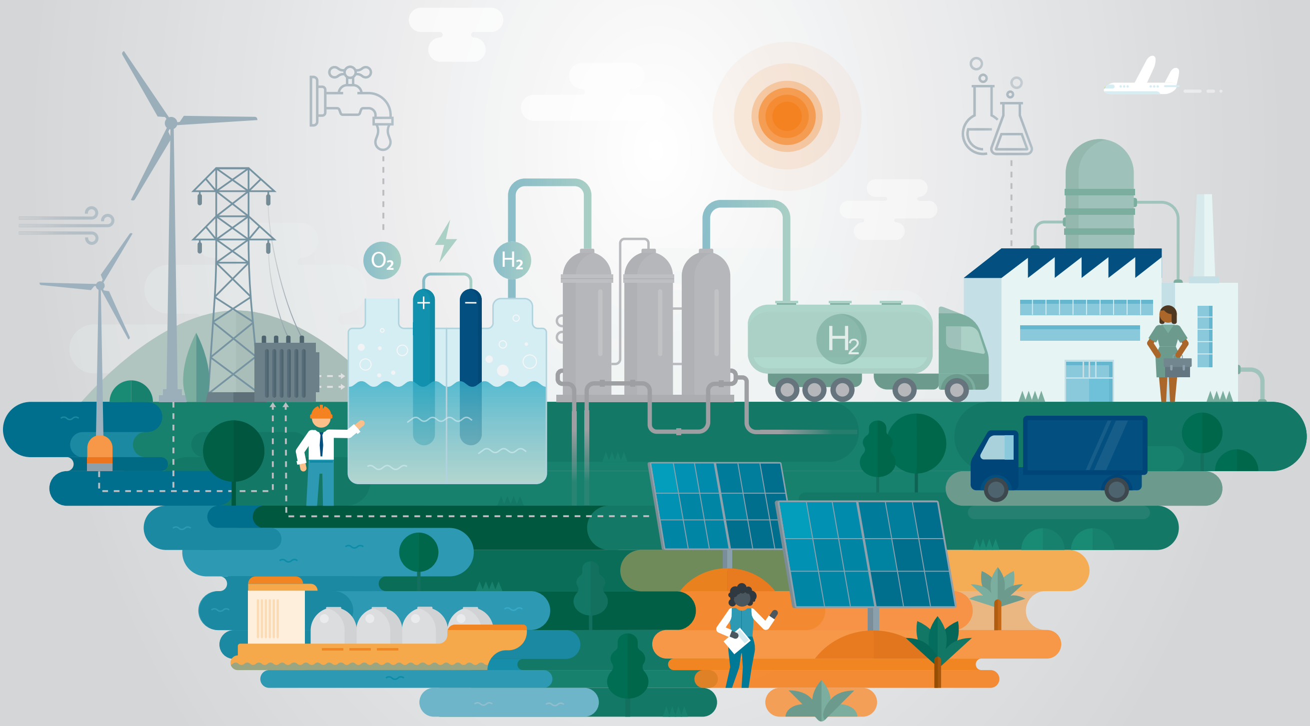
中德能源与能效合作
Energiepartnerschaft
DEUTSCHLAND - CHINA

China's Hydrogen Sector 2025: Balancing Growth and Challenges

Sino-German Energy Partnership



Imprint

The report is published in the framework of the Sino-German Energy Partnership between the German Federal Ministry for Economic Affairs and Energy (BMWE), the National Development and Reform Commission (NDRC) and the National Energy Administration (NEA) of China. As the central dialogue platform on energy between two countries, the main objective of the partnership is to foster and advance the far-reaching and profound energy transitions ongoing in both countries by exchanging views, best practices and knowledge on the development of a sustainable energy system, primarily centered on improving energy efficiency and expanding the use of renewable energy. The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH implements the project under commission of BMWE. As a German federal enterprise, GIZ supports the German government in the achievement of its goals in international cooperation for sustainable development.

Commissioned and published by
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Registered offices
Bonn and Eschborn, Germany

Project
Bilateral Energy Partnerships in Developing and Emerging Countries

Contact
Sino-German Energy Partnership Office
Tayuan Diplomatic Office Building 2-5, 14 Liangmahe South Rd, Chaoyang District
100600 Beijing, PR China

Email: energy-china@giz.de
Website: www.energypartnership.cn
www.giz.de/china
Tel.: +86 10 8527 5589

Authors
Vincent Fremery
Yin Yuxia
Hu Ning
Jury Flickenschild

Technical Support and Coordination
Simon Goess
Yisha Liu

GIZ is responsible for the content of this publication.

On behalf of the
Federal Ministry for Economic Affairs and Energy (BMWE)

As at
2025.08

Design
Zhuochaung Co. ltd, Beijing/Han Yun

Photo credits
Cover/BMWE
Where not otherwise stated: © GIZ

On behalf of:

Federal Ministry for Economic Affairs and Energy

Implementing organisation:

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Table of Contents

Abbreviations

ALK	Alkaline (Water Electrolysis)
AEM	Anion Exchange Membrane
CAPEX	Capital Expenditure
CBAM	Carbon Border Adjustment Mechanism
CCUS	Carbon Capture, Utilisation, and Storage
CASC	China Aerospace Science and Technology
CAPID	China Association for the Promotion of Industrial Development
CEC	China Electricity Council
CERS	China Energy Research Society
CHA	China Hydrogen Alliance
CNIS	China National Institute of Standardisation
CNPC	China National Petroleum Corporation
CQC	China Quality Centre
CSSC	China State Shipbuilding Corporation
CNY	Chinese Yuan
DMFC	Direct Methanol Fuel Cell
EUR	Euro
EU	European Union
FYP	Five Year Plan
FCS	Fuel Cell Stack
GW	Gigawatt
HEIC	Hydrogen Energy Industry Committee
HFCV	Hydrogen Fuel Cell Vehicle
IEA	International Energy Agency
kW(h)	Kilowatt (-hour)
LOHC	Liquid Organic Hydrogen Carrier
MPa	Megapascal
MW	Megawatt
MEA	Membrane Electrode Assembly
Mt	Million tonnes
MEE	Ministry of Ecology and Environment (China)
MIIT	Ministry of Industry and Information Technology (China)
MoF	Ministry of Finance (China)
MoST	Ministry of Science and Technology (China)
MoT	Ministry of Transport (China)
NDRC	National Development and Reform Commission (China)
NEA	National Energy Administration (China)
PV	Photovoltaic
PEM	Proton Exchange Membrane (Water Electrolysis)
R&D	Research and Development
SAF	Sustainable Aviation Fuel
SME	Small and Medium Sized Enterprise
SOE	Solid Oxide Electrolysis
SAC	Standardisation Administration of China
SAMR	State Administration for Market Regulation (China)
SASAC	State-Owned Assets Supervision and Administration Commission (China)
SOE	State-Owned Enterprise

Executive Summary

- As of the end of 2024, China's **hydrogen production** capacity stood at 50 Mt per year. Actual production stood at 37 Mt, primarily deriving from coal (21 Mt) and natural gas (8 Mt), while electrolysis contributed 0.5 Mt. The chemical sector remains the largest consumer, with mobility applications still limited.

- Hydrogen **transport and storage** are primarily reliant on road transportation using high-pressure gas cylinders. Alternative carriers, such as liquid hydrogen and LOHCs, remain in the demonstration phase. Hydrogen pipeline infrastructure is underdeveloped, with only 100 km in operation. Larger pipeline projects are either in planning stage or under construction, including a 4,000 km network initiated by the Inner Mongolia government.

- The development of China's hydrogen industry involves **multiple stakeholders**. Government bodies include the NDRC, NEA, MIIT, MoF, MoT, SASAC, and SAC, which shape policies, regulations, and infrastructure; industry associations such as CHA, CERS, HEIC, and HEIPA facilitate collaboration and standardisation, while universities, research institutes, and over 2000 enterprises, including SOEs and SMEs, drive innovation and commercialisation.

- The central government's **Medium- and Long-Term Plan for Hydrogen Energy Industry Development (2021-2035)** outlines a three-phase strategy: by 2025, establish a policy framework and advance core technologies; by 2030, build a comprehensive innovation system for clean hydrogen; and by 2035, develop a diversified hydrogen ecosystem with a strong role for renewable hydrogen, supporting energy storage, industrial decarbonisation, and economic growth.

- **Local governments** are setting ambitious targets and plans, often preceding national policy, to attract investment, drive innovation, and decarbonise energy. By 2024, over 500 sub-national hydrogen policies were issued, with local goals for renewable hydrogen production far exceeding the national goal.

- **Financial incentives** focused on fuel cell technology for the past years using a performance-based "reward instead of subsidy" model to drive innovation and commercialisation. Most recent subsidiary programmes are increasingly shifting focus towards production technology and application beyond mobility.

- **Standardisation efforts** aim to establish a comprehensive framework but remain less developed than in leading markets like the EU, the US, Japan, and South Korea; while national policies emphasise standard development, challenges include gaps in specialised fields, slow adaptation to technological advances, limited coordination among institutions, and insufficient participation in international standard-setting.

- **Renewable hydrogen production** is rapidly expanding, with a capacity of producing 104,000 tonnes annually and 1180 MW installed across 94 projects, primarily powered by solar energy. Future projects focus on hydrogen-derived fuels like methanol and SAF, with projections of 10 Mt renewable hydrogen production capacity by 2030.

- China leads the world in **electrolysis capacity**, with 3.5 GW by the end of 2024, accounting for 70% of global capacity and projected to reach 50 GW by 2030; ALK electrolysers dominate deployment, while investments in electrolyser installations continue to outpace other regions.

- China dominates ALK electrolyser production but **lags** in PEM and other **advanced technologies.** The country also relies on foreign technology in transport, storage, and industrial applications. Currently, China accounts for 60% of global electrolyser manufacturing capacity. As global production capacity expands, China’s share is expected to decline to 30% by 2030 due to increasing competition from Europe and the US. Despite this, Chinese firms are likely to remain key global suppliers, with exports expected to rise significantly after 2030, even in the face of growing trade barriers.

- The **cost of renewable hydrogen production** has reached record lows at just above EUR 2 per kg in some regions of China. However, coal-based hydrogen remains significantly cheaper to produce. Additionally, a geographic mismatch between supply and demand – where production is concentrated in the renewable-rich north, while consumption is centered in coastal industrial hubs – drives up transportation costs, further limiting the competitiveness of renewable hydrogen compared to coal-based hydrogen.

1 Introduction

Background

China's new Energy Law came into effect in early 2025 and redefined hydrogen as an energy carrier rather than a hazardous chemical. This marks a fundamental shift in how hydrogen is classified and regulated in China. By moving away from its previous designation, the government is signalling stronger policy support and a clearer role for hydrogen in China's energy transition.

Against this backdrop, this report examines the status quo of the Chinese hydrogen industry in 2025. It aims to serve as a practical resource for policymakers, academia, and private sector stakeholders who seek a deeper understanding of the sector's current state, recent policy shifts, and future direction.

To ensure a comprehensive perspective, this report not only examines standard industry metrics but also provides a broader perspective by analysing key stakeholders, policy frameworks, and the development of hydrogen-related standards. At the heart of the report is an in-depth assessment of China's progress in renewable hydrogen, covering the sector's current status, near- and long-term developments, and the major challenges shaping the sector's future.

Notes on terminology and data

This report follows the terminology of the widely recognised Chinese association standard for hydrogen classification published by the China Hydrogen Alliance (CHA) in 2020. The association standard classifies hydrogen into three types based on carbon emissions and energy sources: Low-carbon hydrogen (≤14.51 $kgCO_2e/kgH_2$), clean hydrogen (≤4.9 $kgCO_2e/kgH_2$), and renewable hydrogen (≤4.9 $kgCO_2e/kgH_2$, produced entirely from renewable energy). Therefore, this report uses the term "renewable hydrogen" instead of "green hydrogen" to refer to hydrogen produced entirely from renewable energy sources. (CAB, 2020)

Currency comparisons in this report are based on the exchange rates as of 7 February 2025.

Type	Low-Carbon Hydrogen	Clean Hydrogen	Renewable Hydrogen
CO_2 Emissions ($kgCO_2e/kgH_2$)	≤14.51	≤4.9	≤4.9 (using exclusively renewable energy)

Table 1.1: Classification of hydrogen sustainability levels in China
Source: (CAB, 2020)

2 Sector overview

This chapter provides an overview of the Chinese hydrogen value chain and the key stakeholders driving its development. The first section examines the value chain in detail, covering hydrogen production methods, its diverse applications, and the critical aspects of transport and storage infrastructure. The second section shifts focus to the major stakeholders shaping the hydrogen economy, including government bodies, industry leaders, and other key players.

2.1 Hydrogen value chain: Production and application, transport and storage

Production and application

By the end of 2024, China's hydrogen production capacity reached 50 Mt per year, a year-on-year growth of 1.6%. Production reached 36.5 Mt of hydrogen, 3.5% more than 2023. With global hydrogen production at 102 Mt, China produces a third of the global hydrogen output. (NEA, 2025)

Coal gasification makes up the largest share of China's hydrogen production with a capacity of 28 Mt per year and 20.7 Mt produced. Hydrogen production via coal gasification is almost exclusively limited to China, with global hydrogen production via coal gasification being 19.9 Mt in 2021. The high share of coal gasification in China is due to large coal endowments, a strong coal lobby and low coal prices. Among all hydrogen production routes, coal gasification has the highest emission intensity, ranging from 22.5 to 26.5 $kgCO_2e/kgH_2$. (IEA, 2023a; IEA, 2023b; Ouyang, 2023; NEA, 2025)

Natural gas-based hydrogen production reached 7.6 Mt. Hydrogen production as an industrial by-product was 7.7 Mt. 320,000 tonnes of hydrogen were produced via electrolysis, including both grid-powered and renewables-powered hydrogen production (compare Figure 2.1). (NEA, 2025)

The highest demand for hydrogen in China comes from the chemical sector. In 2023, 9.9 Mt of hydrogen were used to produce ammonia, 10 Mt to produce methanol and 8.2 Mt were used for oil refining. Another 7.8 Mt were used for other, mostly chemical, industrial applications (compare Figure 2.1). Application in the mobility sector is politically enforced but does not yet contribute a large share of China's total hydrogen consumption (more details in Chapter 3.2). Furthermore, applications in the building sector and electricity generation are also minimal. (CHA, 2025b)

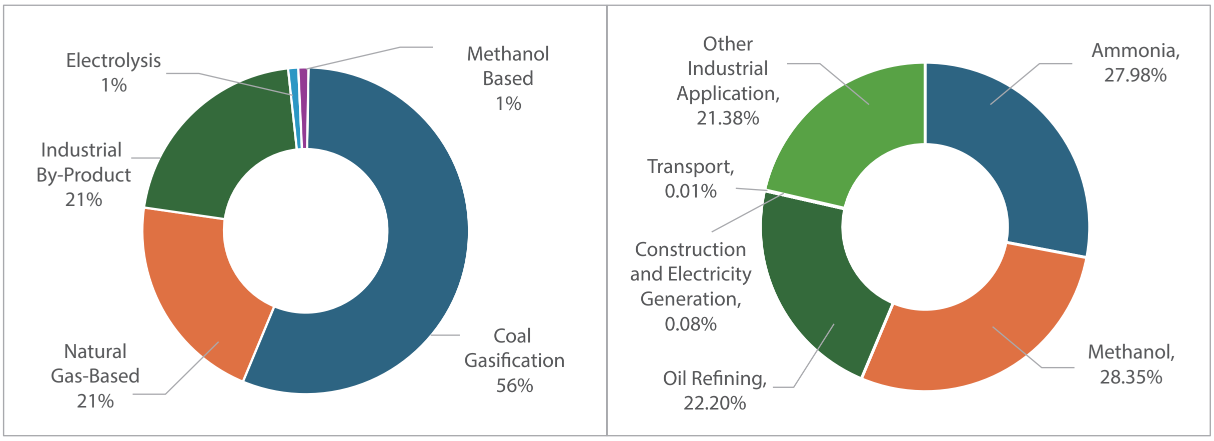


Figure 2.1: Hydrogen production (2024) and application (2023) in China.
Source: (NEA, 2024; CHA, 2025b)

China's hydrogen consumption is projected to reach 60 million tonnes by 2050 and 100 million tonnes by 2060. By then, most of the hydrogen demand is estimated to remain in the chemical industry, accounting for 60%. While the transportation sector's share is expected to rise to 31% of total hydrogen demand, the construction and power sector will make up only smaller portions, with 5% and 4% of hydrogen use, respectively. (Kollar, Qin, & Xiao, 2024; Nakano, 2022)

Transport and storage

With a share of over 98%, high-pressure gaseous hydrogen storage in gas-containers is the most common hydrogen storage method in China. Hydrogen is mostly transported via road, using 35 MPa Type III cylinders. Type III cylinders are wrapped with carbon fibre allowing for a higher storage density. For these containers, 60-80% of the cost stems from the carbon fibre reinforcement. The remaining costs are attributed to components such as valves, balance tanks, and regulators. The cost for mobile hydrogen containers ranges between EUR 15.5-20.3 per kWh of storage capacity. Driven by growing demand from other industries, such as wind turbines and aviation, domestic production of carbon fibre is increasing, and the price is expected to drop. (China EV100, 2024; Kollar, Qin, & Xiao, 2024)

Alternative carrier types, such as liquid hydrogen, ammonia/methanol, or liquid organic hydrogen carriers (LOHC), are not widely applied in China and are limited to demonstration projects. (China EV100, 2024)

Technology for transport and storage of hydrogen largely relies on imports. Regarding hydrogen gas storage containers, compressors and refuelling equipment, Chinese companies have however made significant improvements throughout the past years. Technology required for the production, transport and refuelling of liquid hydrogen, ammonia/methanol and LOHCs is not mature. (China EV100, 2024)

China's hydrogen pipeline network is underdeveloped, with only 100 km of private hydrogen pipelines currently in operation.[1] These single pipelines function as point-to-point connections between production and demand sites. While there is no centralised effort for developing a hydrogen pipeline network, multiple larger scale projects with a total length of over 7000 km are currently in preparation or under construction. Projects include a 400 km hydrogen pipeline connecting Inner Mongolia with Beijing and a 700 km pipeline will link the city of Zhangjiakou in north-western Hebei Province with Caofeidian Port, 250 km southwest of Beijing. The government of Inner Mongolia plans to construct a first network of multiple hydrogen, ammonia and methanol pipelines with a total length of over 4000 km, connecting the province with demand centres in Southern and Central China. (State Council of the People's Republic of China, 2023; Parkes, 2024; Shandong Hydrogen Institute, 2025)

Despite current efforts, the lack of centralised planning is a major bottleneck in the development of the Chinese hydrogen industry. A large share of the current and future electricity generation from renewable sources is located in the north and north-west of the country. As of renewable hydrogen, 89% of operating capacity is located in the north and north-west. For example, the world's largest PV-based electrolyser – Sinopec's Kucha project, with an annual output of 20,000 tonnes of hydrogen – is in Xinjiang, and the Three Gorges Zhun'ger Banner Narisong PV-based electrolyser – with an annual output of about 10,000 tonnes of hydrogen – is in Inner Mongolia. However, hydrogen demand is primarily concentrated in the eastern regions, especially the southeastern part of the country. To transport large quantities of hydrogen over long distances, a hydrogen pipeline network will be required for the development of the Chinese hydrogen industry. (China EV100, 2024; Ouyang, 2024; NEA, 2025)

Although political efforts at the central government level to address this issue have been limited so far, hydrogen transport is expected to become a key focus of Chinese hydrogen policy in the coming years. (Xinhua, 2023; Ouyang, 2024)

2.2 Stakeholders

This chapter aims to provide an overview of the key stakeholders involved in the hydrogen value chain in China, from political entities to associations, research institutions and companies active in the various segments of the industry. For an extended version of this chapter, including a list of enterprises from the Chinese hydrogen sector, refer to Appendix A.

