Hydrogen energy storage republic of china

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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.

Itwas the firsttime thatsolid-state hydrogen generated by photovoltaic-based power has beenused in the country's power system, a milestone for promoting large-scale hydrogen production from renewable energy and accelerating the completion of a new-typepower system.

Wang Chengshan,an academician ofthe Chinese Academy of Engineering,saidthat solid-state hydrogen storage solves the problem of flexible conversion between greenpower and green hydrogen, adding that itis expected to become akeydriving force supporting evolution of power systems in the future.

Previously, storage of hydrogen wasbased on its gaseous or liquid status. Gaseous hydrogen storage has risks of high air pressure, flammability and explosion, and liquid hydrogen storage requires atemperature 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 theambient temperature of the alloy is raised, the hydrogen gas isreleased and converted into electricity through a fuel cell. New energy vehicles can directly realize refueling through that method.

According to thehead 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 ofuse."

The latest forecast of the Chinese Academy of Engineering shows that under the background of carbon neutrality, hydrogen supply in China willexceed 130 million metric tons in 2060, and thathydrogen energy is predicted to take up20 percent ofend-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 success2,3,4,5. Many countries are racing to develop hydrogen energy4,6,7,8,9,10, 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.