



Five hydrogen supply corridors for Europe in 2030

Executive Summary

EUROPEAN HYDROGEN BACKBONE

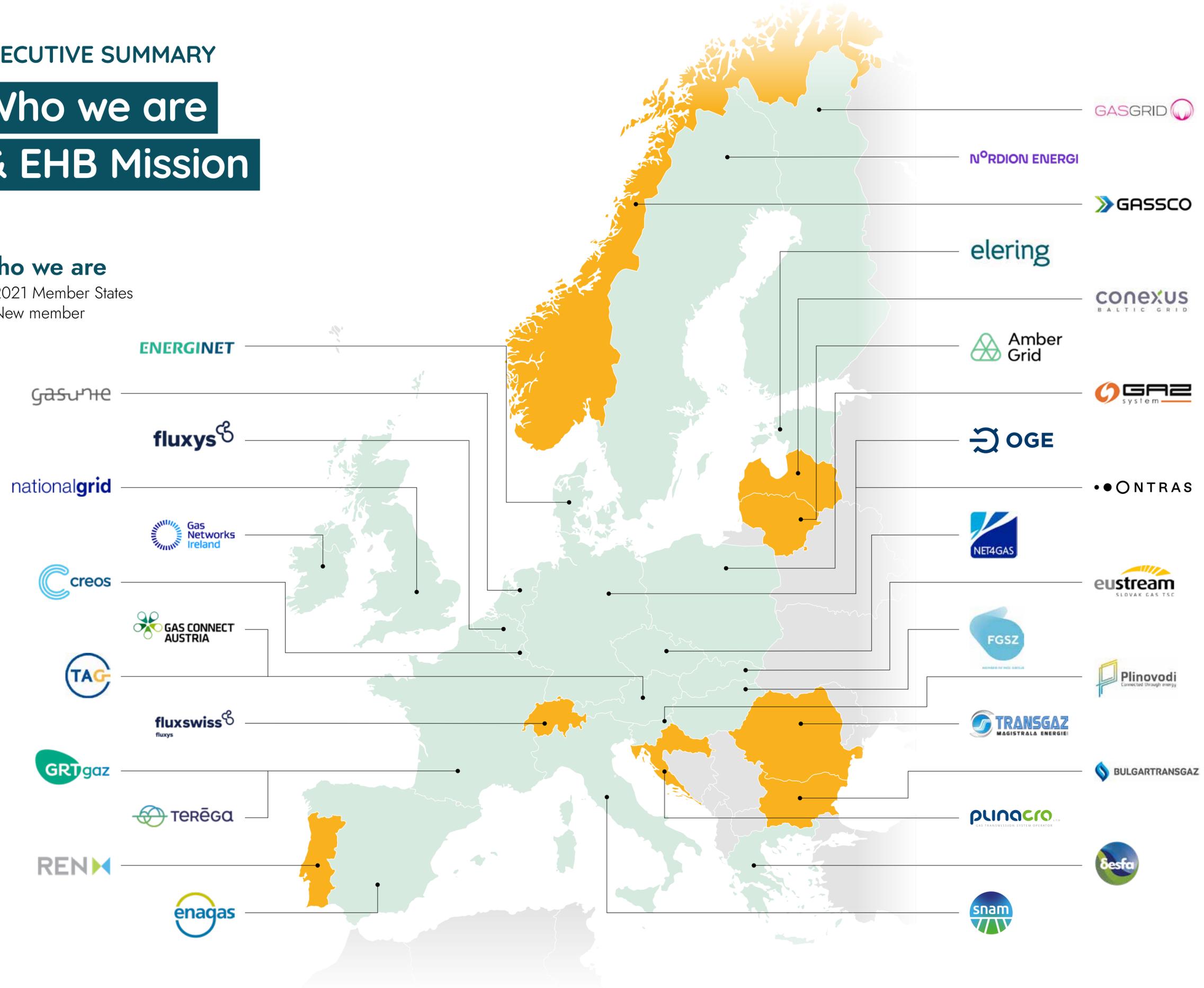
MAY 2022



Who we are & EHB Mission

Who we are

- 2021 Member States
- New member



EHB Mission

- Accelerate decarbonisation of the European energy system
- Define the critical role of hydrogen infrastructure
- Support development of a competitive and liquid European hydrogen market
- Foster cross-border collaboration between Europe and its neighbors