1 For comparison: Around 5000 km of hydrogen pipelines were operational in 2023 in Europe (IEA, 2023a)

Political entities

The development of the hydrogen industry in China involves multiple government bodies. They are responsible for creating an environment conducive to innovation, investment, and the sustainable growth of the hydrogen sector from various angles: strategic planning, regulatory and legislative framework, hydrogen-related infrastructure development, research and development (R&D) support, international cooperation, public awareness, and education.

▶ National Development and Reform Commission (NDRC)

The NDRC is responsible for formulating and coordinating China's macroeconomic policy, including energy policy. In the field of hydrogen energy, the NDRC took lead in issuing the "Medium and Long-Term Plan for Hydrogen Energy Industry Development (2021-2035)" (NDRC, 2022), which clarifies the positioning of hydrogen as a component of the future energy system (see Chapter 3.1 for further details).

▶ National Energy Administration (NEA)

As a vice-ministerial government body under the management of the NDRC, the NEA is responsible for drafting and implementing regulation and strategic plans related to energy development and energy transition. Regarding hydrogen, the NEA's focus is primarily on the development planning of the hydrogen sector:

- Drafting development plans for the hydrogen industry, such as the "Medium and Long-Term Plan for Hydrogen Energy Industry Development (2021-2035)" (NDRC, 2022) and collaborating with the NDRC and other regulatory bodies to foster the industry's growth.

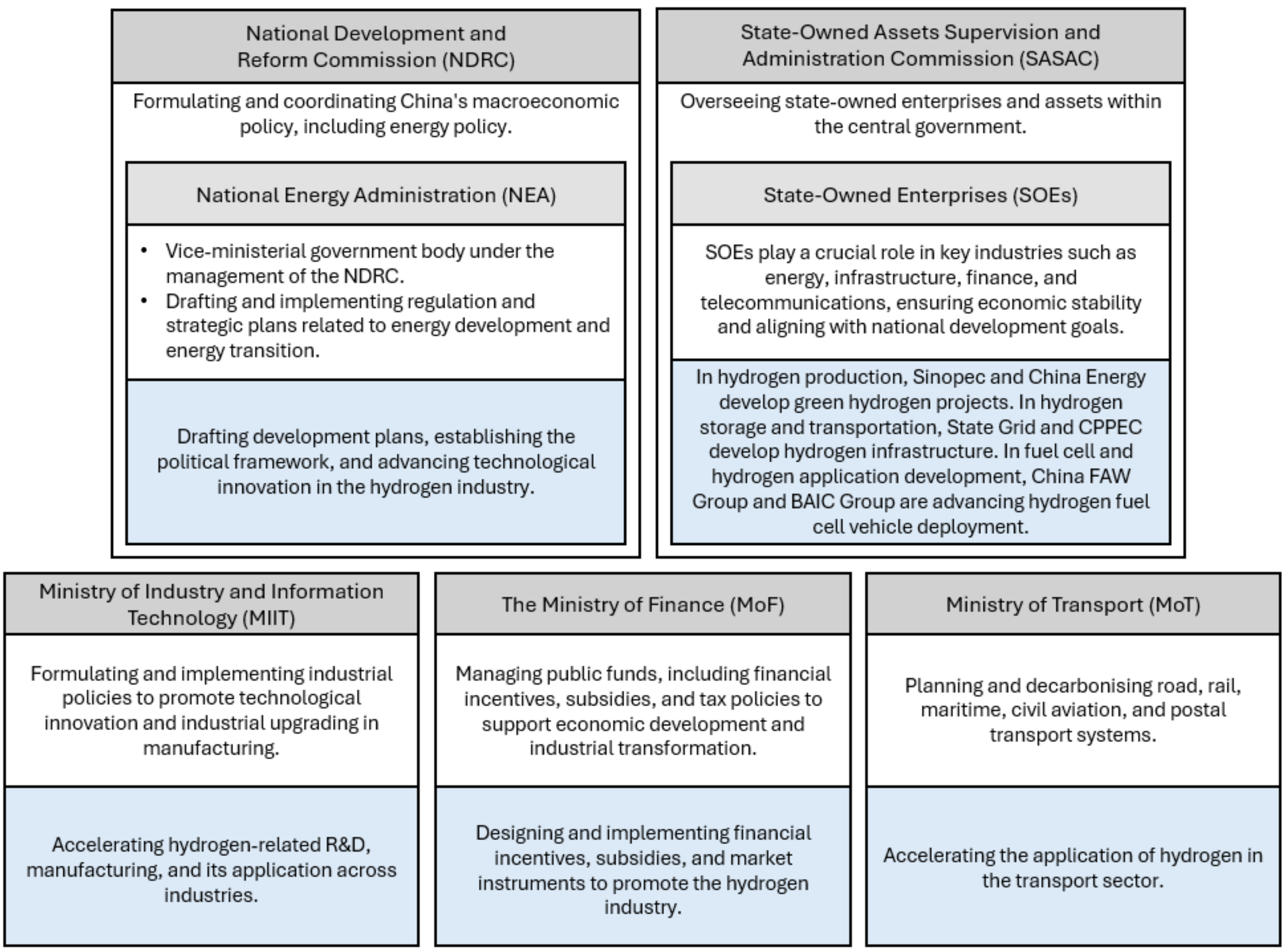


Figure 2.2: Chinese government bodies responsible for hydrogen policy.
Source: Own visualisation.
Note: General responsibility in white, responsibility regarding hydrogen in blue.

- Establishing a comprehensive political framework for the hydrogen industry, including safety supervision and the development of industry standards. In the "Energy Standardisation Action Plan for Carbon Peak and Carbon Neutrality" (NEA, 2022), it calls to develop a complete standard system for hydrogen with a focus on renewable hydrogen production, sector coupling of electricity and hydrogen, and fuel cells (see Chapter 3.4 for further details).
- Advancing technological innovation in hydrogen energy and the construction of hydrogen infrastructure.
- Stimulating the application of hydrogen energy in sectors like transportation and industry and exploring pathways for commercialisation.

▶ Ministry of Industry and Information Technology (MIIT)

The MIIT is primarily responsible for formulating and implementing industrial policies, including promoting technological innovation and industrial upgrading in manufacturing. In the field of hydrogen, the MIIT focuses on the development of hydrogen-related R&D, manufacturing, and the application of hydrogen in industrial fields, such as alkaline water electrolysis (ALK), fuel-cell technology, hydrogen internal combustion engines, and hydrogen application in metallurgy.

▶ The Ministry of Finance (MoF)

The MoF is responsible for allocating public funds, including designing financial incentives, subsidies, and tax policies to support economic development and industrial transformation. It plays a significant role in shaping policies and providing financial support to promote the development of the hydrogen industry, from the allocation of incentives and subsidies to financial policies and market instruments.

▶ Ministry of Transport (MoT)

The MoT is responsible for developing the Chinese transportation system, including the planning and decarbonisation of road transport, rail transport, maritime transport, civil aviation, and postal services. The MoT's primary responsibility regarding hydrogen encompass its application, strategic planning, pilot projects, and safety risk management in the transport sector.

The MoT has initiated pilots for battery electric vehicles, HFCVs as well as renewable synthetic fuel vehicles and vessels as well as for planning and constructing fuel cell charging and refuelling stations along highways. It also promotes the application of fuel cell technology in public transport, such as taxis and buses. Furthermore, the MoT is engaged in investigating the potential application of vessels powered by methanol, hydrogen, and ammonia.

▶ State-Owned Assets Supervision and Administration Commission (SASAC)

The State-Owned Assets Supervision and Administration Commission (SASAC), a ministerial-level body under the State Council, is entrusted with the oversight of state-owned enterprises and assets within the central government. Key performance indicators for SASAC include the security and sustainability of state-owned assets. The major energy suppliers and network operators, including electricity grid and oil/gas pipeline operators are all under the management of SASAC. Currently, 46 out of 98 central government-owned enterprises have added hydrogen business into their portfolio, especially the coupling of electricity and hydrogen, investment and operation of hydrogen production facilities, hydrogen highways[2], and pipeline transportation.

In August 2024, SASAC initiated a hydrogen consortium formed by 116 entities, including the National Energy Group, Sinopec, China Aerospace Science and Technology, China State Shipbuilding Corporation, China National Petroleum Corporation, State Grid, and State Pipeline Network, along with 18 private enterprises and 23 universities. The consortium focuses on advancing renewable hydrogen production, storage, transportation, safety, and testing measures, with the goal of advancing technological innovation and fostering industrial growth of the hydrogen sector. (China Power, 2024)

2 Hydrogen highways are routes with strategically placed hydrogen refuelling stations for HFCVs.

Figure 2.3: The Hydrogen consortium of state-owned enterprises.
Source: (International H2-Energy Net, 2024)

▶ Standardisation Administration of China (SAC) and Standard-Related Stakeholders

The SAC is the national body responsible for developing and managing standards across various industries in China, ensuring consistency and quality in products, services, and processes. It operates under the supervision of the State Administration for Market Regulation (SAMR) and plays a key role in implementing government policies related to standardisation. In August 2023, the SAC in collaboration with the NDRC, MIIT, MEE and other relevant ministries, jointly published the "Guidelines for the Construction of Hydrogen Energy Industry Standard System (2023)" (SAMR, 2023) (see Chapter 3.4 for further details).

Associations

Industry associations are pivotal in advancing the Chinese hydrogen industry. They set standards and foster collaboration among various stakeholders. They facilitate R&D as well as the scaling-up of pilot applications, serve as a bridge between the government and businesses, and are involved in policy development, including drafting and revising policies to interpreting and implementing them.

▶ China Hydrogen Alliance (CHA)

The CHA was established in 2019 by the CHN Energy Group and 19 further entities, including enterprises, universities, research institutes, and financial institutions with the goal to foster the development of the hydrogen industry and to enhance cooperation and communication among its members. The alliance has grown to include 260 members, comprising Chinese and international enterprises as well as research institutes.

▶ The China Energy Research Society (CERS)

The CERS is a national, academic, and non-profit social organisation voluntarily established by enterprises, institutions, social organisations, and people working in energy science and technology areas. With more than 600 company members and 50,000 individual members CERS influences the China's energy sector through their 43 professional committees. The flagship product of CERS in hydrogen area is the China International Hydrogen Energy Vehicles Fuel Cells and Hydrogen Equipment Exhibition. It is one of the most influential exhibitions in China's hydrogen industry. (CERS, 2025)

▶ The Hydrogen Energy Industry Committee (HEIC)

Initiated by the China Energy Conservation Association in 2020, HEIC contributes to the hydrogen industry with information provision via a weekly newsletter, trainings, and the development of association standards (e.g. energy efficiency testing, evaluation and grading methodology for hydrogen liquefaction systems launched in October 2024). (HEIC, 2024)

▶ The Hydrogen Energy Industry Promotion Association (HEIPA)

The HEIPA, established in 2020 by the China Association for the Promotion of Industrial Development (CAPID), consists of over 210 members, including 30 research institutions and 180 Chinese and foreign enterprises such as Siemens, Linde, ThyssenKrupp, and TÜV Süd. It supports the NEA with hydrogen technology and policy research. The flagship product of the Hydrogen Branch of CAPID is the Beijing International Hydrogen and Fuel Cell Exhibition with the China Communications and Transportation Association every March. (HEIPA, 2025)

Research institutes and universities

Chinese universities and research institutes are actively researching hydrogen and fuel cell technology, offering technical expertise, and cultivating talent for the industry. By fostering collaboration between academia and the private sector, they help translate research findings into practical products and services, accelerating the commercialisation of hydrogen technologies in China.

Companies active in the hydrogen sector

As of 2024, over 2000 enterprises are active in the hydrogen sector in China, double the amount in 2020, including 48 SOEs and 88 listed companies. The hydrogen industry in China is further characterised by the contributions of SMEs excelling in key technologies, with 89 of them listed as "Little Giants"[3] by the MIIT. (New Capital News, 2024; China EV100, 2024)

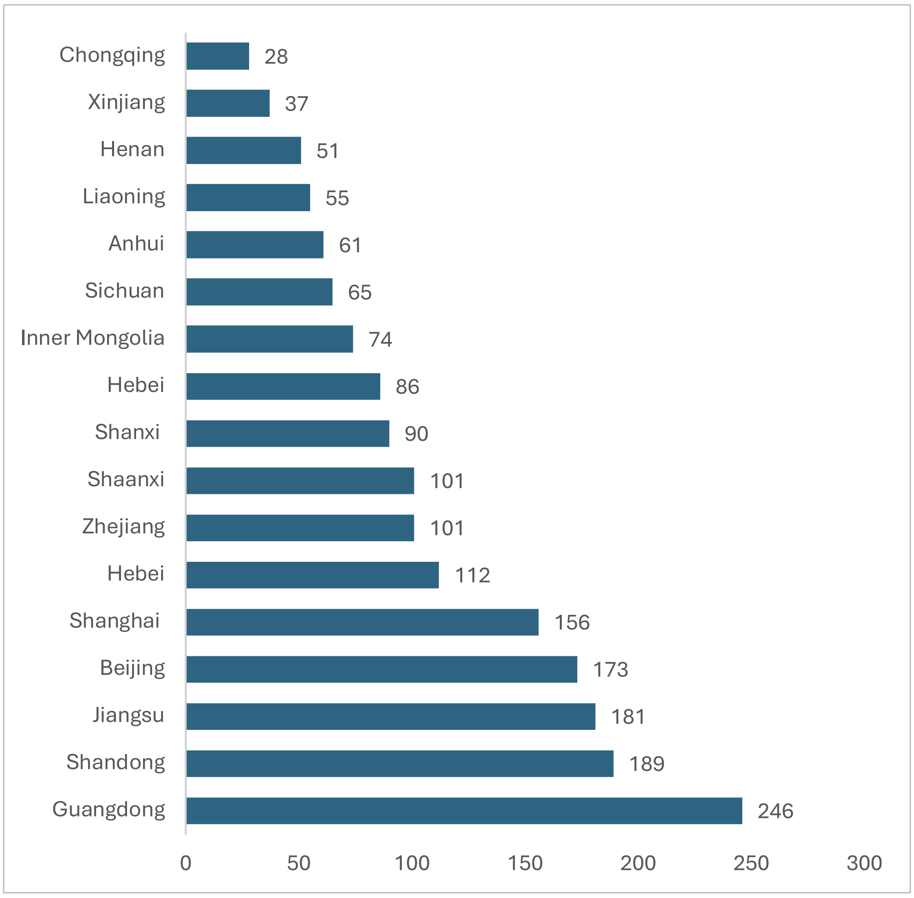


Figure 2.4: Number of Chinese companies active in the hydrogen sector by province (2024). Source: (New Capital News, 2024)

3 SMEs selected by MIIT as leaders in their respective industries, all of whom have high market influence and technological innovation capabilities. As of October 2024, there are 14,600 such enterprises in China.

3 Policy and regulatory framework

This chapter outlines China's regulatory landscape and support mechanisms surrounding its hydrogen sector, including the country's hydrogen strategy, financial incentives as well as the technical standards for hydrogen and hydrogen technologies. The first subchapter introduces the national strategy as outlined in the central national-level hydrogen industry development plan and selected related policies. The second subchapter provides an overview of local strategies, covering policies, targets, and a case example of a regional hydrogen development strategy. The third subchapter delves into national and local-level financial incentives. The fourth subchapter explores technical standardisation within the hydrogen industry, addressing the political framework for standard development, the status quo of hydrogen standard development, key standard-setting committees and challenges.

