

Global Green Hydrogen Market Research Report 2025-2030

Market Report | 2025-08-14 | 134 pages | Arizton Advisory & Intelligence

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Report description:

The global green hydrogen market is expected to grow at a CAGR of 56.75% from 2024 to 2030.

GREEN HYDROGEN MARKET NEWS

- In December 2023, Iberdrola, which committed to doubling its Innovation, Development, and Research (R&D&I) investment to \$4.37 billion by 2030, secured recognition as the world's top private utility in R&D for two consecutive years.
- In December 2023, SoCalGas and Bloom Energy are collaborating on a hydrogen project at Caltech, showcasing hydrogen's potential for long-duration clean energy storage.
- In September 2023, ITM and FRIEM are collaborating to develop a standardized Power Supply Unit (PSU) design optimized for ITM's 2MW Plug & Play electrolysis container.

KEY TAKEAWAYS

- By Technology: The alkaline electrolysis segment accounted for the largest market share of over 61%.
- By Source: The wind energy segment dominates and holds the largest share of the global green hydrogen market.
- By End-User: The refining segment accounts for the largest market share in 2024.
- By Geography: In 2024, Europe accounted for a share of over 41% of the global green hydrogen market.
- Growth Factor: The global green hydrogen market is set to grow due to a rise in applications of green hydrogen and an increase in sustainability & environmental concerns.

GREEN HYDROGEN MARKET TRENDS

Over the past few years, green hydrogen has attracted substantial public and private investments globally, signaling growing confidence in its role in the energy transition. Major players like Siemens Energy, Air Liquide, Plug Power, and others are channeling billions into electrolyzer manufacturing, hydrogen hubs, and end-use technologies.

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The increasing share of solar and wind in global power systems is creating volatility in supply, which helps green hydrogen balance. Acting as both a long-duration energy storage solution and a flexible load sink, green hydrogen allows excess renewable power to be converted and stored for later use.

Rapid advancements in electrolyzer technologies, especially in Proton Exchange Membrane (PEM) and Solid Oxide Electrolyzers (SOEC), are significantly improving the efficiency, durability, and cost-competitiveness of green hydrogen production. Innovations are driving down capital costs, increasing current densities, and enabling systems to operate under dynamic conditions. Anion Exchange Membrane (AEM) electrolyzers are emerging as a promising alternative to traditional electrolysis methods, offering the potential for high efficiency at a lower cost without relying on precious metals like platinum or iridium. This technology combines the benefits of both alkaline and PEM systems, potentially making it ideal for large-scale green hydrogen production.

GREEN HYDROGEN MARKET DRIVERS

Green hydrogen is gaining traction across diverse sectors such as transportation, power generation, steel manufacturing, refining, and ammonia production. As hard-to-abate industries seek decarbonization solutions, green hydrogen offers a viable, scalable alternative to fossil-based fuels. Its versatility as a fuel, feedstock, and energy carrier is driving new use cases and infrastructure development globally.

With mounting pressure to reduce carbon emissions and combat climate change, green hydrogen is emerging as a critical component of sustainable energy strategies. It offers zero-emission production when powered by renewables and emits only water when used, aligning with global net-zero targets and ESG goals across industries and governments.

Government support has become a critical driver in accelerating the global green hydrogen market. Through national strategies, tax credits, subsidies, and major funding programs, countries are actively promoting hydrogen as a cornerstone of decarbonization. Countries are also advancing bilateral hydrogen trade partnerships and domestic manufacturing initiatives. This wave of policy-driven momentum is unlocking private investment, reducing market risk, and scaling hydrogen infrastructure worldwide.

SOEC technology is gaining momentum due to its high efficiency and ability to utilize waste heat from industrial processes, reducing overall energy requirements for hydrogen production. Its suitability for integration with high-temperature systems makes it attractive for energy-intensive sectors, driving commercial interest and R&D efforts in large-scale hydrogen applications.

