threat From Power Crunch

By [Jesper Starn](#)

June 12, 2019, 12:00 AM EDT

Updated on June 12, 2019, 10:45 AM EDT

- ▶ Capacity issues in big cities hamper charging networks
- ▶ Local grids would struggle to handle huge increase of vehicles

Existing infrastructure – and biodiversity

Energy Transport capacity – Public Acceptance

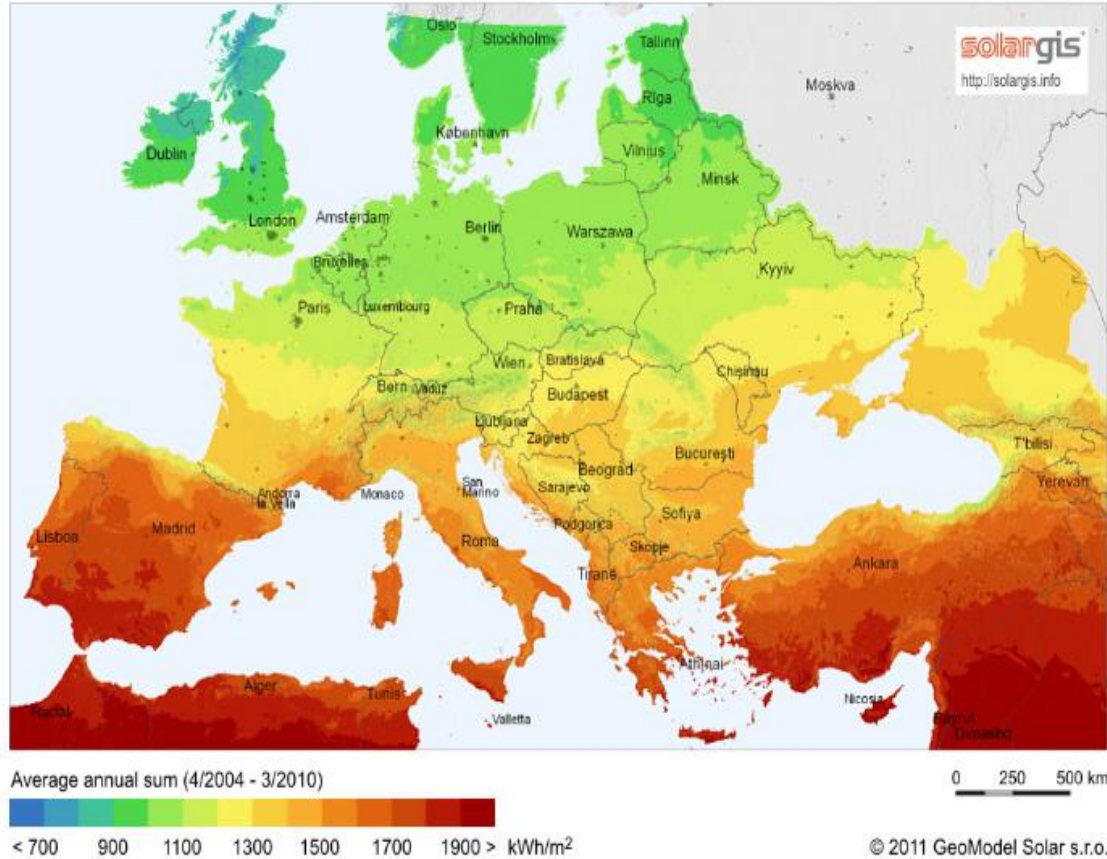


1 gas pipeline ($\varnothing 1,20\text{m}$) transports as much energy as **8** power pylons (of 3 GW each)

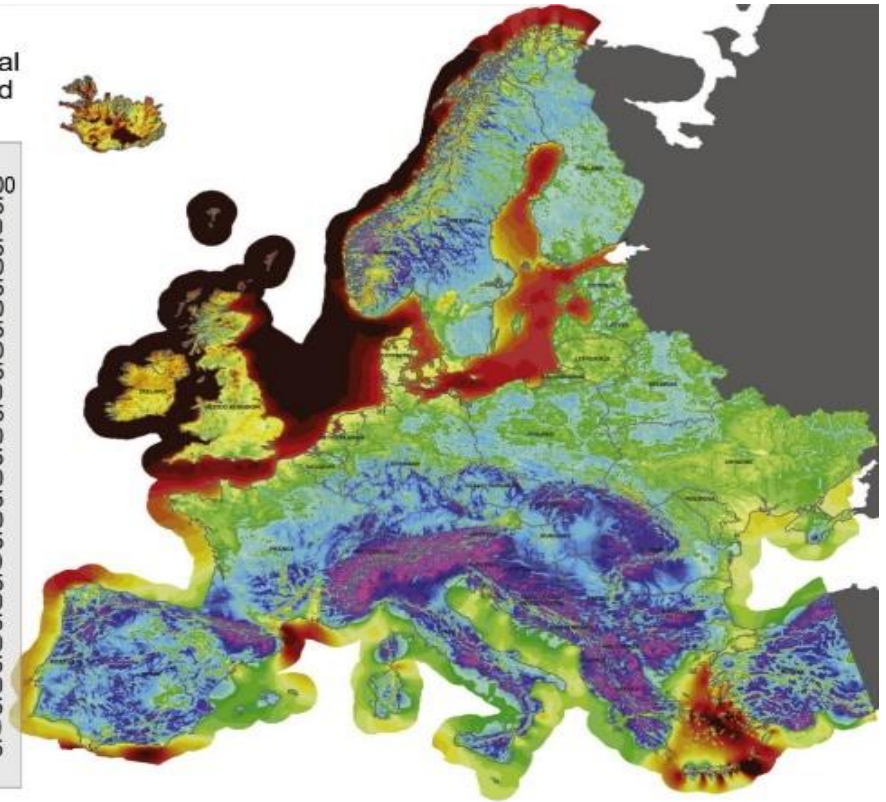
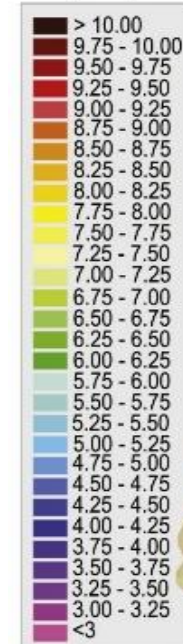
Renewables in Europe

