

**Japan Green Hydrogen Market Assessment, By Technology [Proton Exchange Membrane Electrolyzer, Alkaline Electrolyzer, Solid Oxide Electrolyzer, Polymer Electrolyte Membrane Electrolyzer], By Renewable Source [Solar, Wind, Hydropower, and Others], By Transportation Channel [Roadways, Waterways, Pipelines], By End-user [Power Generation, Transportation, Chemicals & Petrochemicals, Steel, Food & Beverages, Medical, and Others], and By Region, Opportunities and Forecast, FY2017-2031F**

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**Report description:**

The Japan Green Hydrogen Market size was estimated to be 2 MT in FY2023, which is expected to grow to 3 MT in FY2031. Energy is crucial for developing economies and societies, supporting various sectors such as transportation, industries, and everyday necessities. Nevertheless, the growing energy demand raises environmental issues due to the emission of greenhouse gases and their impact on climate change.

Green hydrogen is gaining popularity in Japan as a solution to environmental challenges caused by increasing energy demands. Utilizing renewable energy sources, green hydrogen offers a sustainable and carbon-neutral energy source for industries, transportation, and everyday needs. This aligns with global objectives and promotes a more sustainable and environmentally conscious energy landscape in Japan.

A significant historical milestone was achieved in FY2018 when Japan became the pioneer in unveiling a comprehensive national hydrogen strategy—an initiative that underwent further refinement in FY2022. Looking ahead, Japan has its sights set on a momentous goal: expanding its hydrogen market to a formidable 20 million tons per annum by the culmination of FY2050.

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Japan invests heavily in green hydrogen initiatives, fostering regional hubs for clean hydrogen production. This growth drives Japan's Green Hydrogen market, integrating clean energy into various sectors. As the nation strives for carbon neutrality, Green Hydrogen gains support from commercial enterprises and individuals, contributing to reducing carbon emissions and achieving self-sufficiency in energy consumption.

#### Green Hydrogen's Potential as a Climate-Resilient Fuel

In alignment with the UNFCCC's Paris Agreement, Japan has solidified its emission reduction objectives, striving to curtail global temperature rise within the confines of 2 degrees Celsius, with a distinct inclination towards the more stringent 1.5 degrees Celsius benchmark. As a testament to this resolve, Japan has set its sights on realizing Net Zero emissions by the culmination of FY2051. The 6th Strategic Energy Plan during FY2022 unveiled an audacious roadmap, encompassing a resolute 46% reduction in greenhouse gas emissions and an ambitious aspiration for renewables and nuclear energy to constitute a substantial 36-38% of the energy matrix.

The Japanese government is placing paramount emphasis on green hydrogen, positioning it as a cornerstone within its Green Growth Strategy, a pivotal conduit towards attaining carbon neutrality by the denouement of FY2051. This dedication to hydrogen was further underscored through a strategic update in June of FY2022, where meticulously tailored action plans were seamlessly woven into the strategy's fabric, expressly prioritizing the acceleration of green hydrogen initiatives.

#### Innovations in Electrolyzers Enable Scaling Up Green Hydrogen Projects

Japan is making significant progress in electrolyzer technology, transforming the production of Green Hydrogen from renewable sources. The government's Green Growth Strategy aims to reduce costs by USD 0.21 per Nm<sup>3</sup> by FY2031 and to USD 0.14 per Nm<sup>3</sup> by FY2051. This ambitious goal aims to propel Japan's green hydrogen market into a new era.

In tandem, the strategy is unfurling an ambitious blueprint for augmenting the volume of green hydrogen supply. The objectives are audacious, aiming to attain a capacity of 3 million tons by FY2031, which will surge to an impressive 20 million tons by FY2051, aligning harmoniously with Japan's overarching goal of carbon neutrality.

These advancements are intrinsically tied to groundbreaking Research and Development initiatives. A pertinent example is the Fukushima Hydrogen Energy Research Center, currently erecting a hydrogen production facility in Fukushima Prefecture. With a targeted hydrogen output of 1,000 tons per annum by FY2026, such endeavors promise to substantially slash the cost of green hydrogen generation. The result is a fortified Japanese green hydrogen market, poised to invigorate the nation's transition towards clean, sustainable energy solutions.

#### Japan's Proactive Strategy Paves the Way for Sustainable Energy Autonomy

Japan's robust strategy for clean energy showcases a pronounced focus on nurturing the growth of green hydrogen. The government's proactive approach involves the provision of policy frameworks, incentives, and financial support, serving as a driving force behind the advancement and integration of green hydrogen as an enduring and eco-friendly energy solution. This resolute backing bolsters sustainability and reinforces energy autonomy by diminishing the nation's dependence on imported fossil fuels.

In a notable step forward, the Japanese government is emphasizing green hydrogen in the forthcoming Strategic Energy Plan, anticipated for cabinet endorsement in the fall of FY2024. This blueprint sets its sights on an ambitious goal: to incorporate hydrogen and ammonia into the energy landscape, constituting a substantial 1% of the primary energy mix and electricity supply by FY2031. This initiative harmonizes seamlessly with Japan's broader mission to curtail greenhouse gas emissions by a remarkable 46% from the benchmarks of FY2014. This resounding commitment underscores Japan's resolve to construct a robust and sustainable economy grounded in the principles of Green Hydrogen.