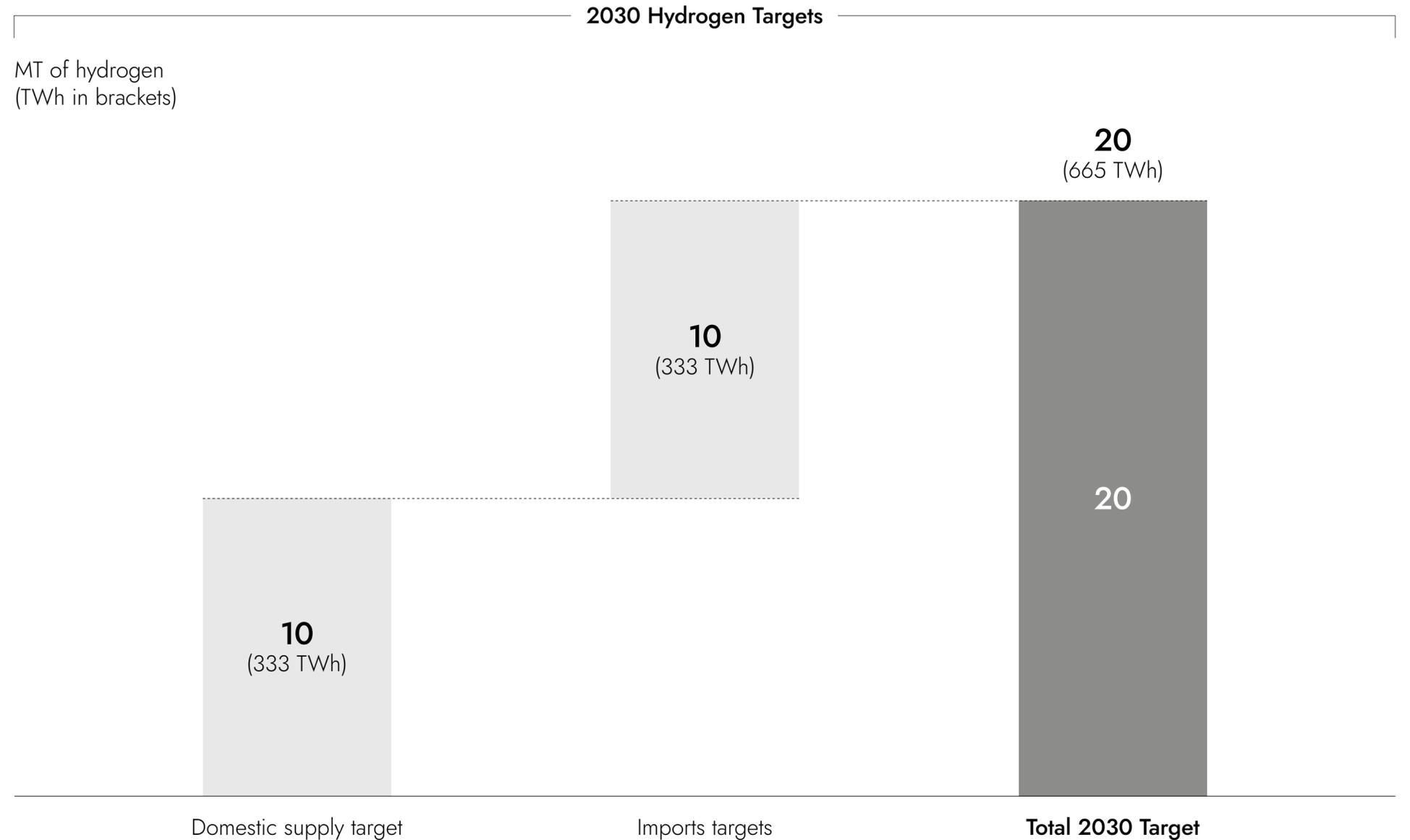
Europe's accelerated 2030 climate targets define an aggressive role for hydrogen

Europe has defined a **bolder and more ambitious hydrogen target of 20 MT** by 2030 in response to the **RePowerEU plan** to phase out Russian fossil fuel imports well before 2030

This includes a **10 MT target of domestic EU hydrogen supply**, as well as a **10 MT target of hydrogen imports** from outside the EU.¹

These targets are strengthened by accelerated **national climate ambitions** as well as the accelerated development of the **European hydrogen market**.

