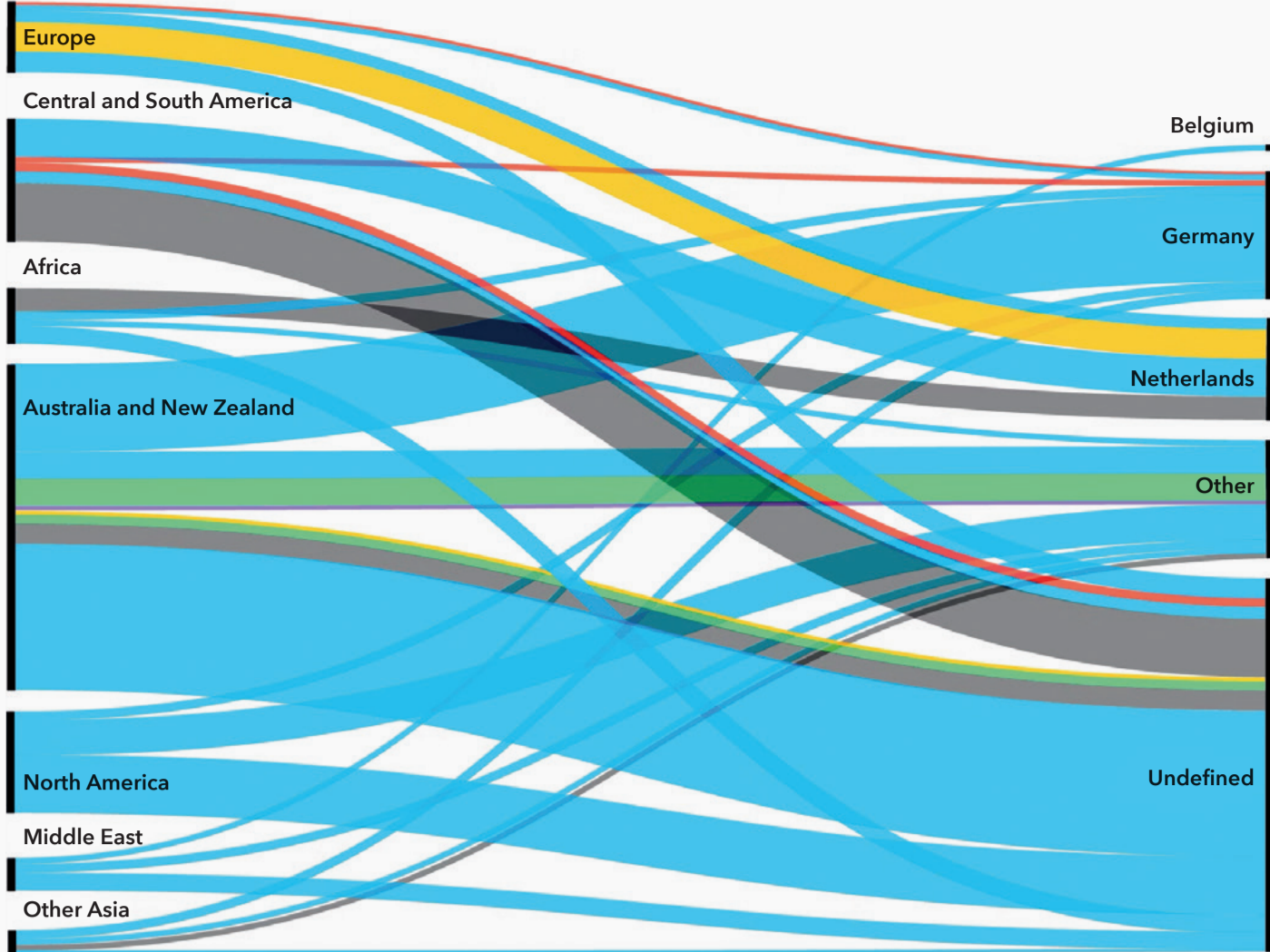


According to analyses conducted by the International Energy Agency (IEA), low-emission hydrogen is crucial for countries to achieve their energy and climate goals in transitioning to a net-zero emission economy. It also plays a key role in the decarbonization of the global energy sector.