3.1 National hydrogen strategy

Hydrogen plays a strategic role in China's 14th Five-Year-Plan (FYP; 2021-2025)[4], aligning with the goals of carbon emissions peaking by 2030 and neutrality by 2060 (dual carbon goals). It is recognised as a vital solution for decarbonisation and is included in the FYP under Chapter 9, Section 2: Forward-looking Planning of Future Industries. Alongside cutting-edge technologies like quantum information and gene technology, hydrogen is identified as a strategic industry for fostering innovation and industrial transformation. (State Council of the People's Republic of China, 2021a)

The central single policy piece outlining China's national hydrogen approach is the "Medium- and Long-Term Plan for Hydrogen Energy Industry Development (2021-2035)" (hereinafter: the plan), released in March 2022 by the NDRC (NDRC, 2022). The plan aligns with the dual carbon goals as well as the 14t[h] FYP and addresses challenges related to industrial innovation capabilities and technical equipment, supporting systems and pathways for industry development. (NDRC, 2022)

The plan follows three phases. By 2025, it aims to establish a robust policy framework and advance core technologies in hydrogen production, storage, and transportation. A quantitative production target was only set for renewable hydrogen with 100,000 to 200,000 tonnes to be produced annually by 2025, which is expected to reduce carbon dioxide emissions by one to two Mt annually. By 2030, the goal is a comprehensive innovation system for clean and renewable hydrogen. By 2035, the plan envisions a fully diversified hydrogen ecosystem that significantly increases the role of renewable hydrogen in energy consumption and drives the green transformation of China's energy sector. (NDRC, 2022)

The plan outlines three key roles for hydrogen within China's new energy system:

- Energy storage and grid flexibilisation: Firstly, hydrogen is seen as a crucial component to stabilise the country's diverse, complementary, and integrated energy system. With its strong potential for large-scale, long-term energy storage and its energy conversion potential, the plan envisions hydrogen to facilitate cross-regional and cross-seasonal energy distribution, ultimately helping to stabilise and diversify China's renewables-based energy supply. Considering this, the NEA issued the "Opinions on Accelerating Energy Digitalisation and Intelligence" (NEA, 2023a) in 2023, improving hydrogen infrastructure regulation, exploring hydrogen's potential in cross-energy network optimisation, and promoting hydrogen-electric integration. (NDRC, 2022)
- Decarbonisation of energy, transport, and the industry: Secondly, hydrogen will play a crucial role in the decarbonisation of the energy, transport, and industrial sectors. As for the transport sector, hydrogen is intended to complement lithium batteries for use in commercial vehicles. There is a particular focus on transport as the

4 The national-level Five-Year Plans (FYP) are central policy documents that outline priorities over five-year periods for the achievement of long-term goals guiding national and local-level policies. The current FYP is the 14th FYP (2021-2025) which aims to drive progress while maintaining stability as China transitions from scale-based growth towards "high-quality development" and "socialist modernisation".

plan sets the target of 50,000 HFCV on the roads by 2025. The 2023 NEA "Blue Book on the Development of the New Power System" (NEA, 2023b) states that by 2045, all vehicles will be electric, running on new energy[5] or hydrogen fuel cells. The plan adopts an incremental approach, initially focusing on industry establishment prior to full decarbonisation. Both grey and blue hydrogen play a role in China's strategy. Industrial by-product hydrogen is prioritised in regions with relevant industries, while renewable hydrogen production is planned for areas rich in renewable energy resources. (China EV100, 2024; NDRC, 2022)

In this vein, in the "National Key Low-Carbon Technology Collection and Promotion Implementation Plan" (MEE, 2024), the Ministry of Ecology and Environment (MEE) calls for the prioritisation of renewable hydrogen production and purification of industrial by-product hydrogen. It aims to promote high-efficiency purification technologies for industrial by-product hydrogen.

Producing hydrogen might present an additional revenue stream for operators of coal power plants. Carbon capture, utilisation, and storage (CCUS) is not mentioned in the plan but in the "Modern Coal Chemical Industry Development Notification" (NDRC, 2023) NDRC promotes the integration of coal-based industries with hydrogen production and CCUS. (Ouyang, 2023; NDRC, 2022)

- Hydrogen for economic development: Thirdly, the development of the hydrogen industry is viewed as a significant opportunity for economic growth and a key technological sector in which China can establish global leadership. The plan emphasises the role the hydrogen industry will play for national economic development in line with China's strategy of innovation-led "high-quality development" and industrial upgrading. Innovation is encouraged in the areas of technology and infrastructure for hydrogen production, PEM technology as well as hydrogen storage and transportation. The State Council's 2024 "Action Plan for Large-Scale Equipment Upgrading" (State Council of the People's Republic of China, 2024b) also encourages development of hydrogen-powered green aviation equipment and green methanol ships. (NDRC, 2022)

The innovation system outlined in the plan integrates industry, academia, and research institutions to drive the development of innovative technologies. The plan stresses the role of state-affiliated research institutes, think tanks, and enterprises. Especially central and local SOEs are active in R&D and commercialisation activities. The leading role of SOEs in the development of the hydrogen industry became even more evident with the establishment of the hydrogen consortium (refer to Chapter 2.2 for further details). (Delaval, et al., 2022; NDRC, 2022)

Moreover, the plan highlights international cooperation to support hydrogen technology innovation via the establishment of international industrial chains. Hydrogen energy trade with Belt and Road Initiative countries and strengthened project partnerships with leading countries in hydrogen technology are viewed as potentials to jointly pursue international market opportunities. (NDRC, 2022)

While hydrogen was classified as a hazardous chemical at the time when the plan was issued, it is recognised as an energy source since China's new "Energy Law" (State Council of the People's Republic of China, 2024a) came into force on 1 January 2025. This change reduces regulatory barriers to hydrogen production, storage, and use, thereby encouraging investment in hydrogen infrastructure and production facilities. (Collins, 2024)

With the plan specifying that the first phase of development – establishing a robust policy framework and core technologies for hydrogen production, storage, and transportation – should be completed by 2025, further key strategic policy developments are expected to be published in this year.

3.2. Local strategies

China's hydrogen industry is following a bottom-up approach, with local governments setting their own development targets and plans often more ambitious than and prior to the announcement of national hydrogen strategy. With this, local governments are looking to attract talent and investments, to stimulate economic growth and decarbonise the local energy sector. Local governments are instrumental in building infrastructure, fostering technological innovation, constructing industrial chains, and demonstrating innovative models.

5 New energy includes renewables and nuclear power.

Overall, 30 provinces mention hydrogen in their respective local 14th FYPs (2021-2025). Some have issued designated FYPs for hydrogen such as Hebei, Guizhou, and Shaanxi. Many provinces have issued comprehensive (industry) action-, implementation-, and development plans with a short timeline ending before the commencement of the 15th FYP (2026-2030). These include Beijing, Tianjin, Shaanxi, Qinghai, Xinjiang, Jilin, Anhui, Liaoning, Sichuan, Ningxia. After the launch of the national "Medium and Long-Term Plan for Hydrogen Energy Industry Development (2021-2035)", many provinces such as Shanxi, Shanghai, Jilin, Shandong, Henan, Qinghai, Jiangxi, and Guangxi followed by developing their own medium- to long-term development plans with most setting the time frame from 2022 to 2035. Overall, by the end of 2024, over 500 hydrogen policies were released on the sub-national level. (Delaval, et al., 2022; CHA, 2024b; CHA, 2024a; CHA, 2025a)

The targets set within the local policies are more ambitious than those outlined in the national plan. For example, Inner Mongolia alone aims to produce more than twice the quantity of renewable hydrogen set out in the national target of 100.000-200.000 tonnes per year at the end of 2025 (detailed progress on these goals will be discussed in Chapter 4). The combined HFCV-related targets of only five provinces combined already correspond to the national target of 50,000 HFCVs on the roads by 2025. (Lou & Corbeau, 2023; Brown & Grünberg, 2022)

In August 2020, the MoF, the MIIT, the Ministry of Science and Technology (MoST), the NDRC, and the NEA officially approved five fuel cell vehicle demonstration application city clusters, namely Beijing-Tianjin-Hebei, Shanghai, Guangdong, Hebei, and Henan. (CHA, 2025a; NEA, 2020)

Case study: Leveraging local endowments and regional integration in Jilin Province

Jilin, a province in north-eastern China, was once a key industrial hub in the country's "Rust Belt". Despite experiencing economic decline in the 1990s and 2000s, Jilin remains a major player in sectors such as petrochemicals, agriculture, and automotive manufacturing – all industries that stand to benefit from the development of renewable hydrogen. Changchun, the provincial capital, is home to FAW Group, China's largest automotive manufacturer.

The hydrogen strategy of Jilin Province, outlined in the "Hydrogen Drives Jilin: Medium- and Long-Term Development Plan" issued in 2022, is to develop an entire hydrogen value chain, leveraging regional advantages in industry, knowledge, and geography. The municipal government of Baicheng City in Jilin Province issued its own "New Energy and Hydrogen Industry Development Plan" in 2019, aiming to establish Baicheng as a hub for hydrogen. The plan is based on support from the provincial government which aimed to establish Baicheng as a "national-level, high-energy, high-tech base." This interplay of development strategies at various levels of government, where Baicheng first developed its hydrogen strategy, aligned with provincial policy, enabled the city to become a central player in the provincial-level plan which was developed after and in line with the national hydrogen development plan.

Jilin is establishing a comprehensive hydrogen industry ecosystem. The creation of clusters is a key element in the local coordination of hydrogen industry development. This includes two hydrogen corridors and four industrial bases. A horizontal corridor will connect the cities of Baicheng, Changchun, and Yanbian, focusing on the construction and integration of hydrogen production and refuelling infrastructure with existing stations. Meanwhile, a vertical corridor will span the three provinces of northeastern China, extending from Harbin's commercial belt in the north to Dalian's economic zone in the south. This corridor aims to integrate the hydrogen supply system and industrial chain.

Four industry bases capitalise on local resources and regional strengths. Western Jilin (Baicheng-Songyuan), rich in renewable energy resources, will focus on large-scale hydrogen production. Changchun, as a hub for automotive manufacturing, will specialise in research and development of hydrogen equipment and the production of PEM electrolysers, fuel cell equipment, and HFCVs. Central-western Jilin (Jilin-Baicheng-Songyuan), leveraging its chemical industry, will focus on the demonstration and production of hydrogen-based chemicals. Medium- and large-scale hydrogen storage systems and hydrogen peak-shaving power stations are to be developed in regions with abundant wind and solar resources (Baicheng) and hydropower resources (Baishan) to facilitate a power system that integrates hydrogen, pumped storage, and electrochemical storage, enabling diversified hydrogen utilisation for renewable energy consumption. Additionally, eastern Jilin will utilise the Yanbian Hydrogen Trade Demonstration Base, levering its geographically advantageous location, and the Harbin-Changchun-Dalian Hydrogen Corridor to drive domestic and international sales of hydrogen-related products and equipment, building a hub for the trade of hydrogen-based products.

	By 2025 (short-term)	By 2030 (mid-term)	By 2035 (long-term)
Strategic vision	Initial layout of the hydrogen industry ecosystem and strong industrial growth	Complete industrial chain and clusters	Jilin becomes a national hydrogen and renewable energy integration demonstration zone
Renewable hydrogen production	60,000-80,000 t	300,000-400,000 t	1.2-1.5 million t
No. of HFCVs in operation	500	7,000	70,000
Refuelling stations	10	70	400
Hydrogen application	Pilot hydrogen blending with natural gas	Expand green chemical capacity to 2 million t	Expand green chemical capacity to 6 million t
Attracting investment	Attract 3-4 hydrogen equipment manufacturing enterprises	Attract 5 fuel cell enterprises	
Industry revenue	CNY 10 billion	CNY 30 billion	CNY 100 billion

Table 3.1: Goals of Jilin Province's hydrogen strategy
Source: (Jilin People's Government, 2022)
Source (of info-box): (Baicheng People's Government, 2019; Jilin People's Government, 2022)

3.3 Financial incentives

National-level incentive programmes

National-level government subsidies in China primarily target fuel cell technologies, including HFCVs, as well as hydrogen supply within city clusters. Recently, there has been a noticeable shift towards funding research and the commercialisation of a wider range of key hydrogen technologies. Local governments compete to attract national subsidies, which are allocated through a "reward instead of subsidy" ( ) model. This means cities receive funding based on their achievement of specific performance and development milestones. In addition to national support, local governments provide their own subsidies to further complement these initiatives. (Dellatte, 2023; Baker McKenzie, 2022; Delaval, et al., 2022; Kollar, Qin, & Xiao, 2024)

In January 2025, the MIIT announced an initiative to advance technologies in future industries, including a list of clean hydrogen technologies. Technologies featured include electrolysers, catalysts, transport and storage technology, and application in industry. The initiative invites companies and research institutions to apply for participation. Successful applications will receive financial and policy support, with progress evaluations planned after two years to identify outstanding innovations for continued backing. (MIIT, 2025)

A four-year HFCV-focused funding programme between 2020 and 2024 by the NEA allocated performance-based rewards to city clusters (as mentioned in Chapter 3.2). The performance of clusters was evaluated using a point system, covering key areas of HFCV-deployment and technical specifications, key component industrialisation (e.g. catalysts) and hydrogen supply. Heavier vehicles and higher fuel cell power capacities as well as clean hydrogen production were incentivised. Participation in the programme required inter-city collaboration in form of clusters which are to be centred around leading enterprises. A lead city within the cluster coordinated efforts while a third-party monitoring system assessed progress. The rewards for the first year were allocated in 2023 and amounted to CNY 770 million. In 2024, the MoF announced that in 2025, funds of CNY 1.6 billion will be distributed among ten provinces with significant allocations to cities such as Tangshan (CNY 399 million), Shanghai (CNY 314 million), and Zhengzhou (CNY 264 million). For more details regarding the point system, refer to Appendix B. (Beijing E-Town, 2024; IEA, 2024b; NEA, 2020)

The MoST included hydrogen technology in its National Key R&D Programme for 2023, allocating a total budget of CNY 340 million (EUR 45 million). The programme provides subsidies covering one-third of the costs for selected projects. It emphasises advancing renewable hydrogen production through ALK and PEM systems, enhancing storage technologies such as liquid and solid-state storage, and improving fuel cell technologies for applications including microgrids and combined heat and power systems. (MoST, 2023)

There are also programmes that do not exclusively focus on hydrogen but include it as part of a broader scope. One example is the CNY 450 billion (EUR 57 billion) subsidy programme for upgrading outdated machinery and equipment, announced by the NDRC in 2024 and extended in 2025. Among its diverse applications, this programme also covers HFCVs. (NDRC, 2024a)

Industrial hubs such as the Beijing Economic-Technological Development Area (Beijing E-Town) offer incentives on top of national and provincial incentives. Beijing E-Town supports large-scale hydrogen projects that have secured funding from national or Beijing-level programmes with grants matching the original funding and reaching up to CNY 20 million (EUR 2.6 million) per project. (Beijing E-Town, 2024)

Local incentive programmes

Compared with national programmes, local subsidies more often encompass the entire hydrogen value chain, covering production, storage, transport, and end-use applications. However, there remains a particular emphasis on fuel-cell technologies and the development of refuelling infrastructure. Given the variety of local subsidies, a selection of exemplary programmes is provided for reference, with a particular focus on incentive mechanisms of Beijing E-Town.

Local subsidies for HFCVs aim to stimulate demand by reducing costs. In Dadong District of Shenyang City, the capital of Liaoning Province, heavy-duty vehicles, smaller logistics vehicles and buses using hydrogen are subsidised at CNY 50,000-105,000 per vehicle (EUR 6,600-13,300), with additional support of CNY 1.5/kg (EUR 0.2/kg) to hydrogen transport projects for the use of HFCVs. Hangzhou City offers subsidies ranging from CNY 20,000-40,000 per vehicle (EUR 2,600-5,300) and a hydrogen supply subsidy of CNY 20/kg (EUR 2.6/kg), tapering to CNY 15/kg (EUR 2/kg) by 2025. (Huanbao Zaixian, 2023)

Local governments provide subsidies for constructing hydrogen refuelling stations, storage facilities, and transport networks, ensuring availability of hydrogen supply infrastructure. In Wuhu City, Anhui Province, subsidies cover 50% of fixed-asset investments in hydrogen refuelling stations, capped at CNY 250,000 (EUR 33,200) per station. (Huanbao Zaixian, 2023)

Some HFCV subsidies aim to encourage industrial synergies. In Fujian Province, subsidies of up to CNY 15 million (EUR 2 million) are provided for hydrogen-powered vessels. Beijing E-Town promotes integration with autonomous technologies, offering up to 30% of project investment (capped at CNY 3 million; EUR 400,000) for projects combining HFCVs with self-driving systems. Beijing E-Town also promotes hydrogen application in other transportation sectors beyond vehicles, such as forklifts, drones, and rail systems, with subsidies of up to CNY 500,000 (EUR 66,400) available for eligible projects. (Beijing E-Town, 2024; Huanbao Zaixian, 2023)

Other local subsidies cover land and utilities. In Guangzhou's Huangpu District, companies operating in hydrogen industry parks receive up to CNY 100,000 (EUR 13,300) annually for operational costs and subsidies of 50% on office rents. Similarly, Beijing E-Town provides annual rent support of up to CNY 5 million (EUR 664,000) per company for office, research, and production space. (Huanbao Zaixian, 2023; Beijing E-Town, 2024; People's Government of Guangzhou Municipality, 2020)

In line with the national goal of becoming a leader in hydrogen technology by fostering innovation, Beijing E-Town's further subsidises breakthrough technologies and their deployment. Subsidies are available for so-called "first-unit" demonstration projects, which are designed to showcase new technologies in real-world applications. These projects can receive up to 30% of their contract value, with a maximum of CNY 5 million (EUR 664,000), incentivising companies to take the risks associated with pioneering advancements. To strengthen the R&D ecosystem, Beijing E Town provides funding for the establishment of new R&D institutions, with grants reaching up to CNY 10 million (EUR 1.3 million) per facility. (Beijing E-Town, 2024)

For hydrogen projects launched between 2021 and 2024, Beijing E-Town offers subsidies on annual fixed-asset investment. Projects meeting the threshold of over CNY 10 million (EUR 1.3 million) annually may qualify for financial support equivalent to 1% of their total investment, capped at CNY 30 million (EUR 4 million). This highlights the preference for large scale projects such as those implemented by SOEs which mainly revolve around refuelling stations and pipelines, while smaller companies involved in equipment manufacturing and R&D may have difficulties obtaining subsidies in time. (Dellatte, 2023; Li, 2024)

3.4 Standardisation

The primary objective of standardisation in China's hydrogen industry is to establish a modern, well-structured, cohesive, and comprehensive system of standards that meets the evolving needs of the industry. Technical standards are a critical instrument for driving the development of China's hydrogen sector. However, when compared to more advanced markets such as those in Europe, the United States, Japan, and South Korea, China's hydrogen standardisation framework remains underdeveloped. The following subchapter will provide an overview of the Chinese hydrogen standard system, including its political framework, key standardisation committees, the status of development as well as challenges.