Note: This study's underlying analysis was largely completed prior to the publication of the detailed RePowerEU plan and its 2030 hydrogen targets. As such, this study's supply and demand estimates were not intended to align with the 20 MT target by 2030.



¹ The RePowerEU target of 10 MT of imports includes 6 MT of renewable hydrogen and 4 MT of imported ammonia / derivatives.

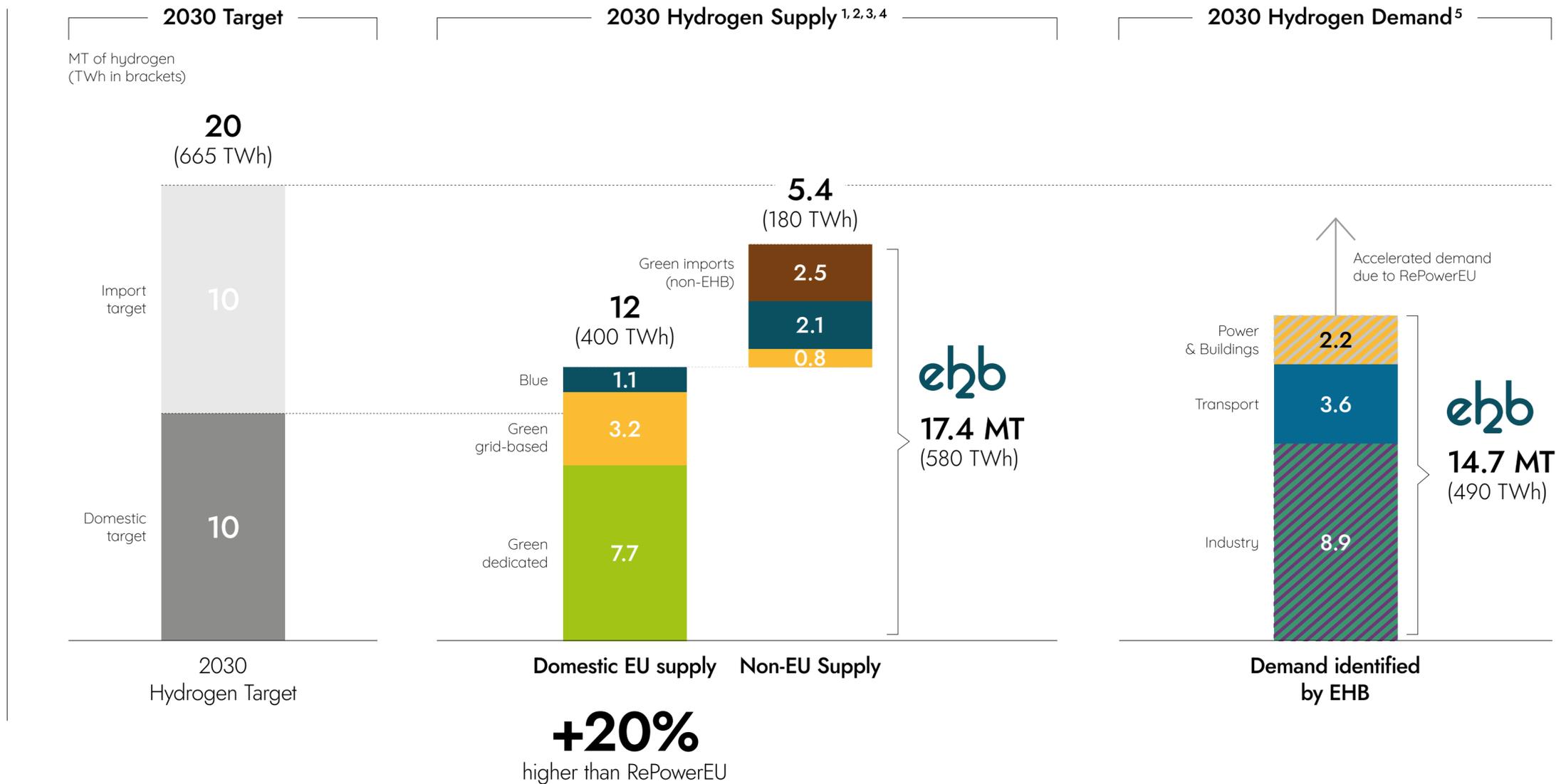
The EHB initiative has identified sufficient hydrogen supply to exceed the 2030 domestic targets