**Estimated low-emission hydrogen trade potential considering the announced projects (2030)**



\* IEA defines low-emission hydrogen as hydrogen produced via electrolysis. The electricity needed for electrolysis is generated from renewable energy sources, nuclear energy, or fossil fuels with carbon capture, utilization, and storage (CCUS) technology.

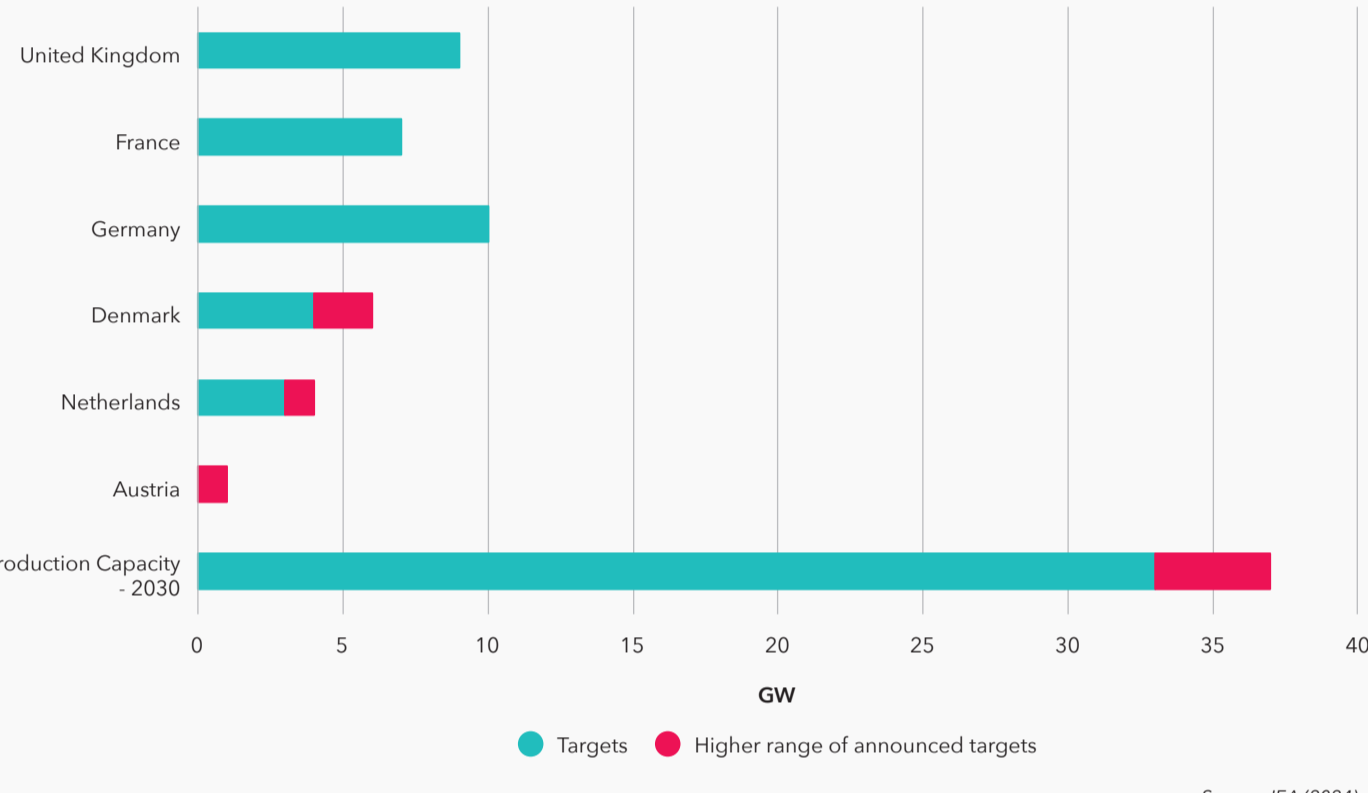
Source: IEA (2024)

Based on global projects on the trade of hydrogen and its derivatives, IEA estimates that by 2030, potentially 16 million tons (Mt) of hydrogen-equivalent fuel could be circulated around the world. However, almost three-quarters of such export-oriented projects are still in the early stages of development.