INDUSTRY RESTRAINTS

Despite its environmental benefits, green hydrogen remains significantly more expensive than fossil-based hydrogen due to the high costs of electrolyzers, renewable electricity, and system integration. Competing with gray or blue hydrogen poses an economic challenge, especially in markets with minimal subsidies or carbon pricing.

Green hydrogen production via electrolysis requires large quantities of purified or desalinated water, about 9 liters per kilogram of hydrogen. In water-stressed or arid regions, this adds operational complexity and cost, making project development less feasible.

GREEN HYDROGEN MARKET SEGMENTATION INSIGHTS

INSIGHTS BY TECHNOLOGY

The global green hydrogen market by technology is segmented into alkaline electrolysis, proton exchange membrane, and others. The alkaline electrolysis (ALK) segment accounted for the largest market share of over 61%, reflecting its crucial role in the clean energy transition. ALK systems operate using an alkaline electrolyte, typically potassium hydroxide (KOH), to split water molecules into hydrogen and oxygen. Their proven scalability makes them particularly well-suited for large-scale hydrogen production, aligning with industrial needs and grid-level energy storage applications. A key driver of demand for alkaline electrolysis is its seamless integration with renewable energy sources. As the world moves toward decarbonization, storing surplus

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renewable energy has become essential to ensuring energy stability. ALK systems help convert this excess energy into green hydrogen, offering a flexible and reliable storage solution to mitigate the intermittency of solar and wind power. Moreover, the declining costs of renewable energy and ongoing technological advancements in electrolysis are strengthening the competitiveness of ALK technology. As renewable electricity becomes more affordable, the cost-efficiency of green hydrogen production improves, encouraging broader adoption across industries seeking to reduce their carbon emissions.

INSIGHTS BY SOURCE

The global green hydrogen market by source is categorized into wind energy, solar energy, and others. The wind energy segment dominates and holds the largest share in 2024. Wind energy is a key renewable source for producing green hydrogen through electrolysis, owing to its maturity, wide adoption, and alignment with global decarbonization goals. The growing push toward clean energy transition has intensified the demand for renewable hydrogen as a sustainable fuel, positioning wind power as a central contributor due to its low emissions and abundant availability. The intermittent nature of wind generation complements the flexible operation of electrolyzers, which can be ramped up or down depending on energy availability. This adaptability makes wind energy particularly suitable for green hydrogen production, especially in regions rich in wind resources such as coastal areas and open plains.

In October 2024, ABO Energy received approval under the German Federal Immission Control Act for its first hydrogen pilot project. The initiative will integrate a wind turbine with green hydrogen production and include both a refueling station and a trailer filling facility.

INSIGHTS BY END-USER

Based on the end-user, the refining segment accounts for the largest global green hydrogen market share in 2024. This industry currently accounts for approximately 40 million tonnes of hydrogen consumption annually, primarily for essential processes such as hydrocracking and desulfurization of fuels like diesel and petrol. Traditionally, this hydrogen has been derived from fossil fuels, particularly through steam methane reforming (SMR), contributing to considerable carbon emissions. Hydrogen plays a central role in the refining process, especially in the desulfurization of crude oil to meet quality standards for end products. The demand for hydrogen in this context is driven by two primary factors. First, the global demand for refined petroleum products is expected to grow, particularly in emerging economies. Second, stringent environmental regulations aimed at reducing sulfur content in fuels are intensifying hydrogen use in desulfurization processes.

GREEN HYDROGEN MARKET GEOGRAPHICAL ANALYSIS

In 2024, Europe accounted for a share of over 41% of the global green hydrogen market. Europe stands at the forefront of the global green hydrogen transition, driven by ambitious climate goals under the European Green Deal and the Fit-for-55 package. The European Union has made green hydrogen a central pillar of its decarbonization strategy, targeting 10 million tonnes of domestic production and 10 million tonnes of imports by 2030, under the REPowerEU Strategy.