EHB identified **12 MT of domestic supply, exceeding the RePowerEU domestic target by 20%** and supporting European energy independence and security of supply.

EHB also identified **5.4 MT of supply** from non-EU neighboring countries, for a **total of 17.4 MT of supply**.

EHB also identified **14.7 MT of demand** based on a bottom-up assessment of demand by sector and country.

We expect this demand estimate to **increase and accelerate further** in response to the RePowerEU plan.



These supply and demand estimates represent **tangible and achievable projections** based on national targets, market developments and announced projects, primarily **prior to the release of the RePowerEU plan**.

1 EHB did not analyse ship imports of hydrogen or derivatives like ammonia and methanol. To meet the 20 MT target, an additional 2.6 MT of hydrogen or derivative imports would be needed.
 2 The 5.4 MT of non-EU supply includes 2.5 MT (~80 TWh) of green hydrogen imports from non-EHB countries (Morocco, Algeria, Tunisia and Ukraine), along with 2.1 MT of blue hydrogen and 0.8 MT of grid-based hydrogen from EHB, non-EU countries (the UK and Norway). Blue hydrogen potential, and its economic viability, is subject to the evolution of gas markets, regulations and the uncertainty of natural gas prices.
 3 Estimates of national green hydrogen supply for European countries are based on projections of renewable energy scaling up above and beyond supply levels needed to meet electricity demand.
 4 Other imports may include pipeline or ship imports from other regions not analysed in this study.
 5 Demand includes all EU countries and the UK and Norway. Demand estimates do not include domestic EU consumption of ammonia for shipping or other derivatives. For comparison, RePowerEU considered 4 MT of demand for ammonia and other derivatives.

Regional differences in supply and demand show the importance of connecting regions across Europe

Across different regions in Europe, there are **significant differences in the hydrogen supply-demand balance**.

Some regions are characterised by a **net supply of low-cost, hydrogen resources**. These regions benefit from vast renewable energy potential, high capacity factors and substantial land availability.

Other regions will require hydrogen imports from other European or neighboring regions to meet their hydrogen demand.

Hydrogen pipeline infrastructure can bridge these regional supply-demand differences across Europe in a cost-effective manner.