Global horizontal irradiation

Europe

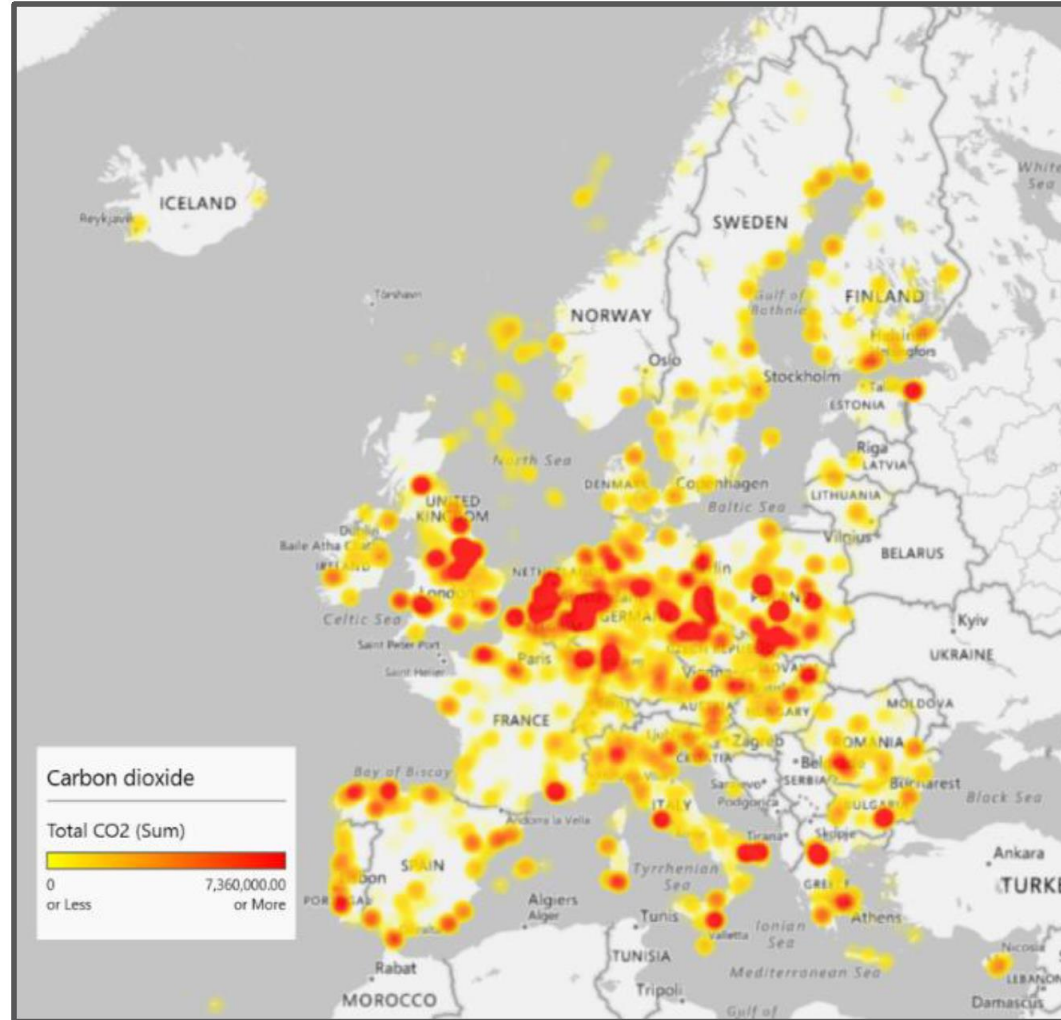


Mean annual wind speed [m/s]

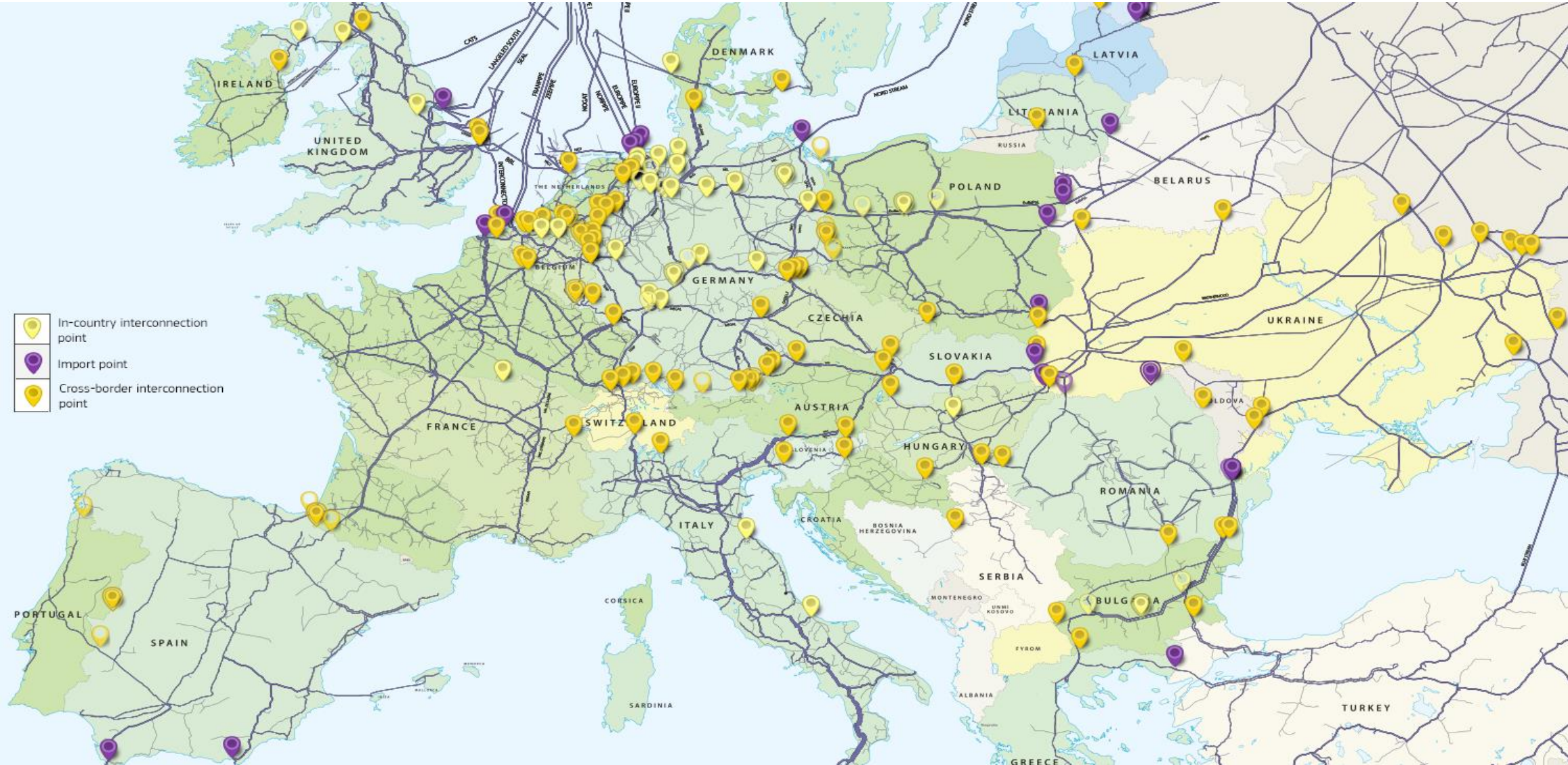


Solar irradiation (left) and wind speed at 80 m height (right) in Europe

Where CO₂ needs to be abated



The European Gas Grid – cheap transport of H₂



Who can do the job?