European energy and manufacturing giants are forming strategic partnerships to advance hydrogen technology. Projects such as H2Med, a planned hydrogen pipeline connecting Spain, France, and Germany, demonstrate a coordinated approach to building a cross-border hydrogen economy in 2023.

Europe's expanding renewable energy base often leads to excess generation. Green hydrogen enables the conversion of surplus wind or solar power into storable, transportable fuel. This helps stabilize energy grids and maximize the use of clean electricity, as seen in projects like Iberdrola's solar-powered hydrogen facility in Spain.

The APAC region shows significant growth, with the fastest-growing CAGR of over 63% during the forecast period. The region is experiencing rapid development in green hydrogen, led by countries like China, Japan, South Korea, and Australia. China is investing heavily in electrolyzer manufacturing and hydrogen hubs, aligning hydrogen development with its dual carbon goals. Japan and South Korea are pioneers in hydrogen mobility, with national roadmaps emphasizing fuel cell vehicles and hydrogen

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refueling networks.

Countries are looking to reduce dependence on imported fossil fuels and increase energy resilience. South Korea, which imports almost all its energy, is investing in hydrogen to diversify its energy mix. Its Hydrogen Economy Roadmap includes plans for hydrogen fuel cell vehicles and infrastructure by 2040.

Heavy industries in APAC (e.g., steel, chemicals, cement) are under pressure to decarbonize, and green hydrogen offers a viable pathway. China, the world's largest steel producer, is piloting green hydrogen in steelmaking processes in companies like Baowu Steel, which plans to integrate hydrogen-based reduction techniques.

GREEN HYDROGEN MARKET COMPETITIVE LANDSCAPE

The global green hydrogen market report contains exclusive data on 44 vendors. The market features a diverse and competitive landscape, with players spanning traditional hydrogen producers, technology providers, and green hydrogen suppliers.

Established firms like Linde, Air Liquide, and Air Products continue to improve conventional production methods, challenging the shift to green hydrogen on cost grounds. Meanwhile, companies such as ITM Power, Nel, and Siemens Energy drive innovation in electrolyzer technology powered by renewables. Major energy firms like Engie and Linde are also entering the green hydrogen supply market. Competition is shaped by factors like production cost per kilogram and energy efficiency, with R&D playing a key role in reducing costs and enhancing supporting infrastructure. The competitive landscape in the green hydrogen market is evolving rapidly and is characterized as relatively immature. As of the current scenario, companies face competition primarily from companies based in the EU and the UK.

Key Vendors

- Air Liquide
- Air Products and Chemicals
- Bloom Energy
- Engie
- ITM Power
- Linde
- Nel
- Siemens Energy

Other Prominent Vendors

- ACWA Power
- Aramco
- Ballard Power Systems
- Beijing SinoHy Energy
- bp
- Cummins
- Elcogen
- Enapter
- Enel Green Power
- Equinor
- ExxonMobil
- Fuelcell Energy
- Fusion Fuel
- Genvia

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- Lhyfe
- LONGi
- Loop Energy
- McPhy Energy
- Messer
- Orsted
- Plug Power
- Sinopec
- Sunfire
- Sungrow Power Supply
- thyssenkrupp nucera
- Topsoe
- Toshiba Energy Systems & Solutions Corporation

SEGMENTATION & FORECASTS

- By Technology
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 - o□Proton Exchange Membrane
 - o□Others
- By Source
 - o□Wind Energy
 - o□Solar Energy
 - o□Others
- By End-User
 - o□Refining
 - o□Ammonia
 - o□Others
- By Geography
 - Europe
 - o□Germany
 - o□Spain
 - o□France
 - o□Portugal
 - o□Italy
 - APAC
 - o□China
 - o□India

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KEY QUESTIONS ANSWERED:

- 1.□How big is the global green hydrogen market?
- 2.□What is the growth rate of the global green hydrogen market?
- 3.□Which region dominates the global green hydrogen market?
- 4.□What are the factors driving the global green hydrogen market growth?
- 5.□Who are the major players in the global green hydrogen market?

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