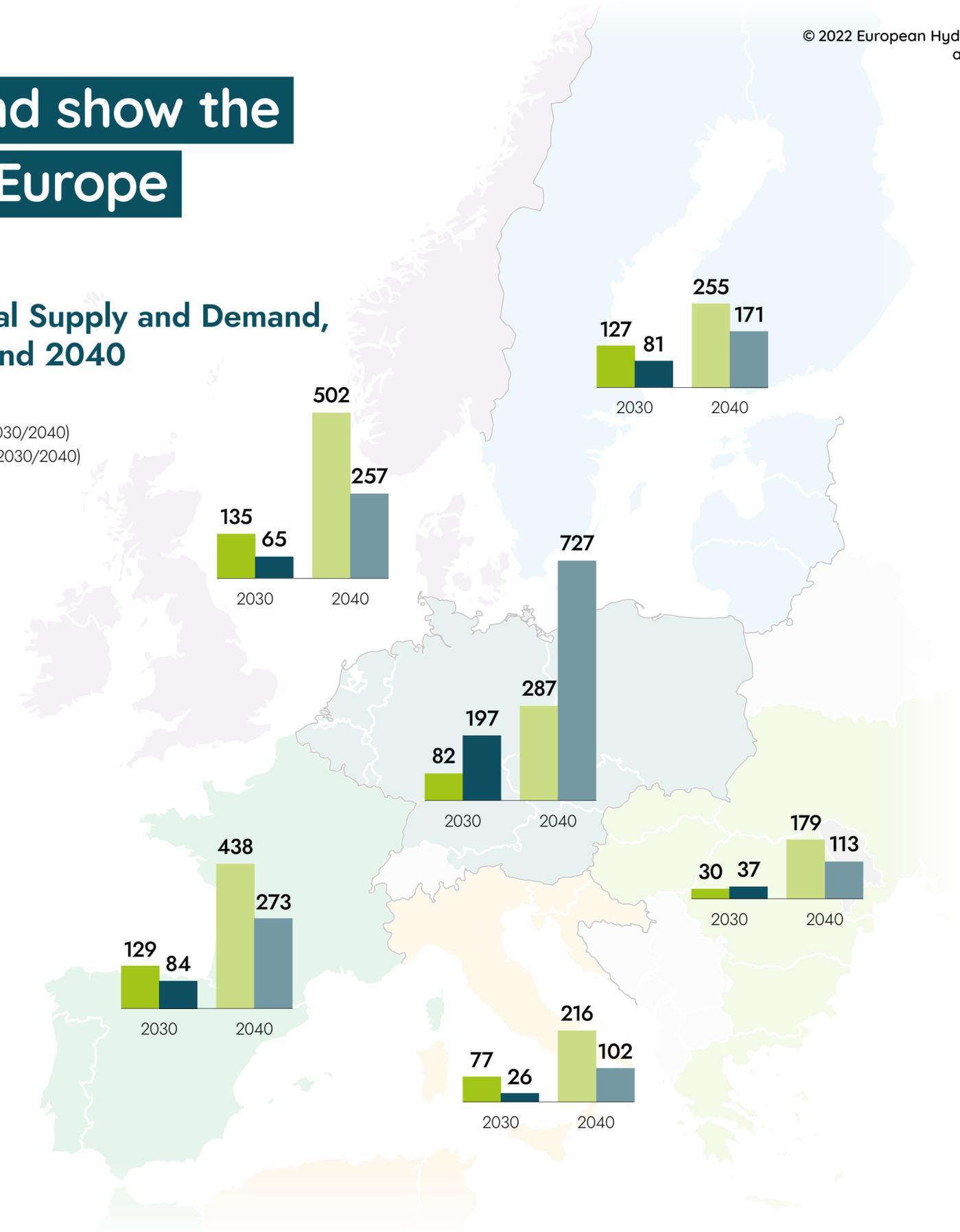
The EHB vision delivers the infrastructure needed to connect hydrogen supply and demand across Europe.

1 Aggregated demand and supply are based on the 2030 figures determined in this study. Supply figures include imports from North Africa and Ukraine. Note: Demand and supply figures may increase further in response to more ambitious national policies and measures following the RePowerEU plan.
 2 This analysis estimates -490 TWh of demand and -580 TWh of supply in 2030 and does not attempt to determine how hydrogen supply and demand will balance out across Europe, nor which hydrogen supply sources – or from which regions – will be used to meet demand.
 3 Demand and supply figures may not align with figures presented in the rest of the report based on aggregation of countries into regions and due to rounding.

Regional Supply and Demand, 2030 and 2040

(TWh)^{1,2,3}

■ Supply (2030/2040)
 ■ Demand (2030/2040)



Five supply corridors are key to the EHB vision and can deliver access to abundant and low-cost hydrogen supply by 2030

To deliver the 2030 hydrogen demand targets set by the RePowerEU plan, **five large-scale pipeline corridors are envisaged**.