Hydrogen Roadmap for Europe

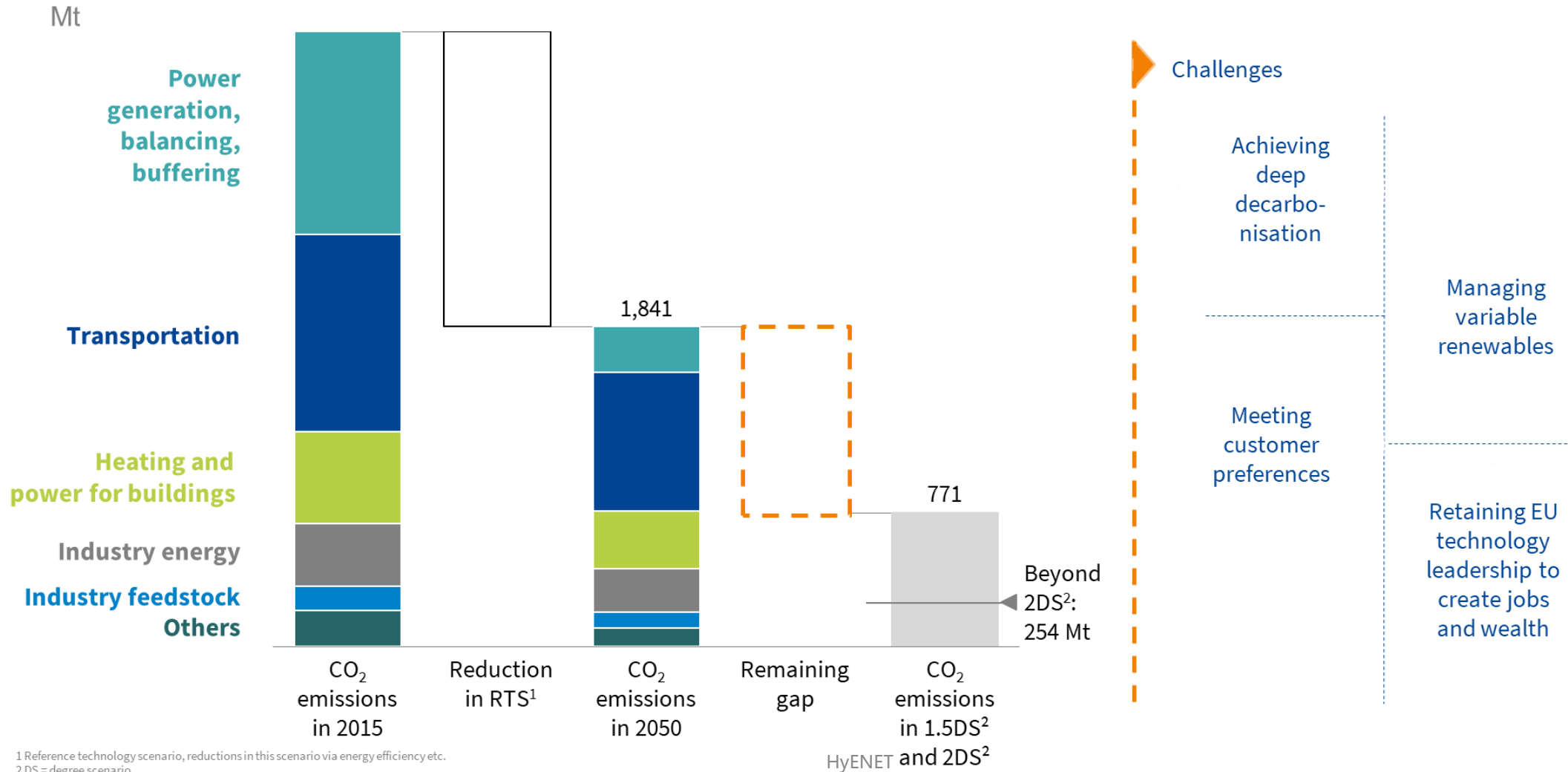


- [Study](#) by the FCH JU, supported by Hydrogen Europe and 17 companies and organizations along the whole value chain of hydrogen
- First comprehensive quantified European perspective for deployment of hydrogen and fuel cells in two scenarios
- Ambitious, yet realistic two-degree scenario and business-as-usual scenario
- Long-term potential
- Roadmap with intermediate milestones
- Recommendations to kickstart



Hydrogen Roadmap for Europe

Why hydrogen: To realise the ambitious transition of the EU's energy system, a number of challenges need to be resolved



Hydrogen Roadmap for Europe

2050 hydrogen vision



~24%

of final energy
demand¹



~560 Mt

annual CO₂
abatement²



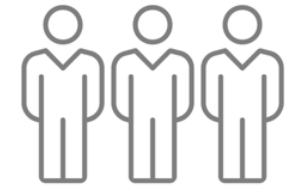
~EUR 820bn

annual revenue
(hydrogen and
equipment)