By 2030, almost one-third of the relevant projects have identified potential buyers, though only a few have secured binding purchase agreements. Northwestern European countries are expected to account for three-quarters of global hydrogen imports by that time.

Northwest Europe accounts for almost half of the total hydrogen demand in Europe. The region is considered advantageous due to its proximity to the North Sea, which has high renewable energy and carbon storage potential. The region also stands out with its well-developed and internationally connected natural gas grid, which can partially be adapted for low-emission hydrogen use. In addition to imports, Northwestern European countries aim to install 30-40 gigawatts (GW) of electrolyzer capacity by 2030 to produce their own low-emission hydrogen.

**Northwest Europe - Electrolyzer Capacity Targets (2030)**

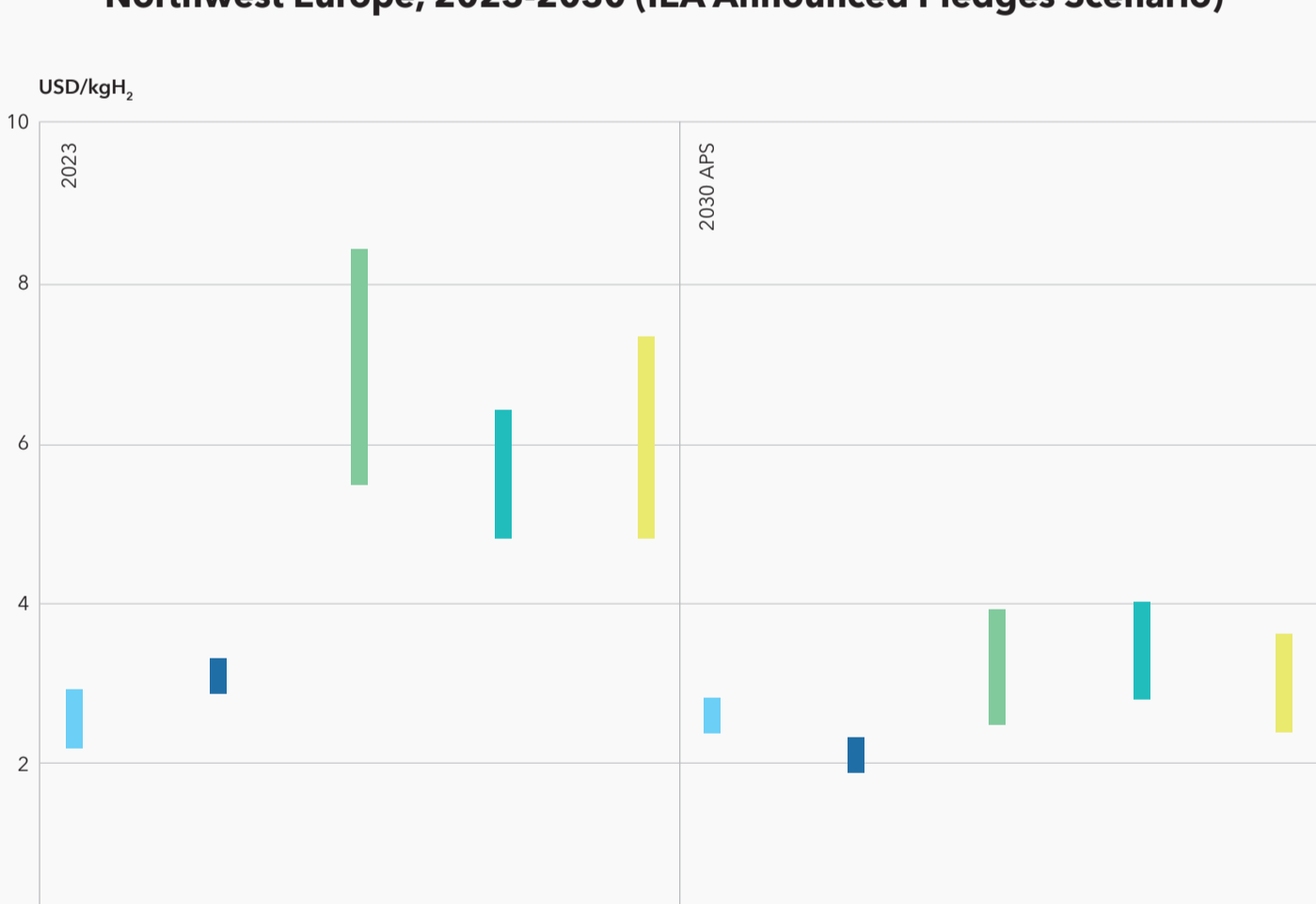


Source: IEA (2024)

According to the IEA, if all the projects in Northwestern Europe focused on producing low-emission hydrogen and its derivatives become commercially viable and achieve the targeted efficiencies, the region could produce 7 million tons (Mt) annually by 2030. This amount would correspond to 2% of the region's total primary energy demand.

The price of hydrogen produced through renewable energy-based electrolysis is estimated to be approximately three times the levelized cost of natural gas-based hydrogen. Therefore, technological improvements are needed to make low-emission and renewable energy-based hydrogen production more cost-effective.

**Levelised cost of hydrogen for selected technologies in Northwest Europe, 2023-2030 (IEA Announced Pledges Scenario)**



Source: IEA (2024)

To accelerate the global production of low-emission hydrogen and ensure timely operationalization of related projects, a hydrogen market needs to be established. For this purpose, countries can take the following key steps.

- Implementing and defining strategies that include medium- and long-term hydrogen targets
- Preparing legal regulations for the development and scaling up of the hydrogen market, accelerate investments and facilitate international trade
