

Hydrogen energy storage republic of china

The Chinese government laid out a medium- and long-term development plan for hydrogen, for the period 2021-2035. China targets to bring 50000 hydrogen fuel-cell vehicles on the road by 2025 and to build a number of hydrogen refuelling stations. The plan targets green hydrogen production using renewable feedstock resources to reach 100000-200000 tonnes per year by 2025. Besides transport, the plan envisages the use of clean hydrogen in other sectors: energy storage, electricity generation and industry. Currently, China is already the world largest producer and consumer of hydrogen.

It was the first time that solid-state hydrogen generated by photovoltaic-based power has been used in the country's power system, a milestone for promoting large-scale hydrogen production from renewable energy and accelerating the completion of a new-type power system.

Wang Chengshan, an academician of the Chinese Academy of Engineering, said that solid-state hydrogen storage solves the problem of flexible conversion between green power and green hydrogen, adding that it is expected to become a key driving force supporting evolution of power systems in the future.

Previously, storage of hydrogen was based on its gaseous or liquid status. Gaseous hydrogen storage has risks of high air pressure, flammability and explosion, and liquid hydrogen storage requires a temperature below minus 250 degrees Celsius, which is extremely costly.

The newly-launched hydrogen energy development project, led by China Southern Power Grid (CSG), is expected to solve the technical bottleneck of storing hydrogen in solid form under normal temperature conditions.

It is based on the principle of chemical reaction between hydrogen and a new-type of alloy material. When the ambient temperature of the alloy is raised, the hydrogen gas is released and converted into electricity through a fuel cell. New energy vehicles can directly realize refueling through that method.

According to the head of the hydrogen research center of CSG's power supply branch in Guangzhou, South China's Guangdong Province, "a solid-state hydrogen storage facility is like a large-capacity charger that can store unstable renewable energy such as photovoltaic and wind power with high density, which solves the problem of developing wind and photovoltaic-based power generation with strong volatility and overcomes difficulties of use."

The latest forecast of the Chinese Academy of Engineering shows that under the background of carbon neutrality, hydrogen supply in China will exceed 130 million metric tons in 2060, and that hydrogen energy is predicted to take up 20 percent of end-use energy consumption, with more than 80 percent of it

being“green hydrogen”.

“The integration of hydrogen and electricity will provide an effective way to speed up development and utilization of “green hydrogen” and help achieve China’s “dual carbon” goal of peaking carbon dioxide emissions by 2030 and reaching carbon neutrality by 2060,” said the head of the hydrogen research center of CSG’s power supply branch in Guangzhou.

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Hydrogen energy from renewable resources has the potential to address climate challenges¹, but there are barriers to lowering costs on both the supply and demand sides, with technological advances being the key to success^{2,3,4,5}. Many countries are racing to develop hydrogen energy^{4,6,7,8,9,10}, with the primary goal of taking the lead in hydrogen technology, as well as for additional environmental benefits and diversification of energy supply¹¹.

The 2020 launch of the Fuel Cell Vehicle Pilot City Policy has encouraged more cities to join the hydrogen energy trend as they compete to be chosen for the pilot project. Unlike other programs, this policy encourages intercity collaboration by requiring cities to apply in teams instead of competing with each other in the hydrogen economy. This policy is the first national scheme for hydrogen adoption that specifically engages cities as key players.

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