~15%

reduction of local
emissions (NO_x)
relative to road
transport

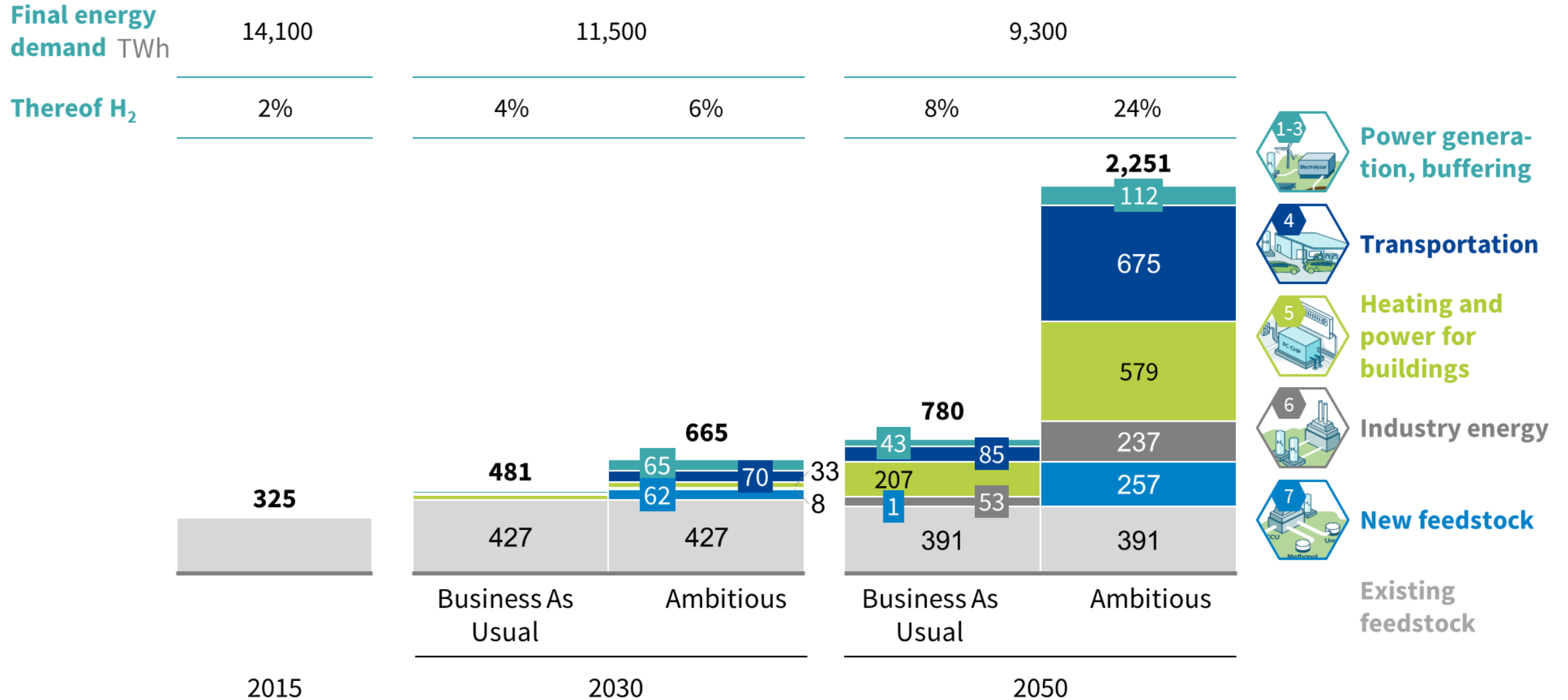


~5.4m

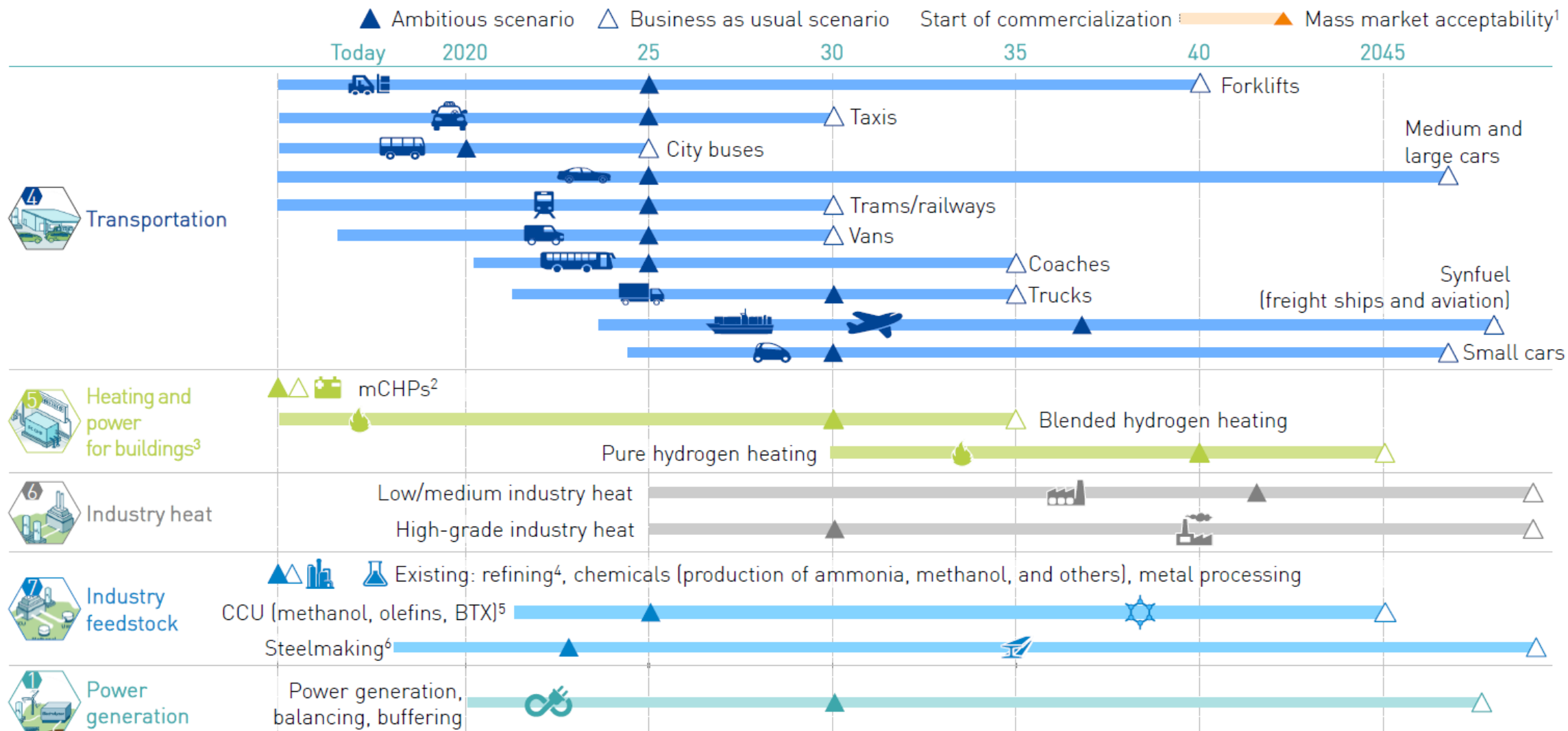
jobs (hydrogen,
equipment,
supplier
industries)³

¹ Including feedstock
² Compared to the reference technology scenario
³ Excluding indirect effects

Hydrogen Roadmap for Europe



Hydrogen Roadmap for Europe

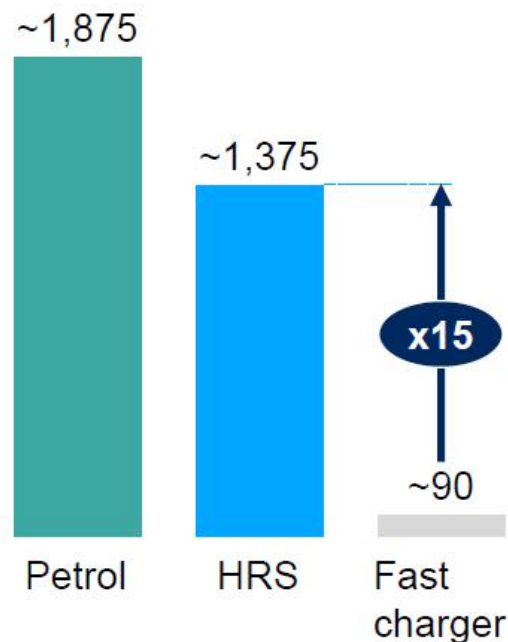


Hydrogen Roadmap for Europe

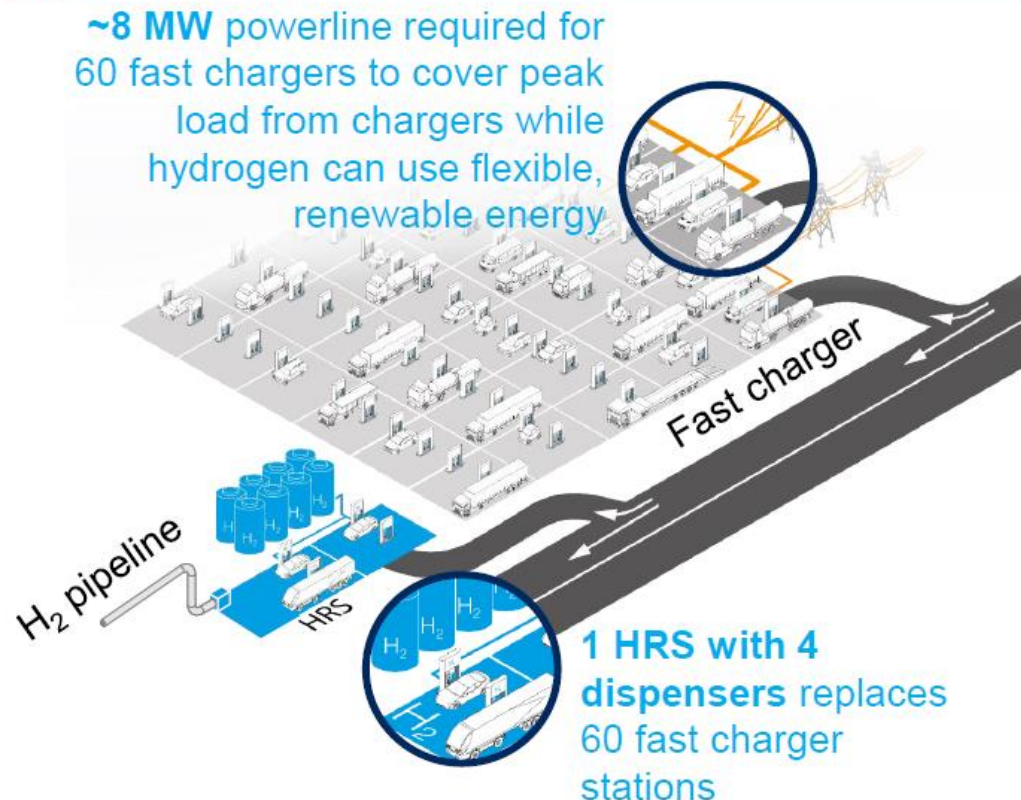
A HRS is able to refuel ~15 times more vehicles than a fast charging station, leading to significantly less space requirements and offsetting the higher installation costs of a HRS