Political framework

Since the start of the 14^{th} Five-Year Plan (2021-2025), China's targets of achieving carbon emissions peak by 2030 and carbon neutrality by 2060 have led to increased attention from policymakers on the hydrogen sector and related standardisation efforts. A series of policies from the central government emphasise the necessity to promote standard development in the hydrogen sector. For example, the "National Standardisation Development Outline" (State Council of the People's Republic of China, 2021b) highlights the simultaneous deployment of technology research and development, standard formulation, and industrial promotion in the hydrogen sector. The "National Standard System Construction Plan for Promoting High-Quality Development during the 14th Five-Year Plan" (SAC, 2021) stresses the need to strengthen the formulation of standards in emerging fields, including hydrogen energy.

The central document for advancing standard development in China's hydrogen sector is the "Guideline for Establishing the Standards System on Hydrogen Energy Industry" (SAC, 2023), released by SAC in collaboration with NDRC in 2023. This is the first document at the national level that systematically establishes a standard system for the full hydrogen industrial chain. The system is organised into five primary subsystems: fundamentals and safety, production, storage and transport, refuelling as well as application. These primary subsystems are further divided into 20 secondary subsystems and 69 tertiary subsystems, categorised based on technology, equipment, systems, safety, and inspection requirements (see figure 3.1).

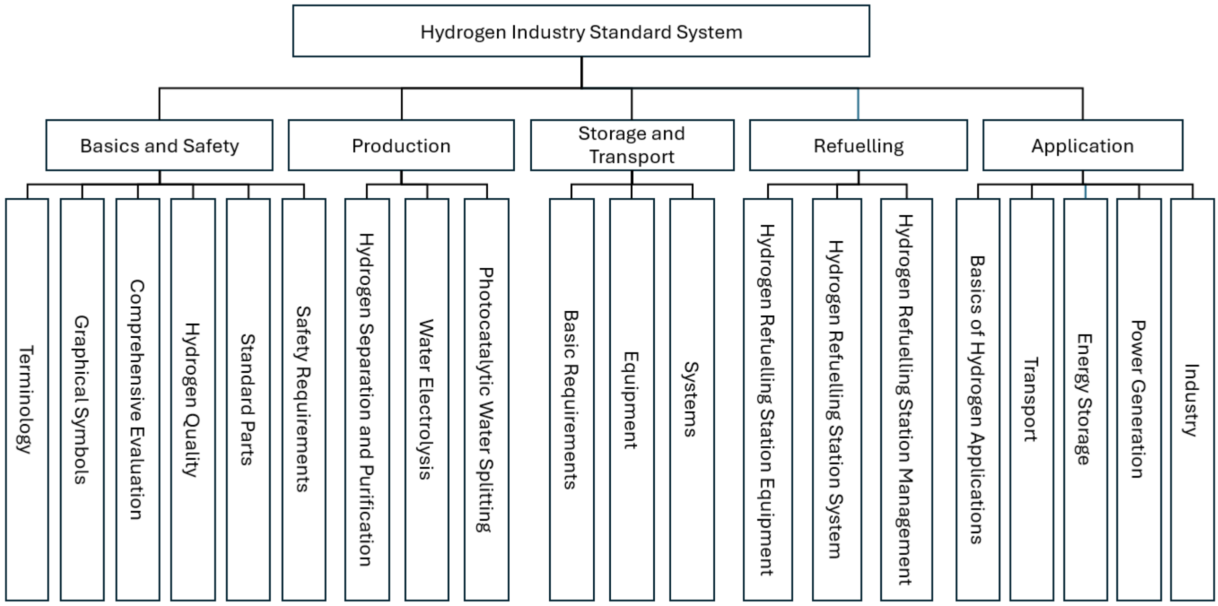


Figure 3.1: Hydrogen energy technical standards system framework.
Source: (SAC, 2023)

The guideline primarily focuses on the following three aspects:

- Core technology standards: The guideline outlines an action plan for the development of core standards. A list of the core standards includes key equipment standards in the upstream of the industry chain, such as technical requirements of PEM electrolysers, hydrogen compressors, and hydrogen expanders.
- Innovative technologies: The guideline also incorporates emerging technologies, still in the initial stages of research and demonstration, such as photoelectrochemical water splitting, organic liquid hydrogen storage, and hydrogen internal combustion engines. The guideline emphasises the synergy between innovative technologies and standards, stating that standardisation helps to lead industry development, while technological advancements and product iterations will also continuously drive the enhancement of standards.
- Exchange and cooperation: The guideline stresses the importance of exchange and cooperation among standard-setting organisations. It promotes the joint development of enterprise standards, association standards, industry standards, and national standards. Coordination between domestic technical committees should avoid duplication and conflicts in standards while alignment with international hydrogen standards should strengthen participation in the development of international standard development. For example, with the EU's Carbon Border Adjustment Mechanism (CBAM) taking effect in 2023 and covering hydrogen, the guideline advocates strengthening synergies with international hydrogen standardisation organisations, such as the Fuel Cells and Hydrogen Joint Undertaking, the International Association for Hydrogen Energy, and the International Partnership for Hydrogen and Fuel Cells in the Economy.

The guidelines also set clear targets for standardisation work. The goal is to revise and develop more than 30 national and for hydrogen energy by 2025. So far, between January 2023 and February 2025, 17 new national standards came into effect.

Standardisation committees responsible for hydrogen standards

The main committees responsible for the development of national level hydrogen standards in China include the following:

- National Hydrogen Energy Standardisation Technical Committee (SAC/TC 309)
- National Fuel Cell and Flow Battery Standardisation Technical Committee (SAC/TC 342)
- National Gas Cylinder Standardisation Technical Committee, Fiber Reinforced Cylinder Subcommittee (SAC/TC 31/SC 8)
- National Road Vehicles Standardisation Technical Committee, Electric Vehicles Subcommittee (SAC/TC 114/SC 27).

These committees are essential in advancing the establishment of the hydrogen energy standardisation framework in China, covering various aspects of hydrogen technology from production to application. The secretariat of the National Hydrogen Energy Standardisation Technical Committee is located at the China National Institute of Standardisation (CNIS). (SAC, 2025e)

Committee Name	Area of Responsibility
National Hydrogen Energy Standardisation Technical Committee (SAC/TC 309)	Hydrogen General
National Fuel Cell and Flow Battery Standardisation Technical Committee (SAC/TC 342)	Fuel Cells and Flow Batteries
National Gas Cylinder Standardisation Technical Committee, Fiber Reinforced Cylinder Subcommittee (SAC/TC 31/SC8)	Fiber Reinforced Gas Cylinders (Including Hydrogen Cylinders)
National Road Vehicles Standardisation Technical Committee, Electric Vehicles Subcommittee (SAC/TC 114/SC27)	Electric Vehicles (Including HFCVs)

Table 3.2: Committees responsible for hydrogen standards development in China.
Source: Own visualisation

The SAC/TC 309 is primarily responsible for standardisation work in the areas of hydrogen production, storage, transportation, and utilisation. SAC/TC 342 focuses on standards in fields such as terminology, performance, general requirements, and testing methods for fuel cells and flow batteries. They are the respective counterparts in China for ISO/TC 197 (International Organisation for Standardisation, Technical Committee 197 on Hydrogen Technologies) and IEC/TC 105 (International Electrotechnical Commission, Technical Committee 105 on Fuel Cells). The number of hydrogen standards developed by SAC/TC 31/SC 8 and SAC/TC 114/SC 27 is comparably small, covering areas such as automotive high-pressure hydrogen gas cylinders and composite material gas cylinders. (Zhang & Zhang, 2024)

Status quo of hydrogen standardisation

▶ National standards

By 2025, the total number of active national standards in the hydrogen sector has reached 114. Among them, 35 standards are developed by SAC/TC309, 42 standards by SAC/TC342, 15 standards by SAC/TC114 and 5 by SAC/TC 31. The distribution of national standards among the different fields as defined by the "Guideline for Establishing the Standards System on Hydrogen Energy Industry" is illustrated in Figure 3.2. (SIS, 2025)

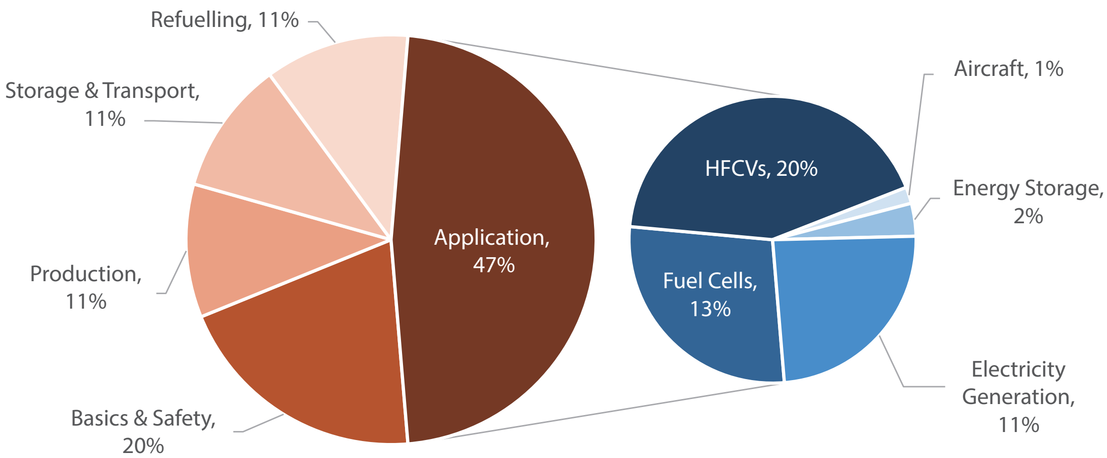


Figure 3.2: Distribution of national standards in the hydrogen sector.
Source: (SIS, 2025)

Figure 3.2 illustrates that the existing national standards primarily concentrate on the downstream segments of the hydrogen industry chain, with a particular emphasis on fuel cells. Notably, national standards pertaining to fuel cells, hydrogen fuel cell vehicles (HFCVs), electricity generation via fuel cells, fuel cells in aviation, and fuel cells in energy storage collectively constitute 47% of the total. In contrast, the upstream segments, such as production, refuelling, and storage and transportation have significantly lower proportions. (SIS, 2025)

National standards are separated into mandatory standards, recommended standards, and so-called "guiding technical documents"[6] refer to Figure 3.3). Of the 114 national standards on hydrogen, only five are mandatory:

- GB 32311-2015: Minimum allowable values of energy efficiency and energy efficiency grades for hydrogen producing systems by water electrolysis (SAMR, 2025a)
- GB 4962-2008: Technical safety regulation for gaseous hydrogen use (SAMR, 2025b)
- GB 50177-2005: Code for design of hydrogen refuelling stations (CSSN, 2025b)
- GB 50516-2010: Technical specification for hydrogen refuelling stations (CSSN, 2025c)
- GB 50156-2021: Technical standard for automotive refuelling, gas filling, and hydrogen refuelling stations (CSSN, 2025a)

Of the remaining 109 national standards, 105 are recommended national standards and four are guiding technical documents. (SIS, 2025) For a list of all national standards related to the hydrogen sector, refer to Appendix C.

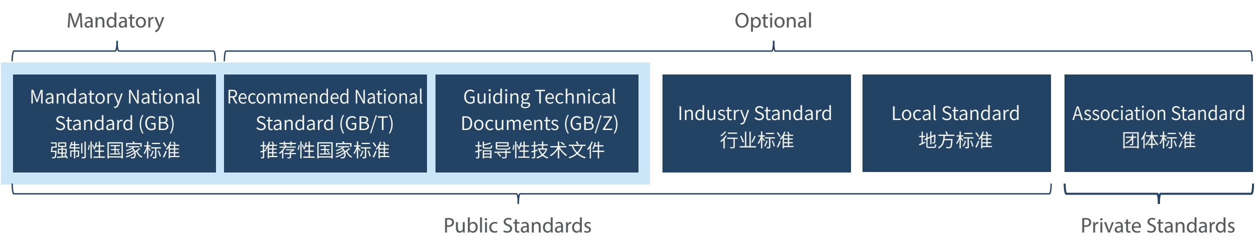


Figure 3.3: Standard types.
Source: Own visualisation.

▶ Industry standards, local standards, and association standards

The process of establishing national standards – ranging from initiation and drafting to approval and implementation – is long and unable to meet the immediate needs of the industry. As a result, industry standards, local standards, and association standards serve as an effective supplement to the national standards. A list of all national, industry, local and association standards can be accessed via the National Public Service Platform for Standard Information. As of the end of 2024, a total of 46 industry standards, 50 local standards, and approximately 500 association standards related to hydrogen were in place in China. (SAC, 2025g; NEA, 2025)

- Industry standards (行业标准): ndustry standards refer to standards established for technical requirements that need to be unified within a specific industry nationwide when no national standard exists. They are centrally overseen by a designated industry standardisation authority, such as, in the case of hydrogen, the MoT, the China Machinery Industry Federation, or the China Non-Ferrous Metals Industry Association and require a prolonged development process. Once a corresponding national standard is implemented, the industry standard is immediately abolished.

  In the hydrogen sector, industry standards encompass safety, equipment, and technical requirements across areas such as hydrogen production, hydrogen inspection, fuel cells, and applications. They are primarily distributed across industries like machinery, transportation, and non-ferrous metals. (SAC, 2025f)

6 Guiding technical documents are standard documents developed to provide guidance or information for standardisation work in areas where technology is still evolving (such as rapidly changing technical fields).

- Local standards (地方标准): Local standards are technical standards formulated by provincial or municipal governments in China to address regional needs, such as environmental regulations, industrial practices, or public safety requirements. These standards supplement National Standards (GB) and Industry Standards, ensuring that local conditions and priorities are adequately met.

  Regions with well-established hydrogen industry chains, such as Shandong, Hebei, and Guangdong, are among the most active regarding local hydrogen standard development. Shandong leads in the number of local standards issued, reflecting its robust industrial base in hydrogen energy. Guangdong has pioneered efforts by establishing China's first provincial hydrogen energy standards committee. Additionally, Foshan City of Guangdong has taken the lead in piloting research on hydrogen production standards at the industrial park level. (Zhang & Zhang, 2024)

- Association standards (团体标准): An association standard is a voluntary technical standard developed by industry associations, companies, or other private organisations to guide specific industries or technologies. These standards complement National Standards and Industry Standards, providing more flexible and specialised guidelines for emerging sectors or niche markets.

  Amid the rapid growth of China's hydrogen energy industry, collaboration between large enterprises and private associations in developing association standards are addressing the lack of applicable standards and to regulate the market. The National Association Standards Information Platform offers information on the release of policies, news and information related to association standardisation work in China, and is a channel providing access to, evaluating and supervising association standards. Since the publication of China's first hydrogen energy association standard, "Hydrogen Specification for Proton Exchange Membrane Fuel Cell Vehicles" (T/CECA-G0015-2017), in February 2017, 137 association standards related to hydrogen energy have been developed and released. These standards address deficiencies in areas not yet covered by national and industry standards, providing support for the industry's structured growth. (TTBZ, 2025; CCPS, 2024)

Challenges of hydrogen standard development

Standardisation in China's hydrogen sector faces several challenges, some of which are addressed by the "Guideline for Establishing the Standards System on Hydrogen Energy Industry":

- Lack of market foresight: Standardisation efforts must closely align with technological innovation. As outlined in Chapter 2.1 and further explored in Chapter 4, China's hydrogen technology development partly lags international competition in certain areas, with the absence of forward-looking standards being one of the key reasons for this gap. In 2024, more than 70% of national hydrogen standards have been in place for over five years, making them inadequate to meet the current needs of the industry. While association and local standards help address the long formulation cycle of national standards, they often have limitations in terms of technical depth. (Zhang & Zhang, 2024; Zhong, 2023)

- Lack of standards in subfields: China's hydrogen standard system remains simple compared to more developed markets, with gaps particularly in more specialised areas. For example, the low level of domestic manufacturing of technology for hydrogen storage and transportation has hampered developing national standards, which in turn restricts the growth of China's hydrogen energy industry. (CNIS, 2019; Zhang & Zhang, 2024)

- Lacking coordination: China has yet to establish a unified coordination system among its hydrogen standard-setting institutions. Inadequate communication has led to insufficient review and maintenance of existing standards, particularly in association and industry standards. Moreover, there is an overlap in the content of standards across different subfields, which complicates the process for users in selecting and implementing appropriate standards. (Zhang & Zhang, 2024)

4 Renewable hydrogen

China aims to make renewable hydrogen a cornerstone of its transition towards a sustainable, low-carbon future. As the world's largest energy consumer, China recognises the immense potential of renewable hydrogen to decarbonise key sectors of its economy, such as heavy industry, transportation, and energy (refer to Chapter 3.1). With abundant renewable energy resources and a commitment to peak carbon emissions by 2030, renewable hydrogen is seen as a potential pathway to meet climate goals while enhancing energy security and industrial competitiveness.

In October 2024, the Chinese government, led by the NDRC, published the "Guiding Opinions on Vigorously Implementing Renewable Energy Replacement Action" (NDRC, 2024b). Among an outlook on the transition towards a greener economy in general, the guiding opinions also outline a clear roadmap for deploying renewable hydrogen at scale. The guiding opinions direct provinces, autonomous regions, and municipalities to advance the production of hydrogen from renewable sources and identify specific sectors in the economy that should be prioritised for decarbonisation using hydrogen.

The strategy emphasises the large-scale substitution of high-carbon hydrogen with low-carbon alternatives, particularly in industries like ammonia and methanol synthesis, petrochemicals, and steel manufacturing. Furthermore, it encourages the creation of integrated energy bases that combine wind, solar, and hydrogen production. It also prioritises building robust hydrogen infrastructure, including refuelling stations, and developing innovative pricing mechanisms to make renewable hydrogen economically attractive. Notably, the plan calls for pilot projects, such as hydrogen-based clean fuels for shipping and aviation, hydrogen applications in metallurgy, and co-firing green ammonia in coal plants. The framework positions green hydrogen as a catalyst for sustainable growth and a key player in the nation's quest for energy transformation. (NDRC, 2024b)

Building on this framework, the following chapter offers a comprehensive overview and outlook on the development of renewable hydrogen in China. It examines the current and projected demand and supply for renewable hydrogen, investment trends, costs and technological advancements, and the challenges facing the sector.

