

EXECUTIVE SUMMARY

The development of hydrogen energy is of great significance for China to achieve its energy transition, promote new industrial chains, and ensure the country's energy independence. Although late in development compared to other nations, China's hydrogen energy and fuel cell (FC) industry is developing rapidly. Since March 2019, when, for the first time, **hydrogen energy was included in the "Government Work Report"**, local governments have successively issued hydrogen energy and FC industry plans and implemented support measures, hoping to boost local economies. **More than 40 provincial and municipal governments across the country are building hydrogen cities, hydrogen industrial parks and hydrogen valleys.** Used to be driven mostly by automakers and private companies, the hydrogen value chain has started to attract investment from state-owned enterprises. The sector has seen at least 49 investment, merger & acquisitions deals in 2019, exceeding \$14 billion.

The production and sales of fuel cell electric vehicles (FCEVs) surged in 2019, although the number is still insignificant in the large Chinese automobile market. China accounted for a quarter of the global FCEV market in 2019 and now, with more than **6,000 FCEVs on the road**, has bypassed Japan and is just behind the US. Japan and South Korea are leading the world in FCEV manufacturing, but China aims to catch up. China is now targeting to reach 10,000 vehicles by the end of 2020 and 1 million by 2030. Investment in hydrogen refuelling stations (HRS) has accelerated. At the end of 2019, China had 52 HRS in operation and aims to achieve the goal of 1,000 HRS by 2030. **However, despite recent progress, China's hydrogen energy market is still in the early stage of development.** Domestic applications are concentrated in the transportation field, especially FC commercial vehicles. Other hydrogen applications have not been developed yet. FCEV sales are booming but they fully rely on policy support. Investment in HRS is insufficient and faces challenges of high up-front investments, complex regulatory procedures and reliance on foreign equipment.

China's hydrogen energy industry has to overcome regulatory, technological and economic barriers. Despite the importance hydrogen energy has been given, **there is no top-level design and strategic planning about the sector itself.** So far, regulations classify **hydrogen as a hazardous chemical** and restrict liquid hydrogen transport to military use. These regulations lead to scattered developments and higher transportation and supply costs. Although China is the world's largest hydrogen producer, its production, mainly coming from coal, is used as feedstock. There are only a few demonstration projects to produce green hydrogen, mainly linked to the supply of clean energy for the Beijing 2022 Winter Olympics. Blue hydrogen from coal with CCUS needs to achieve scale and cost reductions. From a technical perspective, after years of R&D, Chinese enterprises have been established along the entire FC chain, but **there is still a technology gap between China and international advanced levels.** Many Chinese manufacturers are developing FCEVs, but they rely on foreign stacks leading to higher costs. Moreover, standards for hydrogen energy have not been established.

Looking ahead, **the Chinese hydrogen energy sector is on the cusp of a major breakout.** In the context of the 14th five-year plan (2021-2025), the central government is planning the new development path of the sector, while addressing current bottlenecks. Draft policy documents consider the recognition of **hydrogen as an energy source**, the establishment of a **national strategic plan** and implementation roadmap for the sector, and the **set-up of rules, codes and standards** for hydrogen energy. China will strengthen and coordinate R&D to achieve breakthroughs and cost reductions, and to master and localise FC core technologies and key components. China will also expand the field of hydrogen energy applications. **Financial support will be extended to the full hydrogen value chain in selected powerful regional hydrogen clusters.** Hydrogen has broad development prospects in China. According to the China Hydrogen Energy Alliance, **by 2035, China's hydrogen energy supply will reach 40 million tons, accounting for 5.9% of the final energy demand.** From recognising hydrogen as an energy source to finding ways to encourage consumption

in new sectors, China is pushing ahead with plans to make hydrogen a key component in its energy mix. This will have implications on the global energy, hydrogen and automotive industries.