Refueling speed

Km/15 minutes of refueling

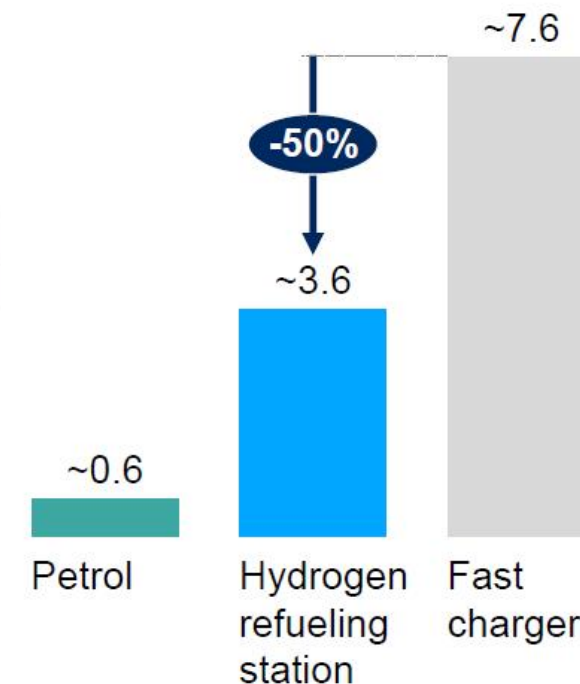


Space requirements



Investment costs per refueling

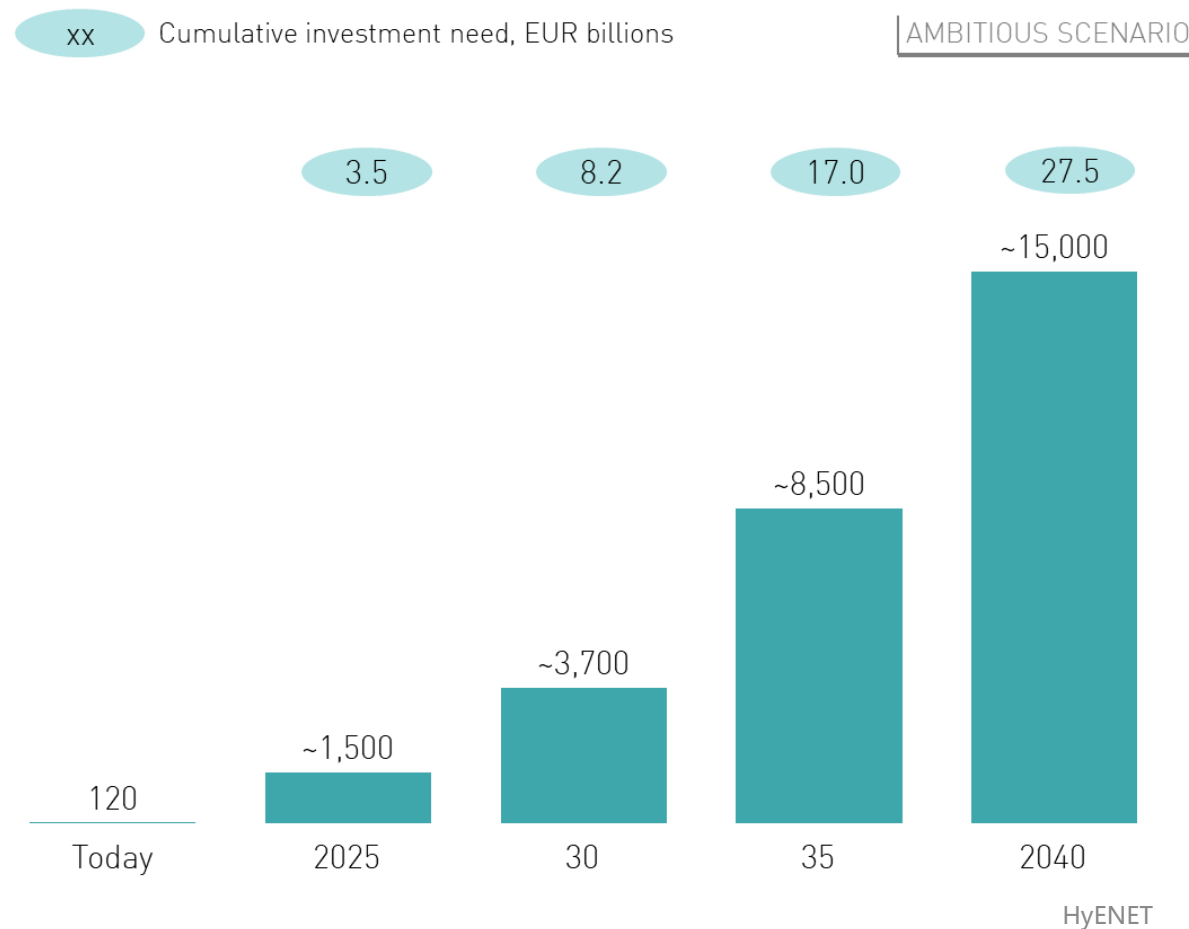
EUR/refueling



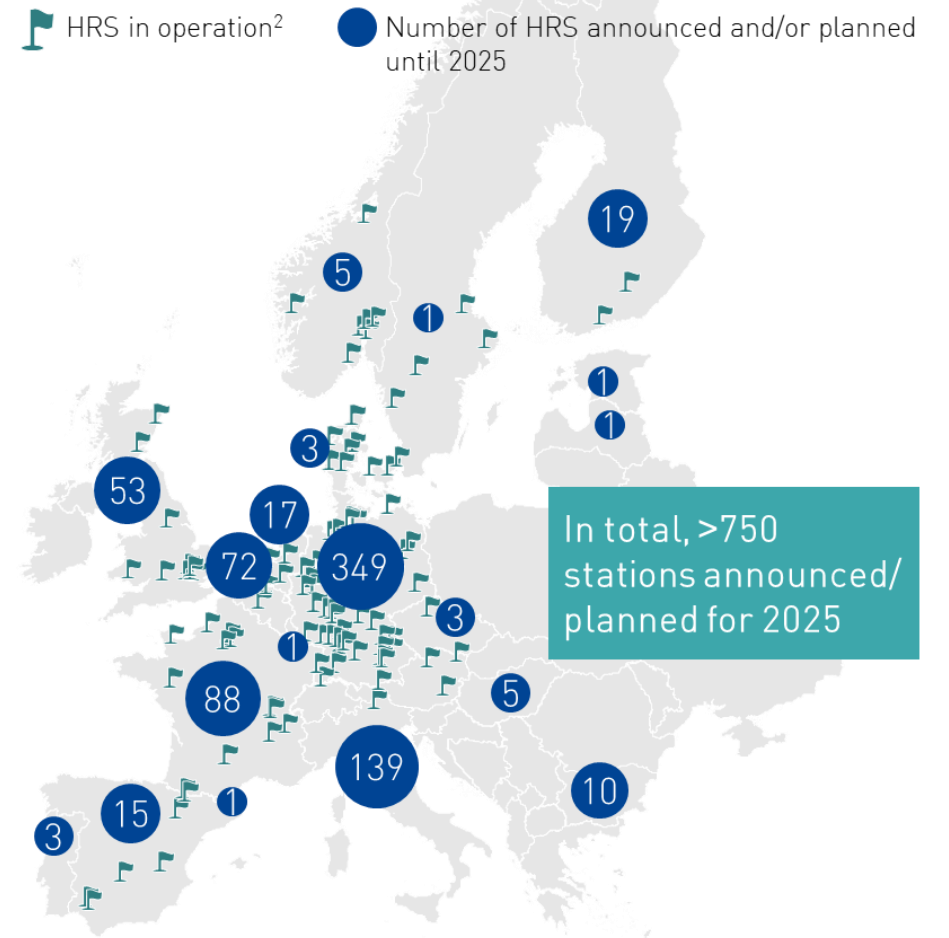
Hydrogen Roadmap for Europe

The equivalent of ~3,740 refueling stations would be required by 2030, implying investment needs of EUR ~8.2 bn