Renewable hydrogen production and application: Status quo and outlook

As of March 2025, the CHA reports an installed renewable hydrogen production capacity[7] of 1180 MW across 94 projects in China, with a capacity of producing 104,000 tonnes annually. As of the currently installed capacity, 66.8% is purely powered by solar energy, 25.1% by a mix of solar and wind, 6.8% purely by wind and 1.2% by hydropower. The renewable hydrogen produced in these projects is primarily used in four major sectors: transportation, which represents the largest share at 32.5%, followed by refining at 24.4%, methane production, which accounts for 19.5%, and ammonia production, making up 9.3% of the total. An additional 68 projects under construction are expected to yield 1.26 Mt per year upon completion in the next years. Moreover, 472 planned projects could produce up to 7.41 Mt annually if fully realised. (CHA, 2025c)

7 Electrolysis with direct supply of electricity from renewable sources.

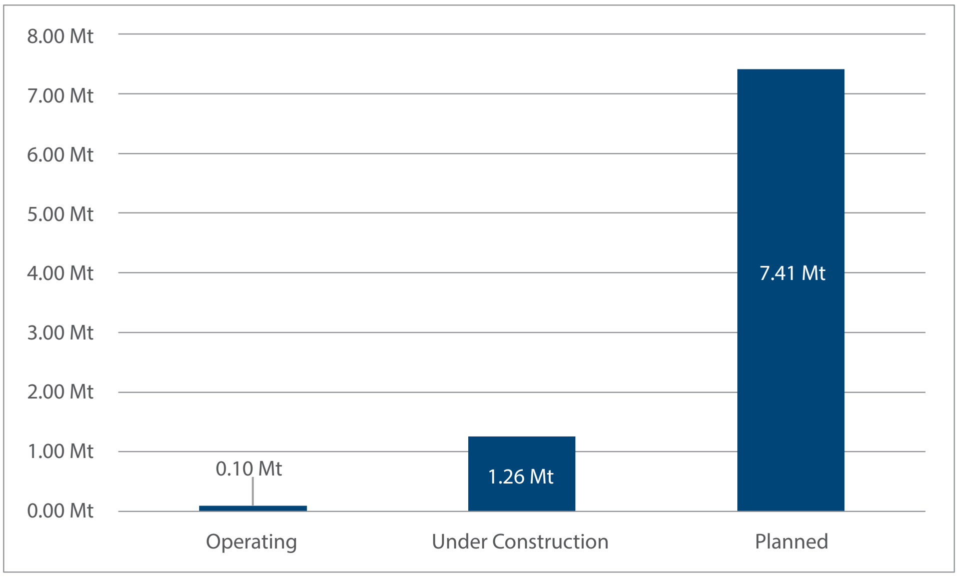


Figure 4.1: Renewable Hydrogen Production Capacity in China (Q1 2025).
Source: (CHA, 2025c)

For planned projects, the primary consumption pathways are in chemicals, transportation, and energy storage, with chemical applications accounting for 90% of planned consumption. Renewable hydrogen is primarily intended to produce hydrogen-derived fuels such as green methanol, green ammonia, and sustainable aviation fuel (SAF). (Han, 2024)

China is currently the global leader in installed electrolysis capacity. At the end of 2024, the country achieved approximately 3.5 GW of capacity[8], contributing to three-quarters of global electrolyser additions in 2024. This expansion raises China's share of global electrolysis capacity to about 70%, up from 55% at the end of 2023. Looking ahead, the International Energy Agency (IEA) projects that China's total installed electrolysis capacity will reach 50 GW by 2030. (IEA, 2024b; IEA, 2024a)

ALK electrolysers dominate the landscape of installed renewable hydrogen production capacity, making up 82.4% of the total capacity. Projects combining ALK and PEM electrolysers represent 16%, while standalone PEM electrolysers account for 1.6%. Solid oxide electrolysers so far are only deployed for research related purposes. (CHA, 2025c)

China's leadership in installed capacity is mirrored by its top position in investments in electrolyser installations, ranking first globally. In 2023, China invested approximately EUR 1.6 billion, accounting for more than half of the global total of approximately EUR 2.9 billion. This figure is projected to have increased to around EUR 3.6 billion in 2024, representing half of the estimated global total of EUR 7.3 billion. In comparison, investments in Europe stood at approximately EUR 1 billion in 2023 and are projected to have doubled to EUR 2.1 billion in 2024. (IEA, 2024b)

Renewable hydrogen cost

The primary challenge to the large-scale deployment of renewable hydrogen in China is the significant price disparity with inexpensive conventional hydrogen, primarily produced through coal-gasification. In China, the cost gap between hydrogen production through coal gasification – the cheapest method – and hydrogen production from electricity using renewable sources has narrowed but is stagnating in recent years (refer to Figure 4.1). Additionally, regional variations in renewable sources impact the cost of renewable hydrogen production. In northwestern China, where abundant space, sunlight, and wind are available, one kilogram of renewable hydrogen can be produced for approximately CNY 16 (EUR 2.09). In contrast, production costs are highest in the densely populated southern region, reaching around CNY 20/kg (EUR 2.62/kg). By comparison, hydrogen produced via coal gasification costs between CNY 8-11/kg (EUR 1.05-1.44/kg). (CHA, 2024f)

8 Including facilities connected to the public electricity grid.

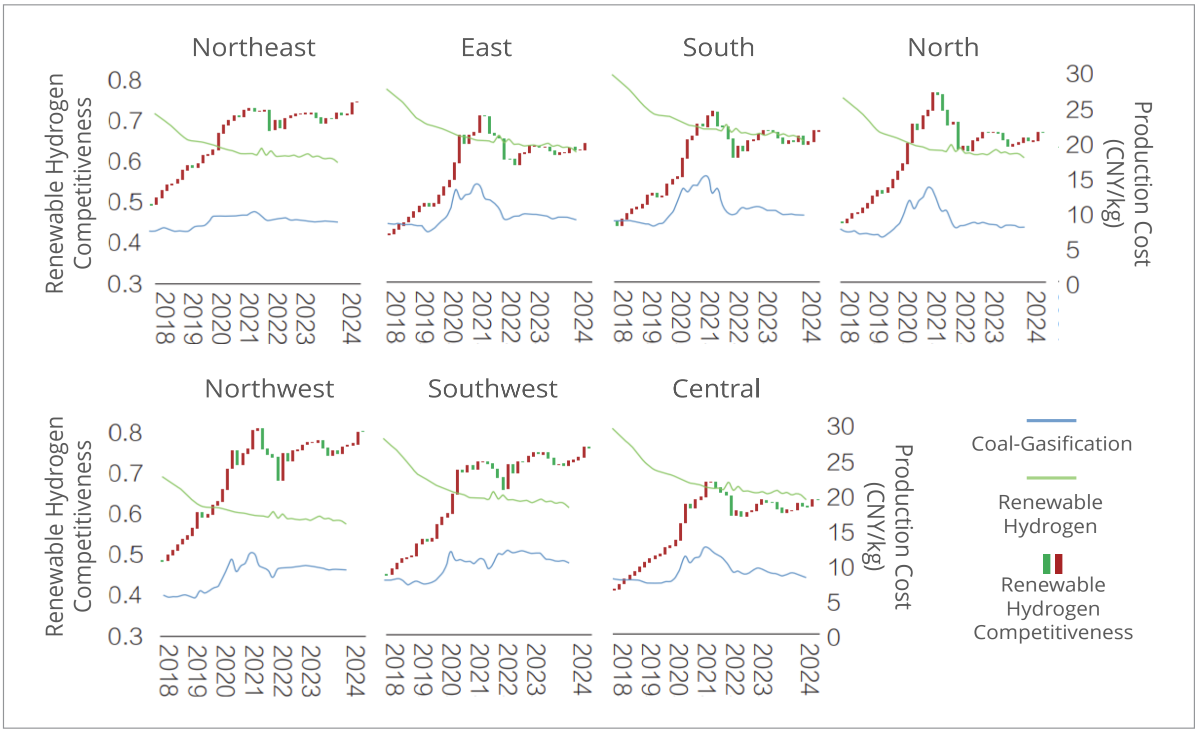


Figure 4.2: Hydrogen production cost by region and production type.
Source: (CHA, 2024f)

Note: The competitiveness of renewable hydrogen is assessed by comparing its production costs with those of hydrogen derived from natural gas and coal. The competitiveness index ranges from 0 to 1, where 0 represents the lowest and 1 the highest level of competitiveness.

Northeast: Liaoning, Jilin, Heilongjiang; East: Shandong, Anhui, Zhejiang, Fujian, Shanghai; South: Guangdong, Guangxi, Hainan; North: Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia; Northwest: Ningxia, Xinjiang, Qinghai, Shaanxi, Gansu; Southwest: Sichuan, Yunnan, Guizhou, Tibet, Chongqing; Central: Hubei, Hunan, Henan, Jiangxi.

The path to achieving cost parity for renewable hydrogen will be through reducing the cost of manufacturing (renewable) hydrogen equipment, as well as exposing emission-intensive hydrogen to a (higher) carbon price to increase its production costs. Just as with other clean technologies, China, with its large market and strong manufacturing base has enormous potential to drive down domestic and global costs of hydrogen technology, in the first place through scaling up electrolyser production. Equipment costs, alongside energy costs, are the two primary factors determining the price of renewable hydrogen. For instance, in 2023, the average production cost for one kilogram of green hydrogen in Europe was EUR 6.1, with CAPEX accounting for EUR 3.79 of this total. (European Hydrogen Observatory, 2025)

Looking at the cost of installing electrolysers a stark difference is observed between China and the global average. In 2023, the cost of installing one kW of ALK averaged at EUR 2,070 globally. ALK electrolysers produced in China are notably more affordable, with costs between EUR 780 and EUR 1,350 per kW for an installed system. According to predictions for 2030 by the IEA, producing electrolysers in China is projected to still be cheaper than in the EU and the US, averaging at 40% and 25% less. Even when tariffs and non-tariff measures are taken into account, Chinese electrolysers are still 5% to 40% more affordable than locally manufactured options in many markets. (IEA, 2024b)

Technology and trade

China boasts the largest capacity globally for ALK electrolyser production. For PEM electrolysers and other electrolyser types, China still lacks behind foreign manufacturers in costs and efficiency. China also relies on foreign technologies at other parts of the hydrogen value chain, such as technology for transport and storage and application in the industry.

By the end of 2024, China's annual electrolyser production capacity reached approximately 25 GW. Globally, the total electrolyser manufacturing capacity stood at about 42 GW per year. Therefore, China currently accounts for around 60% of the global manufacturing capacity. However, by 2030, if all announced projects are realised, China's share is anticipated to decline to 30% as Europe and the United States also ramp up their manufacturing capabilities. The capacity is scattered among a large group of manufacturers, with over 300 manufacturers in China and only two Chinese manufacturers in the top ten largest manufacturers globally by orderbook in 2024. (IEA, 2024b; Energy Iceberg, 2024; Martin, 2024c)

The electrolyser market orders in 2024 have been primarily concentrated among leading companies such as Peric Hydrogen, Sungrow Hydrogen, Hydrogen Era, Mingyang Hydrogen, and CRRC Zhuzhou Institute. Between January and November 2024, there have been 40 direct bidding projects for electrolysers in China, with a cumulative tendered capacity of approximately 1.72 GW, with the top five companies accounting for more than 60% of the total market share. Comparing the bidding capacity with the approximate electrolyser production capacity of 25 GW, a heavy overcapacity for electrolysers can be observed. (Han, 2024)

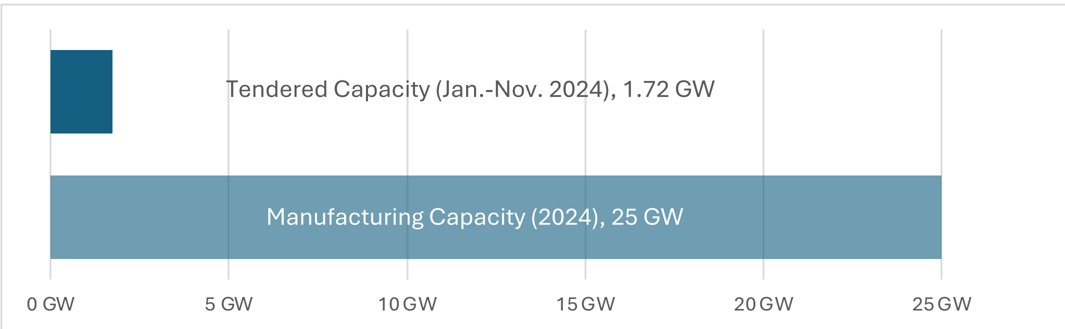


Figure 4.3: Electrolyser Manufacturing Capacity and Tendered Capacity in China (2024).
Source: (Han, 2024; IEA, 2024b)

China is currently the global leader in ALK electrolyser technology and will only begin manufacturing PEM technology on a greater scale in the mid-term. Based on announced projects, almost half of the 2030 global PEM electrolyser production capacity of 43 GW per year will be in Europe, followed by the US and India. However, BloombergNEF predicts that during the 2030s, Chinese electrolyser manufacturers are expected to focus on scaling up PEM manufacturing capability, achieving significant efficiency gains and cost reductions. In the 2030s, Chinese manufacturers are expected to scale up PEM production and refine their designs, building on the innovations pioneered by their Western competitors. (Martin, 2024a; IEA, 2024a)

Commercialisation and cost reductions in fuel cell systems have been significant. The price of fuel cell systems in China has declined from CNY 20,000/kW in 2018 to CNY 1,500/kW at the end of 2024, with projections of CNY 1,000/kW by the end of 2025 and CNY 500/kW by 2030. The substantial cost reduction is largely driven by the political focus on hydrogen applications in transportation, which has led to strong subsidies for fuel cell system research and deployment (as outlined in Chapter 3.3). (Han, 2024)

Challenges remain with other technologies in the hydrogen value chain. This is reflected in the 2025 announced R&D funding programme by MIIT (as discussed in Chapter 3.3). The MIIT published a list of core technologies to research and commercialise highlighting areas where the Chinese government recognises the need to bridge gaps in the hydrogen value chain relative to foreign manufacturers. Regarding electrolysers, the focus is on scaling up the production of PEM and AEM electrolysers. Additionally, the programme prioritises the cost-effective and large-scale production of catalysts and reactors for ammonia and methanol synthesis, as well as high-capacity carbon fibre-wrapped transport and storage containers. In terms of application, funding is directed towards projects that reduce costs and enhance efficiency in hydrogen-based iron reduction. Overall, technology for carbon paper and catalysts, storage and transportation, as well as applications such as hydrogen metallurgy technology and hydrogen gas turbines, are still under development. (MIIT, 2024)

Considering trends in other clean energy technologies, such as solar panels and electric vehicles, it is evident that the combination of low manufacturing costs and substantial production capacity in China, along with increasing global demand, forms a robust export model for Chinese electrolyser manufacturers. As mentioned in Chapter 3, China's "Medium and Long-Term Plan for Hydrogen Energy Industry Development (2021-2035)" views hydrogen as a significant opportunity for economic growth and a key technological sector in which China can establish global leadership. Against this background, China is set to become a major global supplier of electrolysers over the next decade. While as of now, manufacturers in China, as well as in Europe and the US, are focusing on meeting local demand, heavy competition within China is pushing more companies to explore foreign markets. The Chinese electrolyser market has seen a dramatic increase in the number of suppliers, growing from just a dozen in 2018 to over 300 today. New players from sectors such as renewable energy manufacturing and fuel cell technology are driving this surge, bringing extensive experience and substantial investments in R&D. Especially major renewable energy manufacturers, such as LONGi, Sungrow, are leveraging their established networks with renewable energy developers and their ability to offer cost-effective solutions. These companies have rapidly risen to dominate the industry, integrating electrolyser sales into their broader renewable energy projects. This intensified competition is pressuring not at last smaller, specialised electrolyser firms to explore alternative strategies for growth. (Energy Iceberg, 2024; IEA, 2024a)

Although current exports are minimal, by 2035, Chinese manufacturers are predicted to dominate the global market, accounting for more than 95% of global exports. These exports will primarily serve regions such as Central and South America, the Middle East, and other parts of Asia. Recent international orders, including two-digit MW scale orders from Oman, Thailand, and Uzbekistan, highlight the already growing demand for Chinese electrolysers. With steep growth anticipated for Chinese electrolyser manufacturing capacity, by 2040, 65-75% of all electrolysers manufactured in China will be exported. However, after 2030, other regions are likely to expand their domestic production capacities, reducing reliance on imports from China. (IEA, 2024a)

Similar to its approach with electric vehicles, the European Union is adopting a cautious stance toward importing electrolysers from China to safeguard its domestic industry. Although there has been no significant discussion about raising tariffs, the European Commission announced in September 2024 a new regulation for the upcoming EUR 2.2 billion European Hydrogen Bank auction. This regulation restricts bidders to sourcing more than 25% of their electrolysers from China. (Martin, 2024b)

It is notable that, no matter the scenario, future trade of electrolysers will be of far lower monetary value compared to other clean technologies such as solar panels, batteries, or, foremost, electric vehicles. (IEA, 2024a)

Conclusion and challenges

In conclusion, China stands as the global leader in renewable hydrogen production. Based on its significant investments in renewable hydrogen facilities and its projected growth in electrolyser manufacturing capacity, China is poised to remain at the forefront of hydrogen output and electrolyser manufacturing capacity. However, the rapid expansion of electrolyser manufacturing and renewable hydrogen production, coupled with the enduring price gap between carbon-intensive and renewable hydrogen, raises the risk of overcapacity within the sector. The discrepancy between planned capacity and actual output stems from challenges in demand. Many projects are facing delays due to the difficulty of finding end-users for renewable hydrogen. (Han, 2024)

Furthermore, consumption challenges persist beyond demand concerns. Despite resource-rich regions being able to produce hydrogen at costs of CNY 16/ kg, a major issue is the lack of nearby consumption centres. Without local demand, the hydrogen must be transported to distant demand centres – but road transportation methods are uneconomical, and domestic transportation and storage technology is underdeveloped. As touched upon in Chapter

2, renewable energy resources are located in the countries north, whereas most industry is located in the coastal regions. In the absence of a centralised pipeline network, long-distance transportation of renewable hydrogen significantly increases costs, severely undermining its competitiveness compared to conventional hydrogen production methods. (Han, 2024)

To mitigate this challenge, Chinese policymakers are expected to adopt measures to reduce the price disparity, stimulate demand for renewable hydrogen, create more economic transportation methods that are capable to move large quantities of hydrogen over long distances, thereby supporting the sustainable development of China's renewable hydrogen industry.