#### Japan Harnesses Cost-Effective Renewable Energy

As the costs of renewable energy experience a downward trajectory, the viability and cost-effectiveness of Green Hydrogen in Japan come to the forefront, facilitating seamless integration across various sectors and enhancing overall energy system efficiency. This strategic approach entails utilizing Green Hydrogen as a valuable reservoir for energy storage, proficiently converting surplus renewable energy into hydrogen for subsequent electricity generation.

The Japanese government's Green Hydrogen roadmap outlines ambitious benchmarks for core technologies and cost reduction strategies. To concretize these objectives, a series of measures have been detailed, including establishing a fleet of 200,000 fuel cell vehicles (FCVs) by FY2026, which will expand to 800,000 FCVs by FY2031. In parallel, the plan encompasses the creation of

320 fueling stations by FY2026, escalating to 900 stations by FY2031. These strategic targets are meticulously designed to accelerate the incorporation of green hydrogen within the mobility domain, propelling its extensive utilization across Japan and fostering a more sustainable energy landscape.

#### Fueling Green Hydrogen Growth Through Comprehensive Infrastructure Advancements

Hydrogen infrastructure advancements targeting storage, transportation, and refueling stations drive Japan's green hydrogen market growth. This holistic strategy integrates hydrogen across power, transportation, residential, and heavy industries, promoting hydrogen-fueled urban transport, fuel cell vehicles, and clean energy storage. Japan's fuel cell technology leader strives to share its expertise globally.

Events like Connect Green Hydrogen Japan 2023 (CGHJ2023) are pivotal in facilitating collaborations and driving the country's green hydrogen market. Such events stimulate growth and innovation within Japan's green hydrogen sector by fostering insightful discussions and encouraging active industry participation. Notably, the formation of the Japan Hydrogen Association (JH2A) in December FY2021, consisting of nine prominent Japanese companies from the automotive, energy, and steel industries, showcases a unified effort to establish a hydrogen supply chain and provide policy recommendations to the Japanese government. Japan's proactive approach also encompasses the development of hydrogen supply chains, including maritime transport. Kawasaki Heavy Industries has achieved significant breakthroughs with the world's first liquefied hydrogen vessel and receiving terminal. Furthermore, Japan's vision includes establishing a manufacturing technology base for renewable hydrogen production by FY2030, contributing to the creation of hydrogen hubs and robust infrastructure.

#### Impact of COVID-19

The COVID-19 pandemic significantly impacted Japan's energy sector, leading to disruptions, decreased demand for transportation fuels, and a contraction in industrial activities. This highlighted the need for resilience and carbon emission reduction. In response, the Japanese government and the private sector have invested substantially in green hydrogen projects, infrastructure, and research. Post-COVID, the Japanese green hydrogen market has surged, emphasizing renewable sources like solar and wind for green hydrogen production.

Japan is actively engaged in pioneering Green Hydrogen R&D, as demonstrated by the Fukushima Hydrogen Energy Research Field (FH2R), which has been operational since March FY2021. Equipped with a 20-megawatt solar facility and a 10-megawatt hydrogen production unit, FH2R utilizes solar and grid electricity for water electrolysis. It conducts experiments to optimize control technologies, seamlessly integrating power grid demand and hydrogen supply responses.

#### Impact of Russia-Ukraine War

The Russia-Ukraine conflict has highlighted Japan's vulnerability due to its heavy dependence on fossil fuels for energy. Japan is proactively exploring alternative energy sources and technologies to enhance energy security and reduce reliance on fossil fuel imports. The country is actively investing in cleaner and more sustainable energy solutions to mitigate potential disruptions caused by geopolitical conflicts.

Japan's significant role as a top importer of liquefied natural gas (LNG) from countries like Russia, Qatar, and Malaysia positions it as a global leader. It can be repurposed to develop green hydrogen by leveraging its extensive LNG infrastructure in ports, storage facilities, and pipelines. This strategic shift aims to bolster Japan's green hydrogen market and align with its vision of achieving a sustainable energy future.

#### Key Players Landscape and Outlook

Major stakeholders in the Japan's green hydrogen sector are actively engaged in research and development (R&D) efforts to enhance technologies, reduce production costs, and enhance efficiency. These key players are making significant investments in large-scale projects and forging strategic partnerships to propel market expansion and foster the development of green hydrogen infrastructure within Japan and on a global scale.

JERA, the largest power generation company in Japan, strongly emphasizes the co-firing of hydrogen and ammonia in its coal-fired power plants as a critical measure for decarbonization. Illustrating this strategy, the Hekinan power station near Nagoya in Aichi Prefecture will initiate a co-firing demonstration project using a fuel blend comprising 20% ammonia and 80% coal.

The New Energy and Industrial Technology Development Organization (NEDO) is constructing a hydrogen supply chain in eastern and western Japan, with a target completion by FY2030. Major automotive players, including Isuzu Motors, Toyota, Hino, and Commercial Japan Partnership Technologies, collaborate to develop light-duty fuel cell electric trucks for widespread adoption.

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This joint effort aims to advance a hydrogen-based society, promote carbon neutrality, and expand hydrogen's utility as a clean energy solution.

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