- Ensuring demand security for low-emission hydrogen via establishing a pipeline of projects by defining standards, quotas, and public procurement rules
- Defining measures and incentives to improve the cost competitiveness of renewable hydrogen
- Creating effective subsidy schemes and support mechanisms along the entire value chain (R&D, production, transport, storage, etc.) including demand creation, to scale up the use of low-emission hydrogen
- Developing hydrogen infrastructure in terms of transport and storage for the effective use of hydrogen

- In addition to reducing emissions in the hard-to-abate sectors, low-emission hydrogen will also lower fuel imports, enhancing energy supply security.
- The integration of low-emission hydrogen into the system requires specific regulations and roadmaps, particularly to support hydrogen use. The "Hydrogen Technologies Strategy and Roadmap of Türkiye," published in 2023, is expected to be followed by a relevant legal framework that includes standards for hydrogen production, storage, transportation, and use.
- Türkiye, which has a high potential for renewable energy, plans to install 2 GW of electrolyzer capacity by 2030 and increase this to 70 GW by 2053.
- With its high renewable energy potential and developed natural gas pipeline and port infrastructure, Türkiye has significant prospects for low-emission hydrogen production and international trade. To use this potential efficiently, strategies for hydrogen production and export should be developed taking into account domestic demand.
- Türkiye should monitor developments in high-potential hydrogen markets, such as Northwestern Europe, and define its role within its own geographic region.
- According to the results of SHURA's net zero carbon roadmap, the shares of e-fuels and green hydrogen in industry and transportation are set to increase rapidly by 2030, owing to the expected technological developments, decreasing costs and the acceptance of such technologies in the world as well as in Türkiye. In the analysis, the share of green hydrogen and other e-fuels in the total energy demand of Türkiye in 2053 corresponds to approximately 15%.