References

Baicheng People's Government. (2019). 白城市氢能发展规划 (New Energy and Hydrogen Industry Development Plan). Retrieved from www.jlbc.gov.cn: http://www.jlbc.gov.cn/xxgk_3148/ywdt/201907/t20190708_715370.html

Baker McKenzie. (2022). China: Recent developments in the Chinese hydrogen market: Policy and Market Trends. Retrieved from Baker McKenzie: https://insightplus.bakermckenzie.com/bm/attachment_dw.action?attkey=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQJsWJiCH2WAUuQVQjpl3o%2BZw5oje8KpU1&nav=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQbuwypnpZjc4%3D&attdocparam=pB7HEsg%2FZ312Bk8OIuOIH1c%2BY4beLEAejU35eP2Egcc%3D&f

Baicheng People's Government. (2019). 白城市氢能发展规划 (New Energy and Hydrogen Industry Development Plan). Retrieved from www.jlbc.gov.cn: http://www.jlbc.gov.cn/xxgk_3148/ywdt/201907/t20190708_715370.html

Baker McKenzie. (2022). China: Recent developments in the Chinese hydrogen market: Policy and Market Trends. Retrieved from Baker McKenzie: https://insightplus.bakermckenzie.com/bm/attachment_dw.action?attkey=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQJsWJiCH2WAUuQVQjpl3o%2BZw5oje8KpU1&nav=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQbuwypnpZjc4%3D&attdocparam=pB7HEsg%2FZ312Bk8OIuOIH1c%2BY4beLEAejU35eP2Egcc%3D&f

Beijing E-Town. (2024). 北京经济技术开发区管理委员会关于印发《北京经济技术开发区关于促进氢能产业高质量发展的若干措施》的通知 Measures of the Beijing Economic and Technological Development Area on Promoting the High-quality Development of the Hydrogen Energy Industry. Retrieved from Beijing E Town: https://kfqgw.beijing.gov.cn/zwgkkfq/2024zcwj/202411/t20241114_3941434.html

Brown, A., & Grünberg, N. (2022). China's Nascent Green Hydrogen Sector: How policy, research and business are forging a new industry. Berlin: Merics.

CAB. (2020). 低碳氢、清洁氢与可再生氢的标准与评价 (Standard and evaluation of low-carbon hydrogen, clean hydrogen and renewable hydrogen). Retrieved from https://www.ttbz.org.cn/Pdfs/Index/?ftype=st&pms=42014

CCPS. (2024). 2024 年 6 月团体标准大数据 (Association Standard Big Data; June 2024). Retrieved from PXB: https://pxb.ccps.com.cn/show/data/179.html

CERS. (2025). CERS Introduction. Retrieved from www.en.cers.org.cn: https://en.cers.org.cn/web/2/197001/1.html

CHA. (2020). China Hydrogen Energy and Fuel Cell Industry White Paper 2020. Beijing: People's Press.

CHA. (2023). 中国氢能源及燃料电池产业发展报告 (China Hydrogen Energy and Fuel Cell Industry Development Report 2022). Beijing: People’s Daily Press. Retrieved from CHA.

CHA. (2024a). Hydrogen Observation November 2024. Retrieved from www.chinah2data.com: https://www.chinah2data.com/file/bigdata-docs/4c9ff443a50fdb686cffbed4a402438f.pdf

CHA. (2024b). 中国氢能发展报告 2023 年 . Beijing: The People's Daily Press.

CHA. (2024c). 可再生氢 100」化工报告 ("Renewable Hydrogen 100" Chemical Report). Retrieved from CHA: https://pc.h2cn.org.cn/7ge8og/202409/4e995b3167f293447c157d07b581d8fe.html

CHA. (2024d). 氢能产业大数据世界 (Hydrogen Industry Big Data World). Retrieved from China H2 Data: https://www.chinah2data.com/#/client/home

CHA. (2024e). 氢能领跑者行动是什么 (What is the Hydrogen Top Runner Action). Retrieved from 中国氢能联盟 (China Hydrogen Alliance): https://www.h2cndata.com/

CHA. (2024f). 氢能产业观察 2024 年 9 月刊 (Hydrogen Observation, September 2024). Retrieved from CHA: https://www.chinah2data.com/file/bigdata-docs/ee24180239b98d71ca9bfe64a429cae1.pdf

CHA. (2025a). 政策库，政策分布 . Retrieved from CHA: https://www.chinah2data.com/#/client/database/PolicyBaseList

CHA. (2025b). 中国氢气生产与消费 - 氢流图（2023）年 (China Hydrogen Production and Consumption – Hydrogen Flow Graph 2023). Retrieved from CHA: https://www.chinah2data.com/#/client/home

CHA. (2025c). 再生请能项目数据库 (Renewable Hydrogen Project Data Base). Retrieved from CHA: https://www.chinah2data.com/#/client/dataVisualiza?url=aHR0cHM6Ly9iaS5hbGl5dW5jcy5jb20vdG9rZW4zcmQvZGFzaGJvYXJkL3ZpZXcvcGMuaHRtP3BhZ2VJZD1hMTBiODY4NC01OGNkLTQxZWEtODAzMS0yYjk5MTc2OTkwMDYmYWNjZXNzVG9rZW49OTgzODE3YTNmNjU2YmJkZWU2NDBkMWFlMzVjMjhhMWYmZGRfb3Jp

CHEE. (2025). Exhibition Information. Retrieved from www.hydrogenenergyexpo.cn: https://www.hydrogenenergyexpo.cn/en.php

China EV100. (2024). 中国氢能产业发展报告 2024—— 推动绿氢制储输用一体化发展 (China Hydrogen Industry Development Report 2024 - Foster the Integrated Development of Green Hydrogen Production, Storage, Transportation, and Application). China EV 100. Retrieved from https://www.ev100online.com/research/detail/1624

China Power. (2024). 中国电力网 China Power. Retrieved from 央企业绿色氢能制储运创新联合体成立 (State-owned enterprises establish consortium for green hydrogen): http://www.chinapower.com.cn/qingneng/dongtai/20240822/258388.html

China-SAE. (2024). 学会简介 (About us). Retrieved from 中国汽车工程学会 (China Society of Automotive Engineers): https://www.sae-china.org/base/info.html

CIMC Enric. (2025). Company Profile. Retrieved from www.en.enricgroup.com: https://en.enricgroup.com/about

CNIS. (2019). 国际标准化组织氢能技术委员会（ISO/TC197）第 28 届全体会议及工作组会议在法国顺利召开 (The 28th Plenary Session and Working Group of the International Organization for Standardization Technical Committee on Hydrogen Energy (ISO/TC197) were successfully held in France). Retrieved from www.cnis.ac.cn: https://www.cnis.ac.cn/gjbzh/gjdt/201912/t20191224_49176.html

CNIS. (2022). 氢能标准进展 (Progess of Hydrogen Standardisation). Retrieved from China National Institute of Standardisation: https://www.cnis.ac.cn/bydt/kydt/202205/t20220520_53206.html

Collins. (2024). Major boost for hydrogen in China as new law classes it as energy resource, rather than hazardous chemical. Retrieved from Hydrogen Insight: https://www.hydrogeninsight.com/policy/major-boost-for-hydrogen-in-china-as-new-law-classes-it-as-energy-resource-rather-than-hazardous-chemical/2-1-1737843

CRES. (2021). 氢能专业委员会 (Hydrogen Energy Special Committee). Retrieved from 中国可再生能源学会 (China Renewable Energy Society): http://www.cres.org.cn/gyxh/zzjg/zywyh/art/2021/art_1af52cee2f674e1fbb0d86da73582e7c.html

CSSN. (2025a). GB 50156-2021. Retrieved from CSSN: https://www.cssn.net.cn/cssn/productDetail/cb1827651789b87356bf2ee8b856c413

CSSN. (2025b). GB 50177-2005. Retrieved from CSSN: https://www.cssn.net.cn/cssn/productDetail/afa9addc3b61ce9669f9d966566e903c

CSSN. (2025c). GB 50516-2010. Retrieved from CSSN: https://www.cssn.net.cn/cssn/productDetail/e517c5de177a4a901519cc3cb7b8bf74

Delaval, B., Sharma, T. R., Hugh-Jones, W., McClure, E., Temminghoff, M., & Srinivasan, V. (2022). Hydrogen RD&D Collaboration . Australia: CSIRO.

Dellatte, J. (2023). Global Green Hydrogen Policy: China, A Giant Biding Its Time. Retrieved from Institute Montaigne: https://www.institutmontaigne.org/en/expressions/global-green-hydrogen-policy-china-giant-biding-its-time

Enapter. (2024). Wolong Enapter Joint Venture starts series production of AEM megawatt electrolyser. Retrieved from Enapter: https://www.enapter.com/press-releases/wolong-enapter-joint-venture-starts-series-production-of-aem-megawatt-electrolyser/

Energy Iceberg. (2024). China's Electrolyzer Poised for International Expansion 2024. Retrieved from Energy Iceberg: https://energyiceberg.com/china-electrolyzer-international/

EnerScen. (2024). 氢能标准体系顶层文件出台，影响几何？ (What impact will the central hydrogen standardisation guideline have?). Retrieved from Baijiahao: https://baijiahao.baidu.com/s?id=1806818574625826854

European Hydrogen Observatory. (2025). Cost of hydrogen production. Retrieved from European Hydrogen Observatory: https://observatory.clean-hydrogen.europa.eu/hydrogen-landscape/production-trade-and-cost/cost-hydrogen-production

Fullcryo. (2025). Overview. Retrieved from Fullcryo: https://en.fullcryo.com/company.aspx?ClassID=29

GuofuHEE. (2025). Overview. Retrieved from www.en.guofuhee.com: https://en.guofuhee.com/site/about_us

Han, M. (2024). 我国氢能产业发展的大难题：供需错配两头都难 (The Major Challenge of China's Hydrogen Industry: Supply and Demand Mismatch on Both Ends). Retrieved from 香橙会研究所 (The Orange Group): https://mp.weixin.qq.com/s/bX2oB0qBBCqG1217ec3YSg

HEIC. (2024). 《氢液化系统能效评价分级指标及测试方法》团体标准启动会在京成功举办 (The kick-off meeting of the group standard of "Hydrogen Liquefaction System Energy Efficiency Evaluation Grading Indicators and Test Methods" was successfully held in Beijing). Retrieved from HEIC: https://mp.weixin.qq.com/s/Zi3ryYJHDNjkHATVpjMfYg

HEIPA. (2025). 协会介绍 (About us). Retrieved from www.cn-heipa.com: https://cn-heipa.com/xhjs

Huanbao Zaixian. (2023). 多地氢能补贴政策“出炉”，最高一次性补贴 2000 万元 (The hydrogen energy subsidy policy in many places has been "released", with a maximum one-time subsidy of 20 million yuan). Retrieved from 环保在线 (Environmental Protection Online): https://mp.weixin.qq.com/s?__biz=MzAwNDAxNDUwMg==&mid=2649768745&idx=2&sn=7bd9f8163c54981bf1120a77ece8cb66&chksm=83368be0b44102f67b448ddec52cb8792c964f11c75ef3ac4b4807ed81008a111f575e469529&scene=27

IEA. (2023a). Global Hydrogen Review 2023. Retrieved from IEA: iea.blob.core.windows.net/assets/ecdfc3bb-d212-4a4c-9ff7-6ce5b1e19cef/GlobalHydrogenReview2023.pdf

IEA. (2023b). Comparison of the emissions intensity of different hydrogen production routes, 2021. Retrieved from IEA: https://www.iea.org/data-and-statistics/charts/comparison-of-the-emissions-intensity-of-different-hydrogen-production-routes-2021

IEA. (2024a). Energy Technology Perspectives 2024. Retrieved from IEA: https://iea.blob.core.windows.net/assets/ff76d6b7-587e-499e-9016-ca796d36801e/EnergyTechnologyPerspectives2024.pdf

IEA. (2024b). Global Hydrogen Review 2024. Retrieved from IEA: https://iea.blob.core.windows.net/assets/89c1e382-dc59-46ca-aa47-9f7d41531ab5/GlobalHydrogenReview2024.pdf

International Energy Network. (2021). 氢能产业写入“十四五”规划！央企纷纷深度布局！ (Hydrogen is part of the 14th FYP! SOEs are adjusting accordingly). Retrieved from Sohu.com: https://www.sohu.com/a/458061800_257552

International H2-Energy Net. (2024). 中央企业绿色氢能制储运创新联合体启动 (Central Enterprise Green Hydrogen Energy Production, Storage and Transportation Innovation Consortium launched). Retrieved from www.h2.in-en.com: https://h2.in-en.com/html/h2-2438484.shtml

Jilin People's Government. (2022). “氢动吉林”行动实施方案 (Hydrogen Drives Jilin: Medium- and Long-Term Development Plan). Retrieved from www.jl.gov.cn: https://xxgk.jl.gov.cn/szf/gkml/202212/t20221206_8644112.html

Jinglihydrogen. (2025). About Us. Retrieved from John Cockerill Jingli: https://www.jinglihydrogen.com/

Jiping. (2025). Enterprise Introduction. Retrieved from http://www.ijping.com/: http://www.ijping.com/en/list.php?pid=1

Kollar, D. J., Qin, S., & Xiao, Y. (2024). China Hydrogen Economy Report 2024. Zürich: Switzerland Global Enterprise. Retrieved from https://www.s-ge.com/sites/default/files/publication/free/2024_e_campaign_clean_website_gatedcontent_text_ct5_en_china-hyd.pdf

Li, F. (2024). Government pushes hydrogen technology up nation's agenda. Retrieved from ChinaDaily: https://www.chinadailyhk.com/hk/article/380510

LONGi. (2025). LONGi Hydrogen. Retrieved from www.longi.com: https://www.longi.com/en/products/hydrogen/

Lou, Y., & Corbeau, A.-S. (2023). China’s Hydrogen Strategy: . New York City: Columbia University Center on Global Energy Policy.

Martin, P. (2024a). 'Chinese electrolysers could dominate Western markets by 2040, assuming free trade': BNEF. Retrieved from Hydrogen Insight: https://www.hydrogeninsight.com/electrolysers/chinese-electrolysers-could-dominate-western-markets-by-2040-assuming-free-trade-bnef/2-1-1712368

Martin, P. (2024b). EU unveils restrictions on use of Chinese electrolysers in second European Hydrogen Bank subsidy auction. Retrieved from Hydrogen Insight: https://www.hydrogeninsight.com/policy/eu-unveils-restrictions-on-use-of-chinese-electrolysers-in-second-european-hydrogen-bank-subsidy-auction/2-1-1716633

Martin, P. (2024c). EXCLUSIVE | The top ten hydrogen electrolyser makers in the world today. Retrieved from Hydrogen Insight: https://www.hydrogeninsight.com/electrolysers/exclusive-the-top-ten-hydrogen-electrolyser-makers-in-the-world-today/2-1-1663793

Martin, P. (2024d). 'Severe overcapacity' | The global supply of electrolysers far outstrips demand from green hydrogen projects: BNEF. Retrieved from Hydrogen Insight: https://www.hydrogeninsight.com/electrolysers/severe-overcapacity-the-global-supply-of-electrolysers-far-outstrips-demand-from-green-hydrogen-projects-bnef/2-1-1618327

MEE. (2024). 国家重点低碳技术征集推广实施方案 (National Key Low-Carbon Technology Collection and Promotion Implementation Plan). Retrieved from www.mee.gov.cn: https://www.mee.gov.cn/xxgk2018/xxgk/xxgk05/202402/t20240222_1066647.html

MIIT. (2023). 船舶制造业绿色发展行动纲要（2024—2030 年）(Green Development Action Plan for Ship Manufacturing Industry 2024-2030). Retrieved from 中华人民共和国工业和信息化部 (Ministry of Industry and Information Technology of the People's Republic of China): https://wap.miit.gov.cn/jgsj/zbes/wjfb/art/2023/art_ac3246d17b0b4e3f9844922088d71089.html

MIIT. (2024). 工业和信息化部等七部门关于加快推动制造业绿色化发展的指导意见 (Guiding Opinions on Accelerating the Green Development of the Manufacturing Industry). Retrieved from 中华人民共和国工业和信息化部 (Ministry of Industry and Information Technology of the People's Republic of China): https://wap.miit.gov.cn/jgsj/jns/wjfb/art/2024/art_73b02f9fcfcf4687be3cae14aafa5590.html

MIIT. (2025). 工业和信息化部办公厅关于组织开展 2025 年未来产业创新任务揭榜挂帅工作的通知 (Notice of the General Office of the Ministry of Industry and Information Technology on organizing and carrying out the unveiling of the future industrial innovation task in 2025). Retrieved from www.wap.miit.gov.cn: https://wap.miit.gov.cn/zwgk/zcwj/wjfb/tz/art/2025/art_18a01a26d22c4b65a3037bb37cd606bb.html

MoF. (2020). 关于开展燃料电池汽车示范应用的通知 (Notice on Launching the Demonstration Application of Fuel Cell Vehicles). Retrieved from 中华人民共和国财政部 (Ministry of Finance of the People's Republic of China): https://jjs.mof.gov.cn/zhengcefagui/202009/t20200918_3591168.htm