Required large HRS¹, number



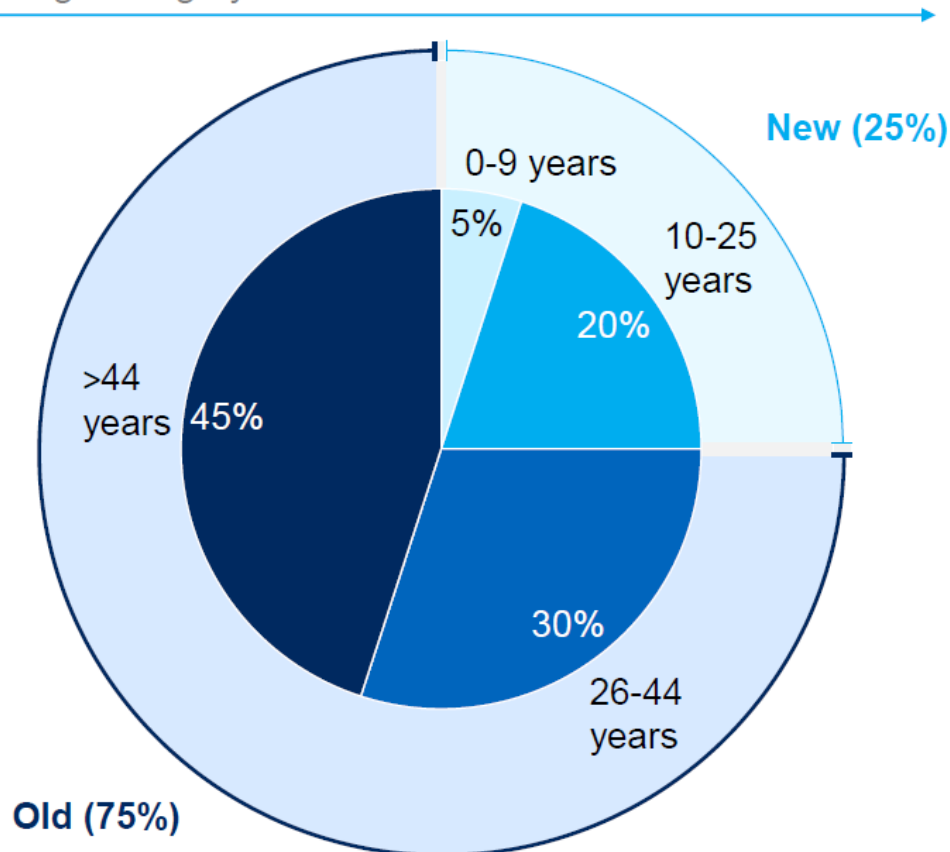
Current and planned HRS in Europe



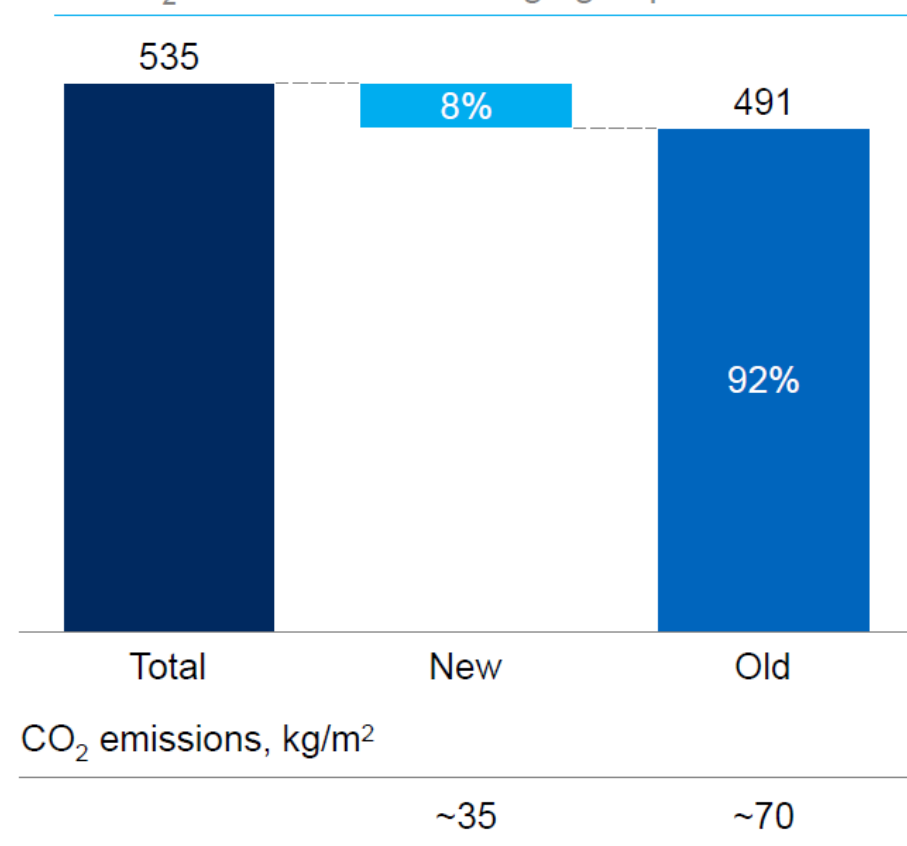
Hydrogen Roadmap for Europe

75% of Europe's buildings are more than 26 years old and **emit the 92%** of all building related CO₂ emissions

Buildings stock in Europe by age,
% of age category



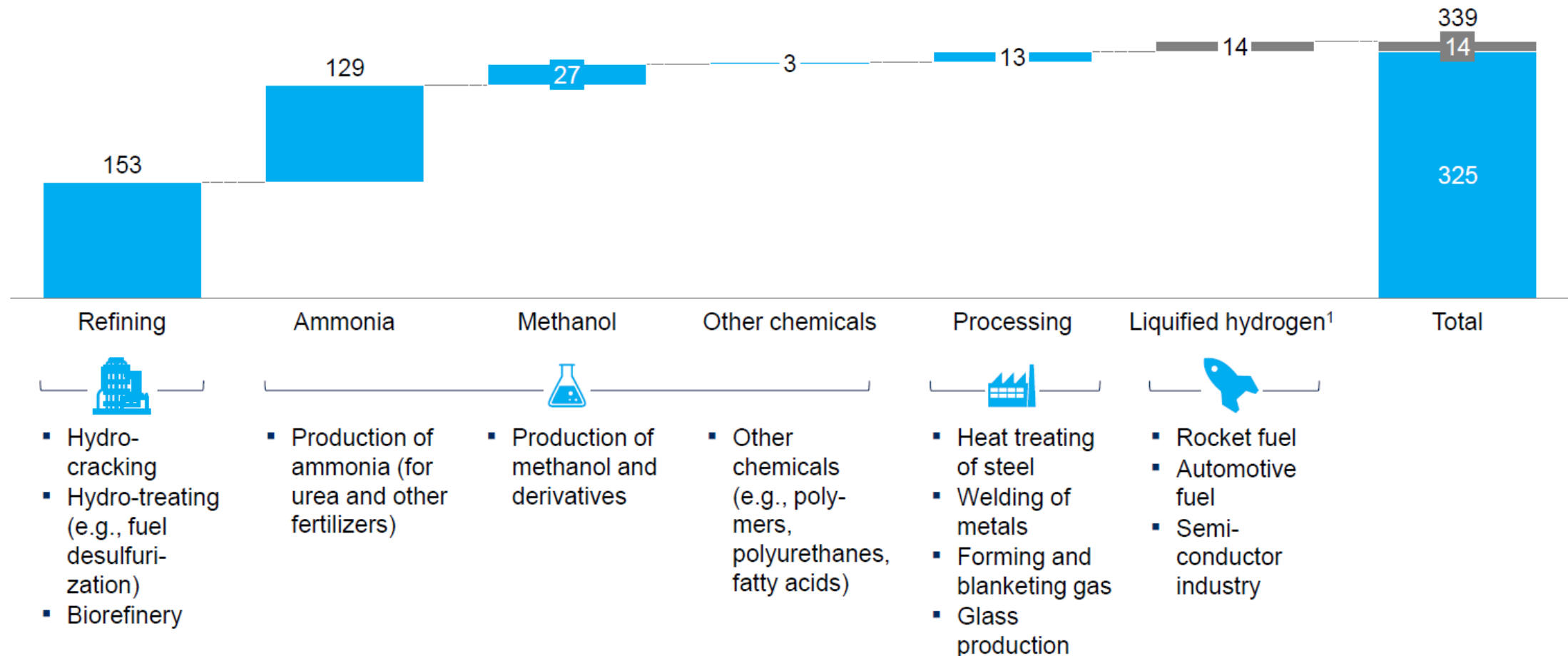
Emission from building stock¹,
Mt CO₂ and shares in % of age groups