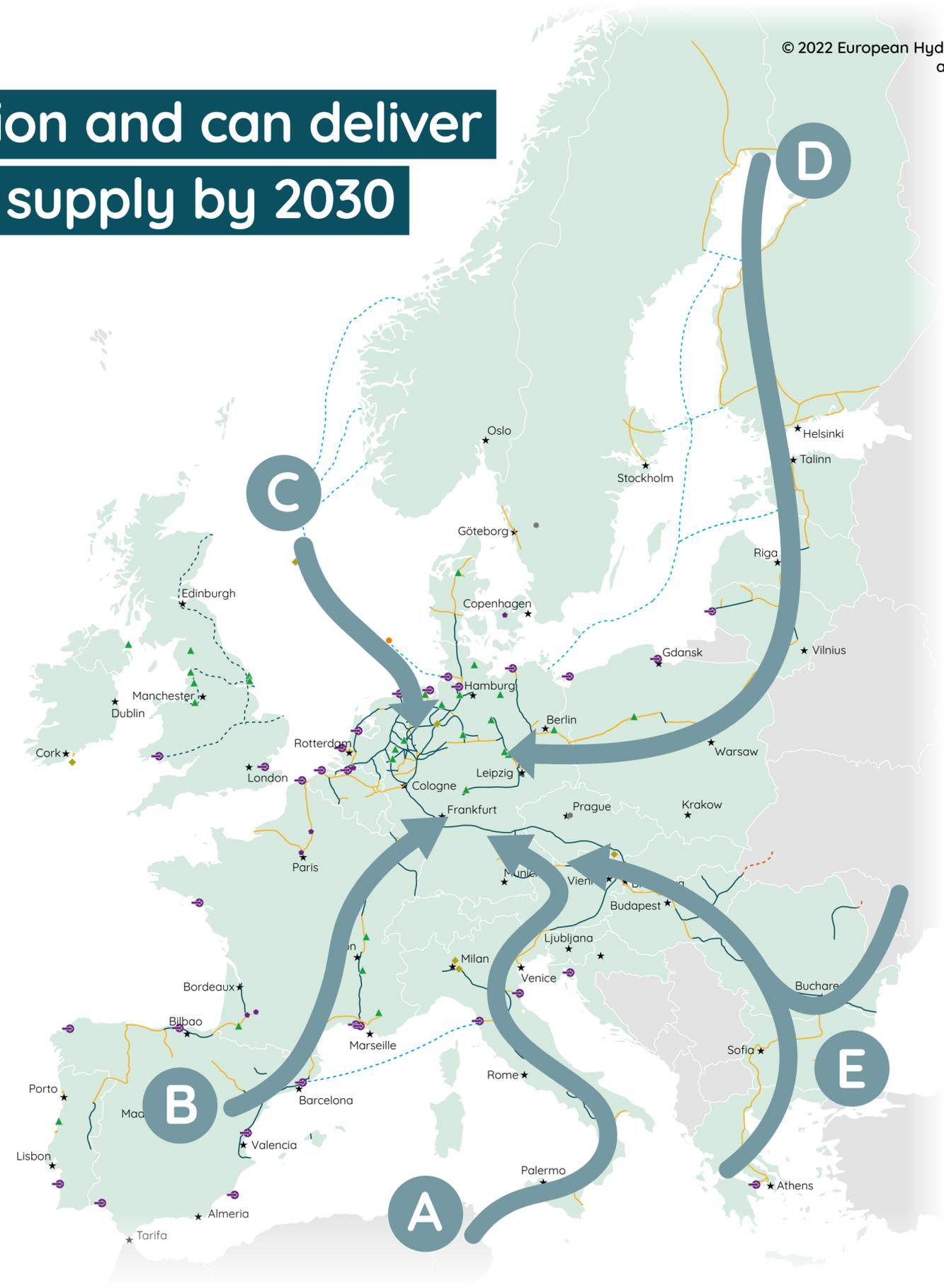
The corridors will **initially connect local supply and demand** in different parts of Europe, before expanding and **connecting Europe with neighboring regions** with export potential.

Certainty about the deployment of this infrastructure will **enable market actors to develop** supply and demand more rapidly

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**

These five corridors **span across both domestic and import supply markets**, consistent with the **three import corridors** identified by the RePowerEU plan, including a corridor via the **Mediterranean** (Corridors A and B), via the **North Sea** (Corridor C) and via **Ukraine** (Corridor E)



These five corridors represent the collective vision of the 31 gas infrastructure companies part of the EHB initiative

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



Note: Since all corridors terminate in Germany, OGE and ONTRAS are presented in each corridor grouping.

Each corridor has a unique regional role in enabling the scale up of low-cost hydrogen supply and the decarbonisation of energy demand

Corridor A — North Africa & Southern Europe

Corridor A would transport **large quantities of cost-competitive green hydrogen potential from Tunisia and Algeria** through Italy to central Europe leveraging existing gas infrastructure.