MoF. (2024). 财政部关于提前下达 2025 年节能减排补助资金预算的通知 (Notice from the Ministry of Finance on the Advance Allocation of the 2025 Energy Conservation and Emission Reduction Subsidy Budget). Retrieved from 中华人民共和国财政部 (Ministry of Finance of the People's Republic of China): https://jjs.mof.gov.cn/zxzyzf/jnjpbzzj/202411/t20241114_3947565.htm

MoST. (2023). 关于国家重点研发计划 " 氢能技术 " 等 6 个重点专项 2023 年度申报项目答辩评审有关事项的通知 (Notice on matters related to the defense and evaluation of 6 key special projects such as the National Key R&D Program "Hydrogen Energy Technology" in 2023). Retrieved from www.service.most.gov.cn: https://service.most.gov.cn/kjjh_tztg_all/20231019/5414.html

Nakano, J. (2022). China's Hydrogen Industrial Strategy. Retrieved from CSIS: https://www.csis.org/analysis/chinas-hydrogen-industrial-strategy

NDRC. (2022). 氢能产业发展中长期规划（2021-2035 年）(Medium and Long-Term Plan for Hydrogen Energy Industry Development (2021-2035)). Retrieved from 中华人民共和国国家发展和改革委员会 (National Development and Reform Commission of the People's Republic of China): https://www.ndrc.gov.cn/xxgk/zcfb/ghwb/202203/t20220323_1320038.html

NDRC. (2023). 推动现代煤化工产业健康发展 (Modern Coal Chemical Industry Development Notification). Retrieved from www.gov.cn: https://www.gov.cn/zhengce/zhengceku/202307/content_6894869.htm

NDRC. (2024a). China announces new measures to boost trade-in program. Retrieved from www.english.gov.cn: https://english.www.gov.cn/news/202407/25/content_WS66a2385ec6d0868f4e8e9738.html

NDRC. (2024b). 关于大力实施可再生能源替代行动的指导意见 (发改能源〔2024〕1537 号) (Guiding Opinions on Vigorously Implementing Renewable Energy Replacement Action). Retrieved from www.ndrc.gov.cn: https://www.ndrc.gov.cn/xxgk/zcfb/tz/202410/t20241030_1394119.html

NEA. (2020). 关于开展燃料电池汽车示范应用的通知 (Notice on the Demonstration and Application of Fuel Cell Vehicles). Retrieved from www.nea.gov.cn: https://www.nea.gov.cn/2020-09/21/c_139384465.htm

NEA. (2022). 能源碳达峰碳中和标准化提升行动计划 (Energy Standardisation Action Plan for Carbon Peak and Carbon Neutrality). Retrieved from www.nea.gov.cn: https://www.nea.gov.cn/2022-10/09/c_1310668927.htm

NEA. (2023a). 国家能源局关于加快推进能源数字化智能化发展的若干意见 (Opinions on Accelerating Energy Digitalisation and Intelligence). Retrieved from www.gov.cn: https://www.gov.cn/zhengce/zhengceku/2023-04/02/content_5749758.htm

NEA. (2023b). 新型电力系统发展蓝皮书 (Blue Book on the Development of the New Power System). Retrieved from www.nea.gov.cn: https://www.nea.gov.cn/2023-06/02/c_1310724249.htm

NEA. (2024). 中国氢能发展报告 2023. Beijing: People's Daily Press.

NEA. (2025). 中国氢能发展报告 2025 (Hydrogen Energy Development Report 2025). Beijing: People's Press.

New Capital News. (2024). 2024 Hydrogen Energy Industry Report. Retrieved from https://m.bjnews.com.cn/detail/1720366975129427.html

Ouyang, A. (2023). Why Is Beijing Taking a Hands-Off Approach to Green Hydrogen? Retrieved from macropolo.org: https://macropolo.org/beijing-hands-off-approach-green-hydrogen/?rp=m

Ouyang, A. (2024). Who Will Do the Heavylifting on China’s Paltry Hydrogen Pipelines? Retrieved from MacroPolo: https://macropolo.org/heavylifting-china-paltry-hydrogen-pipelines/?rp=e

Parkes, R. (2024). World's longest hydrogen pipeline, covering 700km, set for construction work this year at a cost of $845m. Retrieved from Hydrogen Insight: https://www.hydrogeninsight.com/production/worlds-longest-hydrogen-pipeline-covering-700km-set-for-construction-work-this-year-at-a-cost-of-845m/2-1-1605339

People's Government of Guangzhou Municipality. (2019). 鸿基创能膜电极产业化项目竣工 (Hongji Chuangneng finishes MEA industrialisation project). Retrieved from www.gz.gov.cn: https://baike.baidu.com/reference/23801773/533aYdO6cr3_z3kATP2PmP31ZC-SMYiqtr2BVbNzzqIP0XOpX5nyFI8ortAw6LlkGkTMqp9tdpkGw7D7C1RH7vYZcekqQbElzH72ADWRmrnn-9xkm9kQot5CWakV0_ek5RL90HKUmuiR62E

People's Government of Guangzhou Municipality. (2020). 广州市黄埔区发展和改革局 广州开发区发展和改革局关于印发广州市黄埔区 广州开发区促进氢能产业发展办法实施细则的通知 (Implementation Rules of the Measures for Promoting the Development of Hydrogen Energy Industry in Huangpu District, Guangzhou City). Retrieved from www.gz.gov.cn: https://www.gz.gov.cn/gfxwj/qjgfxwj/hpq/qbm/content/post_5790437.html

Peric Hydrogen. (2025). Profile. Retrieved from www.en.perichtech.com: http://en.perichtec.com/about_complex.aspx?FId=n1:1:1

Re-fire. (2025). Re-fire Brochure. Retrieved from Re-fire: https://www.refire.com/int/refire.pdf

SAC. (2021). “ 十四五 ” 推动高质量发展的国家标准体系建设规划 (National Standard System Construction Plan for Promoting High-Quality Development during the 14th Five-Year Plan). Retrieved from SAC: https://www.sac.gov.cn/xxgk/zcwj/art/2021/art_51ab9411394a44d78985f6f5efdc80a7.html

SAC. (2023). 氢能产业标准体系建设指南（2023 版）(Guidelines for Establishing the Standards System on Hydrogen Energy Industry). Retrieved from https://www.gov.cn/zhengce/zhengceku/202308/content_6897986.htm

SAC. (2025a). TC114/SC27 全国汽车标准化技术委员会电动车辆分技术委员会 (List of National Standards under the National Road Vehicles Standardisation Technical Committee, Electric Vehicles Subcommittee (SAC/TC 114/SC 27). Retrieved from SAC: https://std.samr.gov.cn/search/orgDetailView?data_id=BACC0BAA8D9A0E40E05397BE0A0A7FB5

SAC. (2025b). TC309 全国氢能标准化技术委员会 (TC309 National Hydrogen Energy Standardization Technical Committee). Retrieved from SAC: https://std.samr.gov.cn/search/orgDetailView?tcCode=TC309

SAC. (2025c). TC31/SC8 全国气瓶标准化技术委员会缠绕气瓶分技术委员会 (Gas Cylinders Standardisation Technical Committee, Fiber Reinforced Cylinder Subcommittee (SAC/TC31/SC8)). Retrieved from SAC: https://std.samr.gov.cn/search/orgDetailView?data_id=209374FAF93E1487E06397BE0A0A63E6

SAC. (2025d). TC342 全国燃料电池及液流电池标准化技术委员会 (National Fuel Cell and Flow Battery Standardization Technical Committee (SAC/TC342)). Retrieved from SAC: https://std.samr.gov.cn/search/orgDetailView?data_id=98D9A39FDB7DC218E05397BE0A0A0833

SAC. (2025e). TC 目录查询 (TC directory overview). Retrieved from SAC: https://std.samr.gov.cn/org

SAC. (2025f). 行业标准查询 (Industry Standard Register). Retrieved from SAC: https://hbba.sacinfo.org.cn/stdList

SAC. (2025g). 首页 (Main Page). Retrieved from SAC: https://std.samr.gov.cn/hb/hbQuery

Saikesaisi. (2025). Company Introduction. Retrieved from http://www.ql-spe.com/: http://www.ql-spe.com/enportal/index/index.html

SAMR. (2023). 关于印发《氢能产业标准体系建设指南（2023 版）》的通知 (Notification on the Guidelines for the Construction of Hydrogen Energy Industry Standard System (2023)). Retrieved from 国家市场监督管理总局标准技术管理司 (State Administration for Market Regulation): https://www.samr.gov.cn/bzjss/tzgg/art/2023/art_8f81df3e20ed42a0997aa8c108e9f9a5.html

SAMR. (2025a). GB 32311-2015. Retrieved from SAMR: https://openstd.samr.gov.cn/bzgk/gb/newGbInfo?hcno=781E52F0B23E73EE28B56F6B6D70D1F0

SAMR. (2025b). GB 4962-2008. Retrieved from SAMR: https://openstd.samr.gov.cn/bzgk/gb/newGbInfo?hcno=75090D49EBB3C2303221506FCB56BB0D

Shandong Hydrogen Institute. (2025). 超 7000 公里，国内 8 大输氢管道项目梳理 (Over 7000 km, eight domestic large hydrogen pipeline projects). Retrieved from Shandong Hydrogen Institute: https://mp.weixin.qq.com/s/DBAnxAW1OF8IJ8FbPf_85A

SinoHytech. (2025). 关于我们 (About us). Retrieved from SinoHytech: https://www.sinohytec.com/

SIS. (2025). 现行氢能源国家标准清单 (List of Current National Standards for Hydrogen Energy). Retrieved from Sichuan Institute of Standardisation: https://www.scis.net.cn/h2-standard/

State Council of the People's Republic of China. (2020). 关于开展燃料电池汽车示范应用的通知 (Notice on the Demonstration Application of Fuel Cell Vehicles). Retrieved from www.gov.cn: https://www.gov.cn/zhengce/zhengceku/2020-10/22/content_5553246.htm

State Council of the People's Republic of China. (2021a). 中华人民共和国国民经济和社会发展第十四个五年规划和 2035 年远景目标纲要 (The PRC's 14th Economic and Social Development Plan and Vision for 2035 Abstract). Retrieved from www.gov.cn: https://www.gov.cn/xinwen/2021-03/13/content_5592681.htm

State Council of the People's Republic of China. (2021b). 国家标准化发展纲要 (National Standardisation Development Outline). Retrieved from https://www.gov.cn/zhengce/2021-10/10/content_5641727.htm#:~:text=%E6%96%B0%E5%8D%8E%E7%A4%BE%E5%8C%97%E4%BA%AC10%E6%9C%8810%E6%97%A5%E7%94%B5%20%E8%BF%91%E6%97%A5%EF%BC%8C%E4%B8%AD%E5%85%B1%E4%B8%AD%E5%A4%AE%E3%80%81%E5%9B%BD%E5%8A%A1%E9%99%A2%E5%8D%B0%E

State Council of the People's Republic of China. (2023). China plans to build 400-km hydrogen pipeline. Retrieved from www.gov.cn: https://english.www.gov.cn/news/202304/10/content_WS6433ed86c6d03ffcca6ec28a.html

State Council of the People's Republic of China. (2024a). 中华人民共和国能源法 (The PRC's Energy Law). Retrieved from www.gov.cn: https://www.gov.cn/yaowen/liebiao/202411/content_6985761.htm

State Council of the People's Republic of China. (2024b). 推动大规模设备更新和 (Action Plan for Large-Scale Equipment Upgrading). Retrieved from www.gov.cn: https://www.gov.cn/gongbao/2024/issue_11246/202403/content_6941843.html

Tianhai Industry. (2025). 北京天海氢能装备有限公司 (Beijing Tianhai Hydrogen Energy Equipment Co., Ltd.). Retrieved from Tianhai Industry: https://www.btic.cn/subsidiaries/show-233.html

TTBZ. (2025). 关于我们 (About us). Retrieved from www.ttbz.org: www.ttbz.org.cn/Home/Show/2523

Weichai Power. (2025a). Weichai Power Co., Ltd. Retrieved from Weichai Power: https://en.weichaipower.com/about/profile/

Weichai Power. (2025b). Core Strength in Heavy Industry: Weichai's Hydrogen Fuel Cell Technology Leads Industry Development. Retrieved from Weichai Power: https://en.weichaipower.com/media_center/news/202501/t20250126_111659.html

Xi'an Jiaotong University. (2023). 西安交通大学助力陕西省氢能产业延链补链强链 (Xi'an Jiaotong University helps the hydrogen energy industry in Shaanxi Province to extend and strenghten the value chain). Retrieved from www.news.xjtu.edu.cn: https://news.xjtu.edu.cn/info/1002/203967.htm

Xinhua. (2023). 国氢能产业发展迎来窗口期 (Translation: China's hydrogen energy industry is entering a window of opportunity for development). Retrieved from www.news.cn: http://www.news.cn/fortune/2023-06/05/c_1129669472.htm

Zhang, C., & Zhang, M. (2024). 氢能产业标准化体系：中外比较及启示 (Hydrogen Energy Industry Standardization System: Comparison of Chinese and Foreign Standards). Retrieved from www.china-nengyuan.com: http://h2.china-nengyuan.com/tech/213791.html

Zhong, R. (2023). 我国抢占氢能标准国际话语权 (China aims to dominate the international discourse on hydrogen energy standards). Retrieved from www.people.cn: www.paper.people.com.cn/zgnyb/html/2023-05/08/content_25983759.htm

Appendix A:
Extended stakeholders

Political entities

The development of the hydrogen industry in China involves multiple government bodies. They are responsible for creating an environment conducive to innovation, investment, and the sustainable growth of the hydrogen sector from various angles: strategic planning, regulatory and legislative framework, hydrogen-related infrastructure development, incentive policies, market regulation and standardisation, research and development (R&D) support, international cooperation, public awareness, and education.

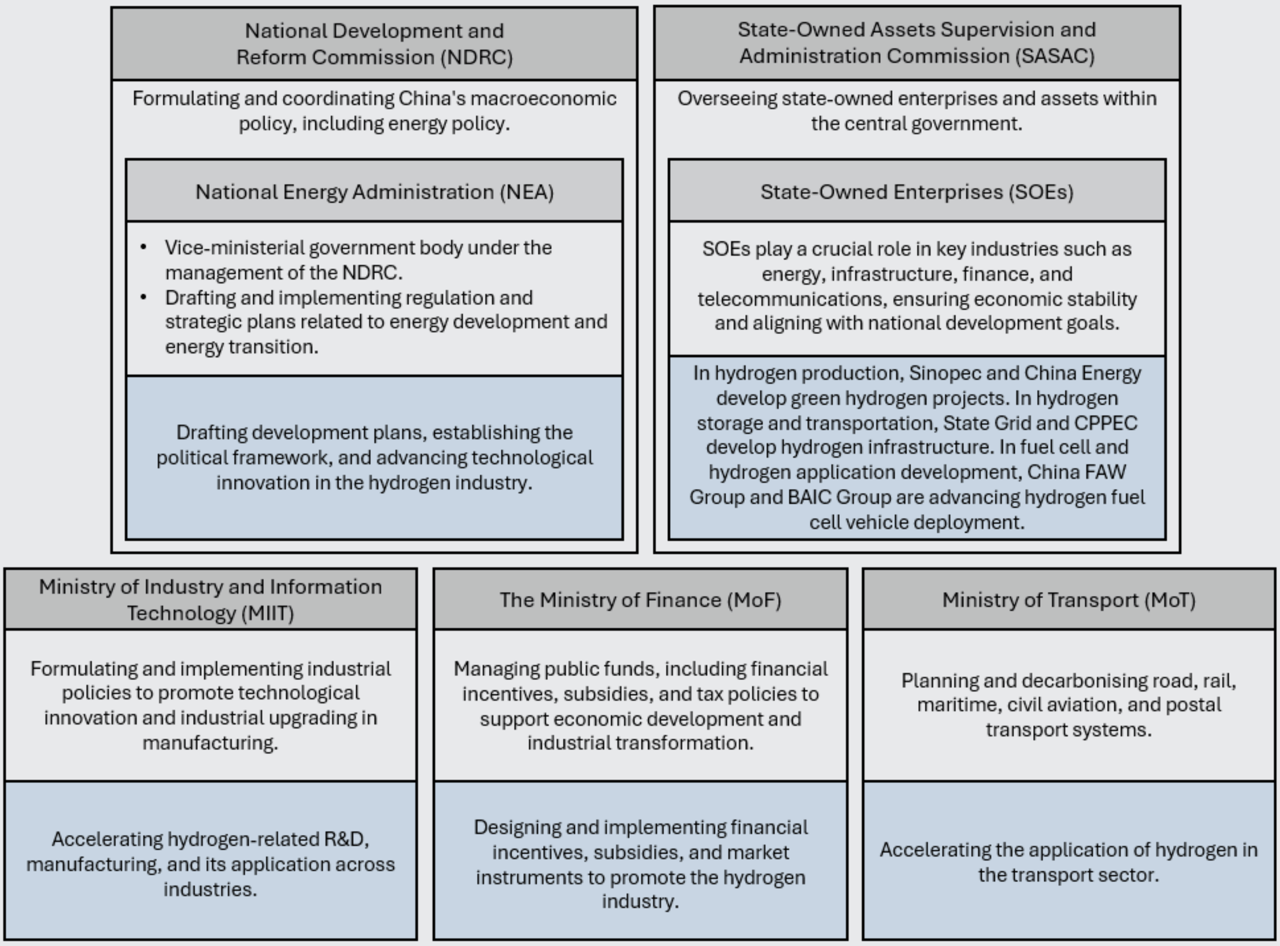


Figure A.1: Chinese government bodies responsible for hydrogen policy.
Source: Own visualisation.
Note: General responsibility in white, responsibility regarding hydrogen in blue.

National Development and Reform Commission (NDRC)

The NDRC is responsible for formulating and coordinating China's macroeconomic policy, including energy policy. In the field of hydrogen energy, the NDRC took lead in issuing the "Medium and Long-Term Plan for Hydrogen Energy Industry Development (2021-2035)" (NDRC, 2022), which clarifies the positioning of hydrogen as a component of the future energy system (see Chapter 3.1 for further details).