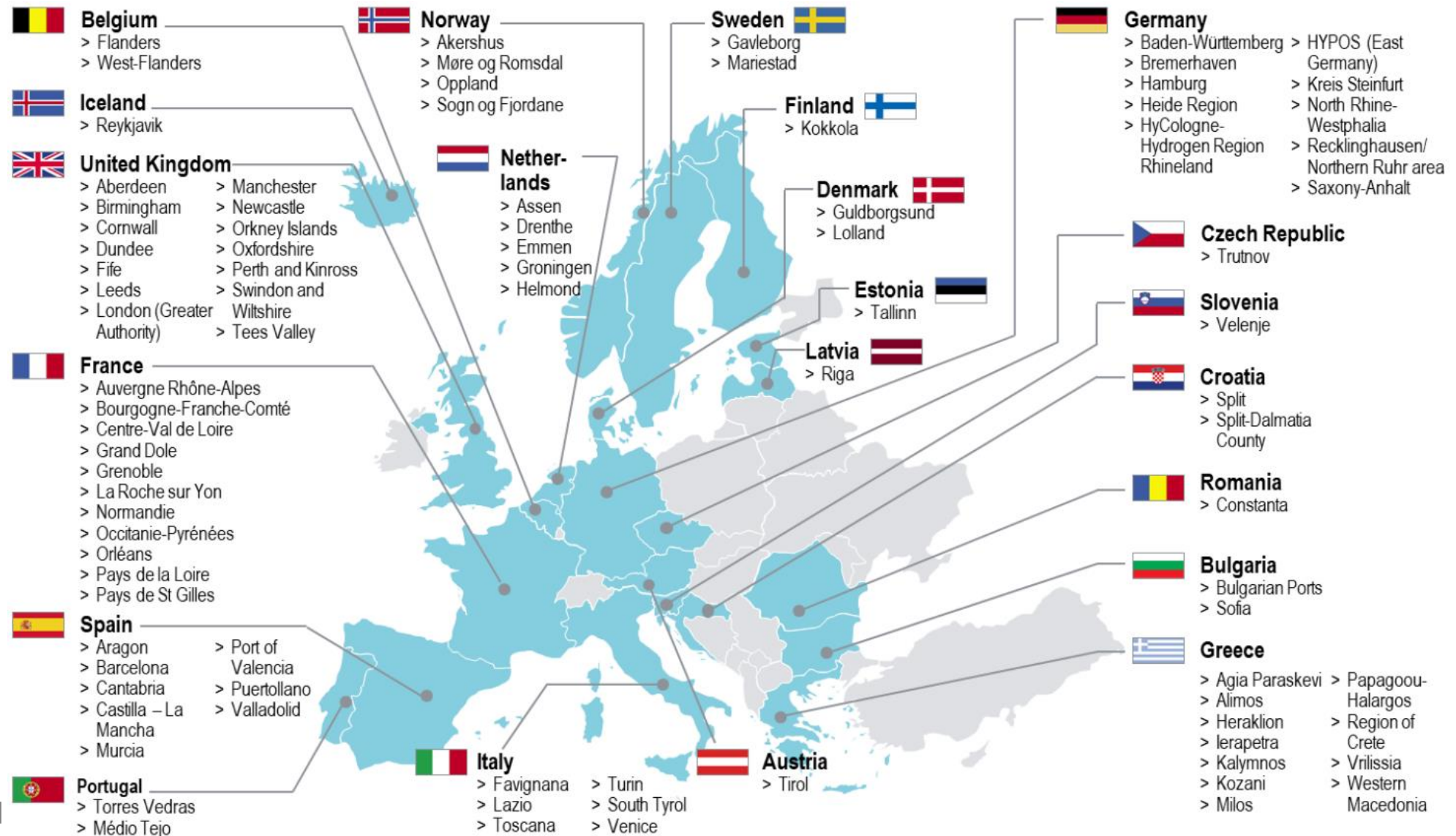
Hydrogen Roadmap for Europe

Almost all the hydrogen currently produced is used as a feedstock for industry primarily in refining and chemicals

Total hydrogen use in the EU, in TWh



The regional perspective: "Hydrogen Valleys"



Status quo

- Various industry reports signal a very significant potential
- A lot of interest and concrete ideas by the industrial actors
- Little hope to change the **dead-lock without public policy intervention**
- **Other continents investing heavily to get their Hydrogen industry ready**

The Future of Hydrogen

Seizing today's opportunities



Report prepared by the IEA
for the G20, Japan

June
2019



China's Father of Electric Cars Says Hydrogen Is the Future

His vision to make China an electric-vehicle powerhouse revolutionized the global auto industry, cementing a move away from the combustion engine....

[bloomberg.com](https://www.bloomberg.com)

