

Hydrogen Fuel Cell Train Market Size and Forecasts (2020 - 2030), Global and Regional Share, Trends, and Growth Opportunity Analysis Report Coverage: By Technology (Proton Exchange Membrane Fuel Cell, Phosphoric Acid Fuel Cell, and Others), Component (Hydrogen Fuel Cell Pack, Batteries, Electric Traction Motors, and Others), Rail Type (Passenger Rail, Commuter Rail, Light Rail, Trams, Freight, and Others) and Geography

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Abstracts

The hydrogen fuel cell train market was valued at US\$ 1,450.98 million in 2022 and is projected to reach US\$ 3,458.62 million by 2030; it is expected to register a CAGR of 11.5% during 2022–2030.

The increasing awareness of the benefits and efficiency level of hydrogen-driven fuel cells is one of the major driving factors for the hydrogen fuel cell train market. Fuel cells operate on the basic mechanism of converting chemical energy to electricity, which is more efficient than internal combustion engines. Fuel cells make the trains or vehicles more efficient, with less vibrations in the bogies and less noise. The hydrogen-driven fuel cell trains only emit water and waste product but also helps in reducing air pollution. In addition, a hydrogen-driven train's speed limit can range up to 140 km/h and can cover up to 1,000 km without refueling, which is way higher than battery-driven electric trains. Hydrogen fuel cell technology also has an energy conversion competence of ~50–60%, which is quite advanced compared to diesel engines. In addition, the hydrogen trains contain a regenerative braking system, boosting energy efficiency. The increasing efficiency and advancement of hydrogen fuel cell technology in speed, noise,

vibration, and energy efficiency are boosting the global hydrogen fuel cell train market growth.

Increasing Proliferation of Proton Exchange Membrane Fuel Cell Technology is Boosting Hydrogen Fuel Cell Train Market Growth

Fuel cells primarily work on the principle of electrochemical reaction by converting chemical energy into electrical power. One of the most promising technologies of fuel cells is the Proton Exchange Membrane (PEM). The PEM fuel cell technology is most suitable for automotive applications owing to its high-power density. The function of PEM fuel cells can be reversed for O₂ and H₂ generation by using a water electrolysis process. The reverse technology of PEM fuel cells is a promising option for storing excess renewable power. When renewable power generation is more than the required amount, surplus renewable energy can be used to generate H₂, and later, it can be converted back to electricity using PEM (Proton Exchange Membrane) fuel cell technology. The key end use of PEM fuel cells emphasizes transportation mainly because of its possible influence on the environment, like reducing the emission of greenhouse gases. Other uses include portable and distributed or stationary power production. In addition, the hydrogen fuel cell is a budding electrification technology that can offer mobility and reduced noise features for military vehicles while delivering high torque with scalable energy capacities. The growing technological evolution and more ongoing research are anticipated to boost the hydrogen fuel cell train market.

Increasing focus on reducing environmental pollution and controlling carbon footprint in the transportation sector is a major driving factor for the Asia Pacific hydrogen fuel cell train market share. Growing pollution, urbanization, and industrialization are boosting the need for expanded transportation networks. The mounting awareness of the advantages of utilizing hydrogen as a prime element for powering vehicles and trains and its environmental viability boosts the Asia Pacific hydrogen fuel cell train market share. China, South Korea, Australia, Japan, and India are a few of the major contributors to the hydrogen fuel cell train market. Hydrogen fuel cell train market players such as CRRC Corporation Ltd., IHI Corporation, and Hyundai Corporation are launching environment-friendly alternatives in the transportation sector to lower carbon emissions. The growing government initiatives toward boosting carbon neutrality in countries such as India, Japan, China, and Australia also positively impact the hydrogen fuel cell train market. For instance, in 2023, Indian Railways collaborated with the United States Agency to increase and incorporate renewable energy sources in Indian railway infrastructure. Through this agreement, the United States Agency will provide technical support to Indian Railways to boost renewable shares in the overall rail

transport sector. In 2023, the Indian Railways declared to operate 35 hydrogen fuel cell trains per the 'Hydrogen for Heritage' initiative. The project aims to revolutionize the railway infrastructure by incorporating hydrogen as the key alternative to fossil fuels. In 2023, Hyundai Rotem introduced its hydrogen-driven trams for passengers in South Korea. The advanced hydrogen-driven transportation project started in 2021 and was supported by the South Korean Ministry of Trade, Industry, and Energy. All such factors are driving the hydrogen fuel cell train market.

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