Corridor A would decarbonise **existing industries along the route in Italy and Central Europe as well as in Germany.**

Corridor B — Southwest Europe & North Africa

Corridor B would transport **green hydrogen supply from the Iberian peninsula and North Africa**, and gain **access to underground storage sites in France** to deliver stable hydrogen supply.

Corridor B would decarbonise **regional industry and transport clusters in Portugal, Spain, France and Germany.**

Corridor C — North Sea

Corridor C includes hydrogen supply from ongoing and planned **offshore wind, blue hydrogen and large-scale integrated hydrogen projects in the North Sea.**

Corridor C would meet **demand from industrial clusters and ports in the UK, the Netherlands, Belgium and Germany.**

Corridor D — Nordic and Baltic regions

Corridor D would transport green hydrogen supply potential from **onshore and offshore wind from countries surrounding the Baltic Sea.**

Corridor D would be built around **regional networks around industrial clusters**, serving numerous new **green steel, e-fuel, fertilizer and green chemicals projects in the Nordics** as well as decarbonizing existing industry in the Nordics, Baltics, Poland and Germany along the corridor route.

Corridor E — East and South-East Europe

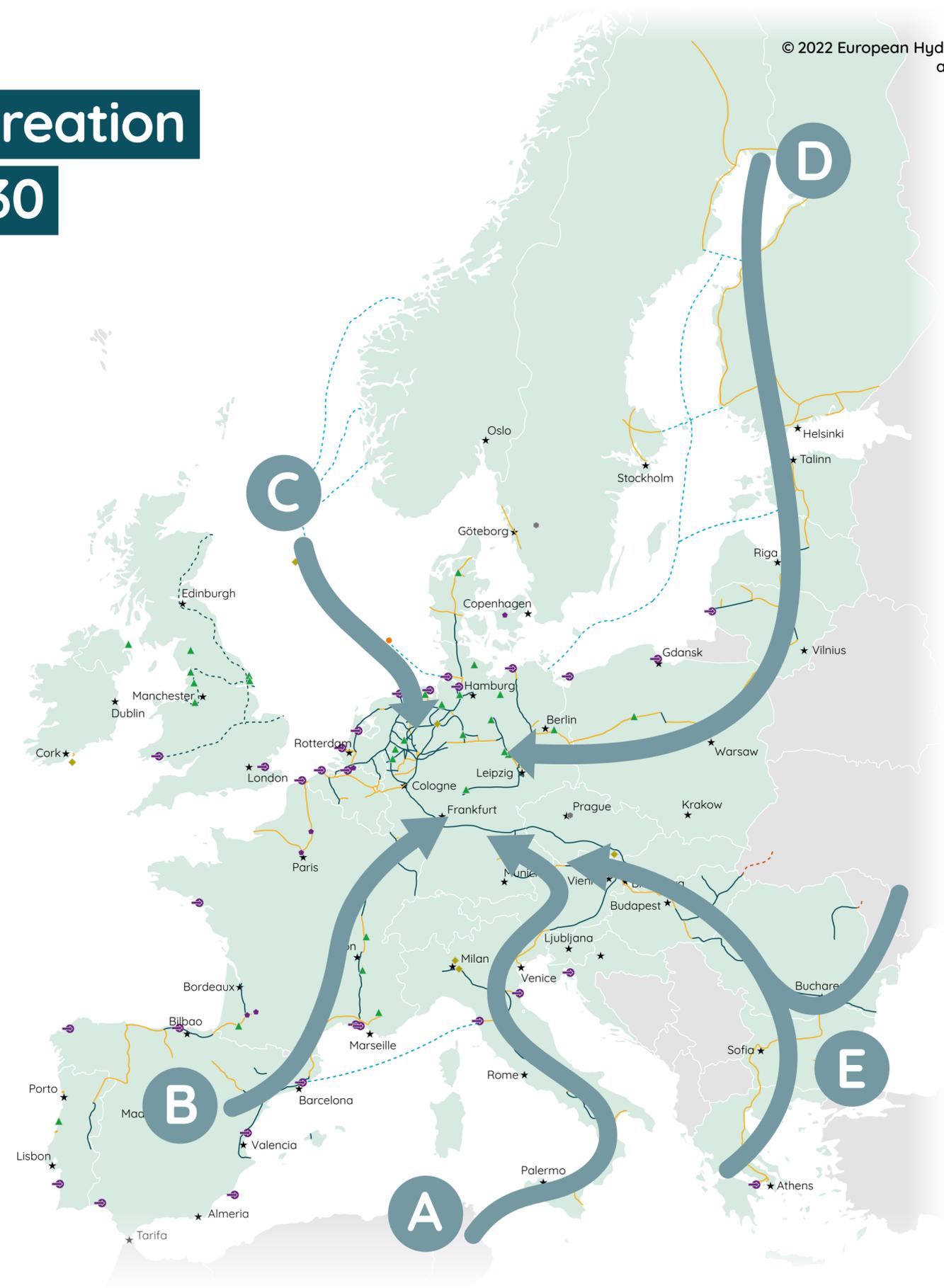
Corridor E would connect **high supply potential regions such as Romania, Greece, and Ukraine¹** — leveraging vast land availability and high-capacity factors for solar and wind.