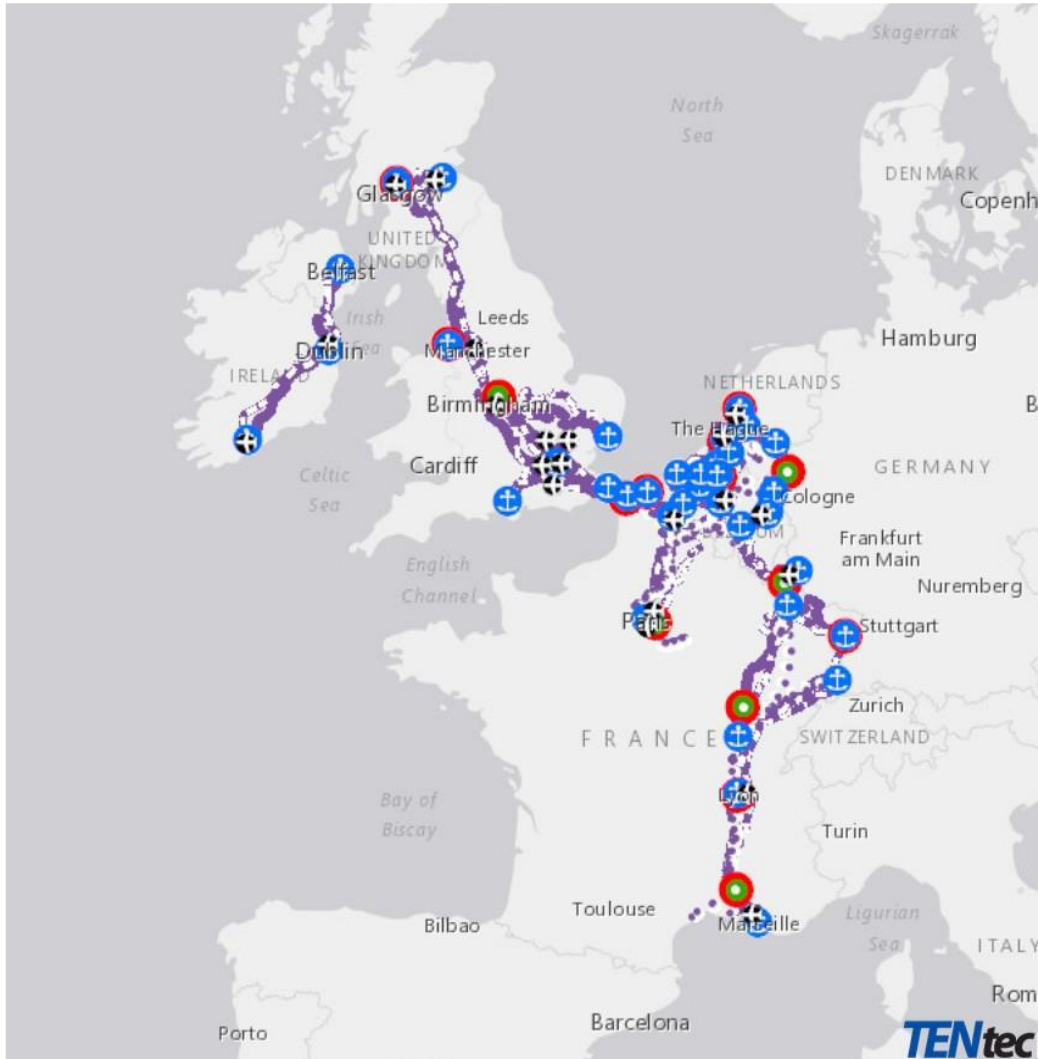


Renewable hydrogen getting cheaper, Australia could lead global ma...

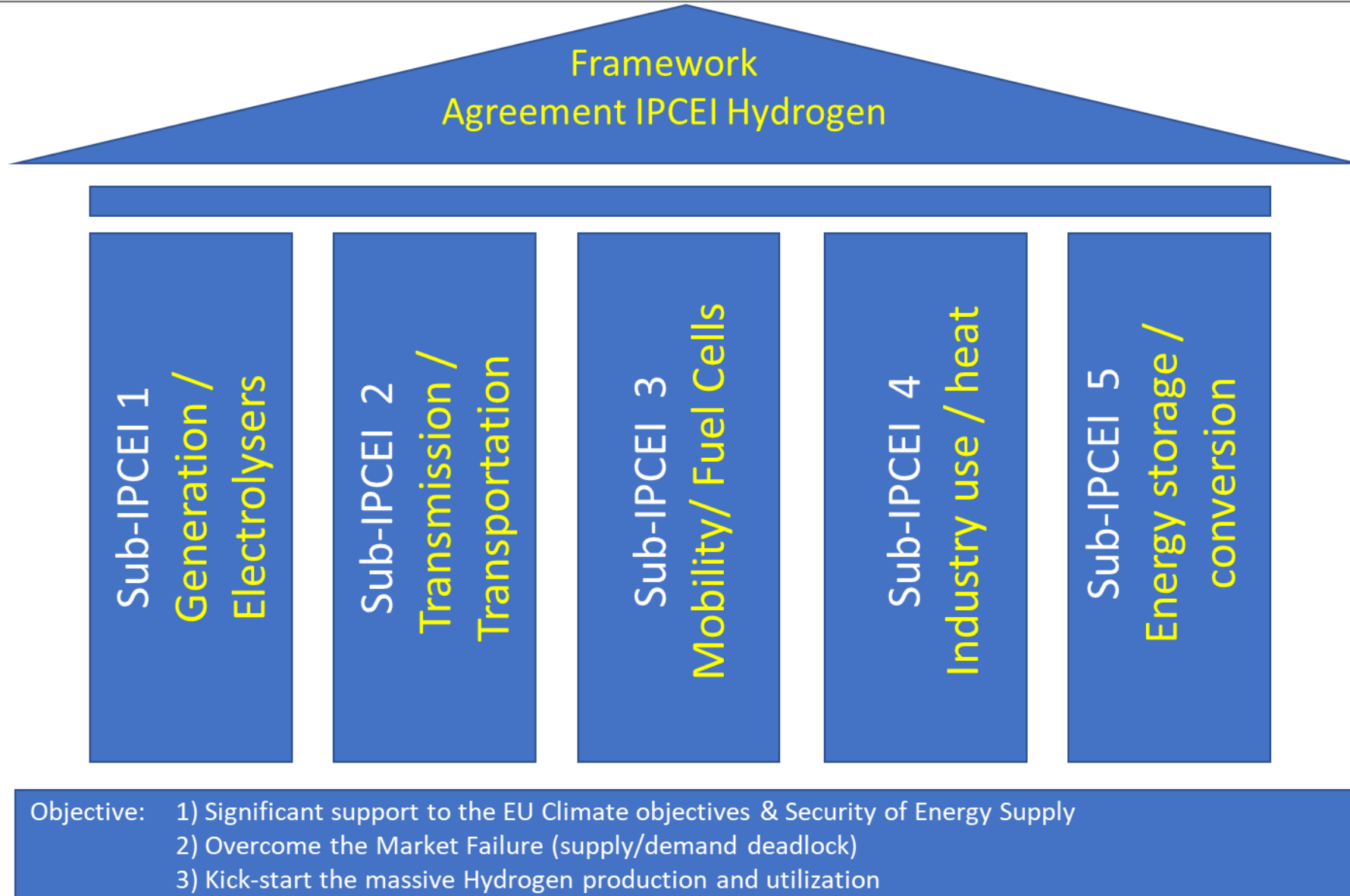
Renewable hydrogen costs fall, becoming competitive with fossil fuels and putting Australia in prime position to lead global supply of zero emissions...

reneweconomy.com.au

Hydrogen & Fuel Cells Value Chain in IPCEIs Hydrogen Europe



Hydrogen & Fuel Cells Value Chain in IPCEIs



- June 19 Strategic Forum report
- 3Q 19 Collection and collation of industry input
- **09 Oct 19 Hydrogen Action Day conference**
- Nov 19 Official info to all MSs to start call for EoI
- 1Q 20 Preparation of the IPCEI request
- April 20 Official request
- Oct 20 IPCEI approval

Political Context: Council



Follow

📣 @EUCouncil outlines principles and priorities for the future of #energysystems in the EU 🇪🇺. Happy to see that the role of #hydrogen for #SectorCoupling and #SectoralIntegration is explicitly called for in view of the next legislative term.
#HydrogenNow
europa.eu/!kH88CU



29. CALLS on the European Commission to undertake an analysis of sector coupling and sector integration technologies, including the production of hydrogen, in particular with regards to regulatory and market barriers and based on this analysis explore possible initiatives regarding the efficient integration and deployment of such technologies and energy carriers.

Thanks for your attention!



Shift happens!

Hydrogen enables you.



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