

Green hydrogen: Global market outlook

By BCC Publishing Staff

Hydrogen fuel is seen as vital for decarbonizing the economy, through replacing fossil fuels in the industrial and transportation sectors as well as aiding in the storage of clean energy (Figure 1).

According to the International Energy Agency, since 1975, the demand for hydrogen fuel has tripled, reaching almost 70 million tons in 2018. According to the World Bank, in 2020, the global demand for hydrogen fuel reached 87 million tons and is anticipated to reach 500 to 680 million tons in 2050. Significant disruptions in the oil and gas sector due to the Russia-Ukraine war have further propelled the need for energy security in the global economy, mainly in Europe.

There are three primary ways to produce hydrogen fuel.

- **Grey hydrogen** is produced by steam reforming of natural gas. This process emits about 9–11 kg of CO₂ per kg of hydrogen production.
- **Blue hydrogen** is also produced by steam reforming of natural gas, but the carbon emissions are captured and stored.
- **Green hydrogen** is produced through water electrolysis. This process emits no CO₂ if renewable energy sources, such as wind and solar power, provide the electricity.

In 2021, green hydrogen accounted for less than 0.1% of worldwide hydrogen production. The cost of electricity is the most crucial variable influencing the financial viability of green hydrogen. It is imperative that energy-efficient electrolyzers be developed. As the prices

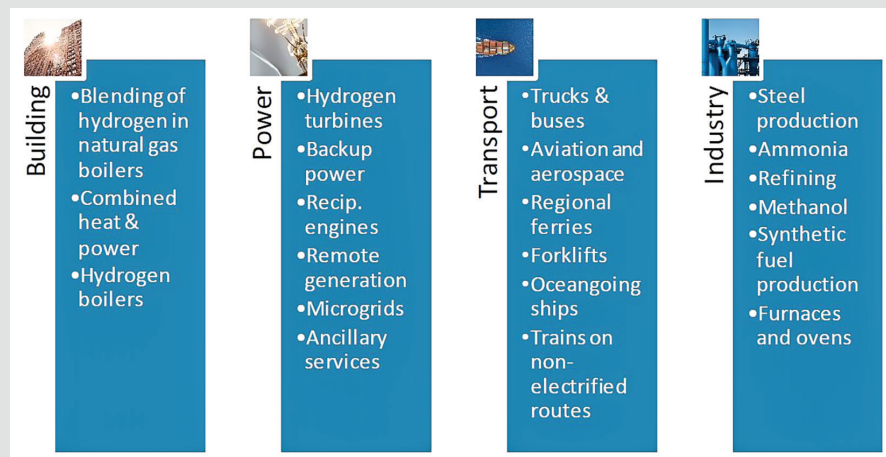


Figure 1. Applications of hydrogen across various end-user sectors.

of renewable energy fall, the production cost of green hydrogen delivered via renewable energy will also decrease.

Among the total installed capacity for green hydrogen production in 2021, nearly 70% was based on alkaline water electrolyzers, while most of the remaining capacity was based on proton exchange membrane (PEM) electrolyzers. Among other technologies that held a minority share, anion exchange membranes and solid oxide electrolysis cells were common; however, they are less mature than alkaline and PEM electrolyzers.

Currently, most hydrogen is consumed at the same location where it is generated. It can be transported by trucks, tankers, and trailers within pressurized gas containers and in cryogenic liquid tanks. But transportation is a cost-intensive process due to the costs of liquefaction, regasification, and refrigeration.

In the global green hydrogen market (Table 1), Europe has emerged as the dominant region, contributing 57% of the market by volume in 2021. While Europe is expected to maintain its dominance throughout the forecast period, the Asia-Pacific region is expected to register the highest compound annual growth rate (CAGR) of 26.0%.

Table 1. Global market volume of green hydrogen, by region, through 2027 (kilotons)

Region	2021	2022	2027	CAGR % (2022–2027)
Europe	535.8	638.0	1,829.2	23.4
Asia-Pacific	319.6	388.2	1,232.1	26.0
North America	57.5	69.4	212.4	25.1
Rest of the world	27.1	32.5	97.4	24.5
Total	940.0	1,128.0	3,371.1	24.5

About the author

BCC Publishing Staff provides comprehensive analyses of global market sizing, forecasting, and industry intelligence, covering markets where advances in science and technology are improving the quality, standard, and sustainability of businesses, economies, and lives. Contact the Staff at Helia.Jalili@bccresearch.com.

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