Corridor E would deliver hydrogen to **off-takers in Central Europe and Germany.**

¹ While Ukraine is expected to be a hydrogen exporting region, there is significant uncertainty related to Russia's invasion of Ukraine and its impact on Ukraine's gas infrastructure and economic development.

These five supply corridors will enable the creation of a pan-European hydrogen market by 2030

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 - **Connect** substantial hydrogen supply and demand across European regions and **leverage** underground storage to deliver stable supply
 - **Access** vast volumes of cost-competitive domestic hydrogen supply and hydrogen imports from neighboring regions
 - **Foster** the creation of a liquid, pan-European, hydrogen trading market
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 - **Accelerate** the deployment and integration of renewable energy resources
 - **Support** scale-up of green, innovative European industries
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 - **Increase** the resiliency of Europe's energy system
 - **Contribute** to European energy independence and diversity of supply.
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 - **Deliver** substantial and cost-effective emission reductions



To ensure the development of each corridor by 2030, there is a need for clear and concrete actions

Corridor A
North Africa
& Southern Europe



Corridor D
Nordic and
Baltic regions



Corridor B
Southwest Europe
& North Africa



Corridor C
North Sea



Corridor E
East and South-East
Europe



Fostering development of new and repurposed hydrogen infrastructure, for example, by unbundling rules facilitating the efficient use of TSO expertise and services and by allowing the adoption of different vertical unbundling models in the EU, as is the case with natural gas

Unlock financing to fast-track hydrogen infrastructure deployment by applying regional regulatory flexibility and other pragmatic financing solutions (including incentivizing the adoption of hydrogen by demand sectors)

Simplify and shorten planning and permitting procedures for the full value chain of renewable energies and hydrogen infrastructure projects.

Facilitate integrated energy system planning of hydrogen, natural gas, and electricity infrastructure supporting the accelerated deployment and integration of renewable energy resources

Intensify energy partnerships with exporting, non-EHB countries (e.g., with Morocco, Algeria, Tunisia, Ukraine) providing financing support to reduce the cost of capital in export countries and identifying a common certification system for hydrogen exchanges

→ **However, speed will be of essence!**

The EHB initiative stands ready to deliver the hydrogen infrastructure needed to achieve Europe's 2030 hydrogen targets

We have identified a large share of the **demand and supply** needed to meet the **RePowerEU targets**.

We analysed and studied **five large-scale, hydrogen supply corridors** that will be critical in transporting the required amounts of hydrogen.

These five supply corridors have the potential to provide Europe with **access to abundant and low-cost hydrogen supply** by 2030.

To ensure the **development of these supply corridors** on time, we have identified **five key concrete actions**

Ultimately, to realise the hydrogen pipeline infrastructure required by 2030, **action is needed now**.

→ The EHB initiative and its members are ready to deliver

Our recommendation: Establish hydrogen supply corridors as enabler for hydrogen market creation

Answering to RePowerEU

This reports shows how all **31 members** are able to **accelerate the hydrogen infrastructure development** to enable the 20 MT of renewable hydrogen by 2030

EHB recommends introducing the **establishment of hydrogen supply & import corridors as front-running infrastructure,** including all infrastructure requirements, **as a political objective.**