Several departments within the NDRC contribute to the development of hydrogen energy policy, including:

1) **Department of innovation and high-tech development:** Devises policies to promote innovation, entrepreneurship, and the growth of high-tech industries. It encourages investment in innovative sectors, particularly in the innovation and commercialisation of new energy technologies such as hydrogen energy and fuel cell technologies.

2) **Department of industrial development:** Oversees the alignment of industrial development strategies and works towards optimizing and upgrading the industrial structure. The hydrogen energy industry, classified as a strategic new industry, is among its key areas of interest.

3) **Department of resource conservation and environmental protection**: Coordinates efforts related to achieving the carbon peaking and neutrality goals. It is responsible for drafting and executing strategies, plans, and policies that support sustainable development. It is actively engaged in and advocates for the adoption of hydrogen energy as a green, low-carbon solution.

National Energy Administration (NEA)

As a vice-ministerial government body under the management of the NDRC, the NEA is responsible for drafting and implementing regulation and strategic plans related to energy development and energy transition. Regarding hydrogen, the NEA's focus is primarily on the development planning of the hydrogen sector:

- Drafting development plans for the hydrogen industry, such as the "Medium and Long-Term Plan for Hydrogen Energy Industry Development (2021-2035)" (NDRC, 2022) and collaborating with the NDRC and other regulatory bodies to foster the industry's growth.

- Establishing a comprehensive political framework for the hydrogen industry, including safety supervision and the development of industry standards. In the "Energy Standardisation Action Plan for Carbon Peak and Carbon Neutrality" (NEA, 2022), it calls to develop a complete standard system for hydrogen with a focus on renewable hydrogen production, sector coupling of electricity and hydrogen, and fuel cells (see Chapter 3.4 for further details).

- Advancing technological innovation in hydrogen energy and the construction of hydrogen infrastructure.

- Stimulating the application of hydrogen energy in sectors like transportation and industry and exploring pathways for commercialisation.

The departments within the NEA that are primarily involved with hydrogen include:

1) **Department of energy conservation and technology:** Guides energy efficiency in power generation, promotes the development of innovative technologies and coordinates the development of industry standards. It is the leading department for hydrogen energy policy, managing research, safety regulation, demonstration, and standard setting for hydrogen technologies.

2) **Department of new and renewable energy:** Oversees the planning and development of new and renewable energy sources, including the utilisation of clean energy carriers such as hydrogen.

3) **Department of electricity:** While primarily in charge of regulating the electricity sector, it also plays a role in the hydrogen industry, particularly in areas where hydrogen is coupled with the power system, like power generation, fuel cells, and energy storage.

4) **Department for general affairs:** Responsible for the general coordination and planning of energy policy, including the overall planning and policy development of the hydrogen industry.

5) **Department of international cooperation:** Promotes international energy cooperation, including international exchanges and cooperative projects on hydrogen.

Ministry of Industry and Information Technology (MIIT)

The MIIT is primarily responsible for the formulation and implementation of industrial policies, including promoting technological innovation and industrial upgrading in manufacturing. In the field of hydrogen, the MIIT focuses on the development of hydrogen-related R&D, manufacturing, and the application of hydrogen in industrial fields, such as alkaline water electrolysis (ALK), fuel-cell technology, hydrogen internal combustion engines, and hydrogen application in metallurgy.

MIIT departments involved in the hydrogen industry and their responsibilities are:

1) **Department of energy conservation and comprehensive utilisation**: Responsible for promoting energy and resource conservation in the industry, including the hydrogen industry, for example by issuing the "Guiding Opinions on Accelerating the Green Development of the Manufacturing Industry" (MIIT, 2024) with other ministries. It promotes the potential of the hydrogen industry as well as building a complete industrial chain for hydrogen production, storage, transportation, and application in chemical, steel, transportation, energy storage, and power generation fields.

2) **Department of equipment industry I:** Responsible for the management of the machinery, automotive, rail, and other equipment industries, involving research and promotion of hydrogen fuel cell vehicles, for example through the directory of Hydrogen Fuel Cell Vehicle (HFCVs) eligible for tax incentives.

3) **Department of equipment industry II:** Responsible for the management of the civil aviation and civil shipbuilding industries. This department is in charge of planning R&D for renewable hydrogen-based aviation technology and green ammonia and green methanol-powered vessels, for example by issuing the "Green Development Action Plan for Ship Manufacturing Industry (2024-2030)" (MIIT, 2023).

4) **Department of science and technology**: Responsible for the development of science and technology strategies, plans, and policies in the field of industry and information technology, including technological innovation and industrialisation in the hydrogen industry.

The Ministry of Finance (MoF)

The MoF is responsible for the allocation of public funds, including designing financial incentives, subsidies, and tax policies to support economic development and industrial transformation. It plays a significant role in shaping policies and providing financial support to promote the development of the hydrogen industry, from the allocation of incentives and subsidies to financial policies and market instruments.

Ministry of Transport (MoT)

The MoT is responsible for the development of the Chinese transportation system, including the planning and decarbonisation of road transport, rail transport, maritime transport, civil aviation, and postal services. The MoT's primary responsibility regarding hydrogen encompass its application, strategic planning, pilot projects, and safety risk management in the transport sector.

The MoT has initiated pilot projects for battery electric vehicles, HFCVs, and renewable synthetic fuel vehicles. It is also planning fuel cell charging and refuelling stations along highways. This promotes the application of fuel cell technology in public transport, such as taxis and buses. Furthermore, the MoT is engaged in investigating the potential application of vessels powered by methanol, hydrogen, and ammonia.

Standardisation Administration of China (SAC) and standard-related stakeholders

The SAC is the national body responsible for developing and managing standards across various industries in China, ensuring consistency and quality in products, services, and processes. It operates under the supervision of the SAMR and plays a key role in implementing government policies related to standardisation. In August 2023, the SAC in collaboration with the NDRC, MIIT, MEE and other relevant ministries, jointly published the "Guidelines for the Construction of Hydrogen Energy Industry Standard System (2023)" (SAMR, 2023) (see Chapter 3.4 for further details).

The overall planning for energy industry standards is managed by the Science and Technology Department of the NEA. Hydrogen-related industry standards are primarily developed by the standardisation expert group of the China Electricity Council (CEC) and the technical committee for the standardisation of high-temperature fuel cells in the energy industry. These committees contain experts of associations, research institutions, and the private sector.

SASAC and the hydrogen consortium of state-owned enterprises

The SASAC, a ministerial-level body under the State Council, is entrusted with the oversight of state-owned enterprises and assets within the central government. Key performance indicators for SASAC include the security and sustainability of state-owned assets. The major energy suppliers and network operators, including electricity grid and oil/gas pipeline operators are all under the management of SASAC. Currently, 46 out of 98 central government-owned enterprises have added hydrogen business into their portfolio, especially the coupling of electricity and hydrogen, investment and operation of hydrogen production facilities, hydrogen highways[9], and pipeline transportation.

In August 2024, SASAC initiated a hydrogen consortium formed by 116 entities, including the National Energy Group, Sinopec, China Aerospace Science and Technology, China State Shipbuilding Corporation, China National Petroleum Corporation, State Grid, and State Pipeline Network, along with 18 private enterprises and 23 universities. The consortium focuses on advancing renewable hydrogen production, storage, transportation, safety, and testing measures, with the goal of advancing technological innovation and fostering industrial growth of the hydrogen sector. (China Power, 2024)

---

9 Hydrogen highways are routes with strategically placed hydrogen refuelling stations for HFCVs.

Figure A.2: The hydrogen consortium of state-owned enterprises.
Source: (International H2-Energy Net, 2024)

Associations

Industry associations are pivotal in advancing the Chinese hydrogen industry. They set standards and foster collaboration among various stakeholders. They facilitate R&D as well as the scaling-up of pilot applications, serve as a bridge between the government and businesses, and are involved in policy development, including drafting and revising policies to interpreting and implementing them.

China Hydrogen Alliance (CHA)

The CHA was established in 2019 by the CHN Energy Group and 19 further entities, including enterprises, universities, research institutes, and financial institutions with the goal to foster the development of the hydrogen industry and to enhance cooperation and communication among its members. The alliance has grown to include 260 members, comprising Chinese and international enterprises as well as research institutes.

The CHA has its own research institute, which leads the following initiatives:

- **The white paper of hydrogen sector**: An annual publication that summarises the current state of the Chinese hydrogen industry and provides an outlook for the following years. (CHA, 2024b)

- **Hydrogen big data platform:** A website with interactive data on renewable hydrogen projects, hydrogen policies, refuelling stations, hydrogen technology, and standards as well as publication of newsletters on current developments in China's hydrogen sector. (CHA, 2024d)

- **Hydrogen energy top runner action:** An initiative that aims to promote the application of advanced hydrogen technology through pioneering companies in the Chinese hydrogen sector. Companies applying to participate undergo equipment performance testing and certification conducted in collaboration with third-party laboratories and certification bodies, including DEKRA, Bureau Veritas, China Quality Certification Centre (CQC), CCIC Metrology Co., Ltd. Equipment that meets the criteria of the Top Runner Initiative is granted preferential treatment for research and innovation incentive policies, demonstration projects, and procurement whitelists of CHA member organisations. (CHA, 2024e)

Figure A.3: The CHA's Hydrogen Top Runner Action Initiative.
Source: (CHA, 2024e)

- **The renewable hydrogen 100 initiative**: Launched in 2021, with the goal of achieving 100 GW of installed hydrogen production from renewable energy sources by 2030 in China. (CHA, 2024c)

- **Association standard on hydrogen classification:** Published in 2020, this standard classifies hydrogen, based on production method and carbon emissions (as introduced in Chapter 1). (CAB, 2020)

- **The Hydrogen Energy & Fuel Cells Expo China (CHEE):** Co-hosted by CHA, the China Electricity Council (CEC), and other stakeholders, the CHEE hosts its 4th expo in March 2025 and is expected to attract over 600 enterprises displaying more than 1000 new technologies, products, and application scenarios at the expo. (CHEE, 2025)

The China Energy Research Society (CERS)

The CERS is a national, academic, and non-profit social organisation voluntarily established by enterprises, institutions, social organisations, and people working in energy science and technology areas. With more than 600 company members and 50,000 individual members CERS influences the China's energy sector through their 43 professional committees. The flagship product of CERS in hydrogen area is the China International Hydrogen Energy Vehicles Fuel Cells and Hydrogen Equipment Exhibition. It is one of the most influential exhibitions in China's hydrogen industry. CERS initiated two Special Committees in the area of hydrogen: The Fuel Cell Professional Committee and the Hydrogen Energy Professional Committee. (CERS, 2025)

◎ **Fuel Cell Professional Committee of CERS**

Founded in 1985, the committee comprises professionals from various sectors, including hydrogen production, storage and transportation, fuel cells, hydrogen safety and regulations, as well as hydrogen energy applications. It aims to foster academic exchanges, integrate technology with industry, provide policy recommendations, and promote the connection between hydrogen science, technology, and the economy. It focuses on advancing hydrogen technologies, accelerating research-to-application processes, and raising public awareness. (CERS, 2025)

◎ **Hydrogen Energy Professional Committee of CERS**

With the support of State Power Investment Corporation Limited (SPIC) and China United Gas Turbine Technology Co., LTD, CERS established this committee in 2022. Compared to the Fuel Cell Committee, this new committee focuses on hydrogen application in industry and development of the hydrogen industry. Members include the China Iron and Steel Association (ISA), CQC and 48 further enterprises and research institutes. (CERS, 2025)

The Hydrogen Energy Industry Committee (HEIC)

Initiated by the China Energy Conservation Association in 2020, HEIC contributes to the hydrogen industry with information provision via a weekly newsletter, trainings, and the development of association standards (e.g. energy efficiency testing, evaluation and grading methodology for hydrogen liquefaction systems launched in October 2024). (HEIC, 2024)

The Hydrogen Energy Industry Promotion Association (HEIPA)

The HEIPA, established in 2020 by the China Association for the Promotion of Industrial Development (CAPID), consists of over 210 members, including 30 research institutions and 180 Chinese and foreign enterprises such as Siemens, Linde, ThyssenKrupp, and TÜV Süd. It supports the NEA with hydrogen technology and policy research. The flagship product of the Hydrogen Branch of CAPID is the Beijing International Hydrogen and Fuel Cell Exhibition with the China Communications and Transportation Association every March. (HEIPA, 2025)

Research institutes and universities

Chinese universities and research institutes conducting research on hydrogen and fuel cell technology, offering technical expertise, and cultivating talent for the industry. By fostering collaboration between academia and the private sector, they help translate research findings into practical products and services, accelerating the commercialisation of hydrogen technologies in China.

Tsinghua University

Tsinghua University is one of China's most prestigious research institutions. Many departments of it, including the Industrial R&D Institute, the School of Vehicles and Mobility, the Department of Energy and Power Engineering, the Institute for Carbon Neutrality, the Research Institute of Zero-Carbon Transportation, and the New Energy and Material Chemical Engineering Laboratory, are contributing to the R&D of hydrogen technologies and policies.

In 2000, the Tsinghua Industrial R&D Institute started the research and development of hydrogen fuel cell engines and HFCVs. Together with Beijing SinoHytec Science & Technology Co., Ltd. (hereinafter referred to as SinoHytec) the institute developed China's first hydrogen fuel cell city bus. SinoHytec has become a leading enterprise in China's hydrogen fuel cell industry. (SinoHytech, 2025)

Tsinghua University achieves the commercialisation of its research results through two paths: local start-up incubation (such as SinoHytech) or in collaboration with enterprises such as Capital Steel, Shaanxi Hydrogen, and State Power Investment Corporation on solid oxide fuel cell (SOFC) technology. Additionally, Tsinghua University partners with companies like Kewell and Guohong Hydrogen Energy to tackle key issues in the field of fuel cell testing.

Additionally, Tsinghua plays a leading role in physical adsorption hydrogen storage technology, key materials and components for hydrogen-electric conversion, stack (electrolyser) design and optimisation, direct methanol fuel cell (DMFC), mid-low temperature SOFCs, microgrid integration of user-side fuel cell, and grid forming technologies.

China Society of Automotive Engineers (China-SAE)

Established in 1963, the China-SAE is an engineering society focusing on automotive technology advancement in China with 95,000 individual and 2,300 corporate members. SAE-China encompasses a specialised branch focused on low carbon fuels and hydrogen power automotive technology. This branch actively fosters the evolution and practical deployment of HFCV technology by organising conferences, establishing sector-specific standards, and offering expert technical advisory services. (China-SAE, 2024)

China EV100

Established in 2019 as a professional platform for promoting research and development in the field of hydrogen and carbon neutrality, China EV100's main task is to implement the national strategy, carry out R&D and promote the exchange between government, industry, research and application. In 2024, China EV100 published the report "China's hydrogen industry development report 2024 – foster the integrated development of green hydrogen production, storage, transportation and application". (China EV100, 2024)

Xi'an Jiaotong University

The Hydrogen Fuel Cell Simulation Design Analysis Platform, located at Xi'an Jiaotong University, executes research on high-power hydrogen fuel cell stacks for vehicles in collaboration with the company Xu Qing Times. Further, the university has developed China's first hydrogen fuel cell system for a quadcopter drone weighing less than 10 kg. (Xi'an Jiaotong University, 2023)

Figure A.4: Hydrogen fuel cell drone by Xi'an Jiaotong University.
Source: (Xi'an Jiaotong University, 2023)

China State Shipbuilding Corporation Limited (CSSC)

CSSC has established several research institutes, including the 718th Research Institute, which focuses on research and development related to the application of hydrogen technologies in the maritime sector. The CSSC Power Research Institute cooperates with G-Power and Headway Technology Group (private SMEs focusing on fuel cell and methanol bunkering systems respectively) on joint research and commercialisation of fuel cell-powered and methanol fuelled ships.

Due to its research institutes, CSSC has achieved noteworthy results in the field of vessels using hydrogen and methanol, including the successful development of hybrid methanol-diesel engines, methanol-fuelled ships, and fuel cell-powered ships.

In 2008, the 718th Research Institute of CSSC established a wholly owned subsidiary, PERIC Hydrogen Technologies Co., Ltd., one of the largest manufacturers of electrolysers in China today.

Companies active in the hydrogen sector

As of 2024, over 2000 enterprises are active in the hydrogen sector in China, double the amount in 2020, including 48 SOEs and 88 listed companies. The hydrogen industry in China is further characterised by the contributions of SMEs excelling in key technologies, with 89 of them listed as "Little Giants"[10] by the MIIT. (New Capital News, 2024; China EV100, 2024)

A selection of representative enterprises from China's hydrogen industry is presented below, based on the hydrogen enterprise rankings from the CHA.

Hydrogen production

PERIC Hydrogen Technologies Co., Ltd. belongs to the 718th research institute of CSSC. The main products are ALK and PEM electrolysers, with a production capacity of 1.5 GW, and a 25% share of China's domestic electrolyser market. (Peric Hydrogen, 2025)

Longi Hydrogen is originally a PV and wind power enterprise. Its ALK electrolyser capacity was 1.5 GW in 2022 and is expected to reach 5-10 GW by 2025. (LONGi, 2025)

CJH (Suzhou) Hydrogen Technology Co., Ltd was established in 2019 as a joint venture between Belgium's John Cockerill and Jiangsu Jingli. With an ALK electrolyser capacity of 1.5 GW at its plants in Suzhou and Changzhou in 2023, plus the John Cockerill capacity in China and India totalling 3GW, CJH serves more than 30 countries around the world. (Jinglihydrogen, 2025)

Shandong Saikesys Hydrogen Energy Co., Ltd. is the earliest company in China to produce PEM electrolysis equipment. In collaboration with the Chinese Academy of Sciences, this company successfully developed China's first 6 MW PEM system in 2022. (Saikesaisi, 2025)

Hongji Chuangneng, established in 2017, and specialised in the manufacturing of Membrane Electrode Assemblies (MEAs)[11], holding a market share of approximately 50%. Its products are exported to various regions including Asia, North America, and Europe to support a range of vehicle models such as trains, vans, and heavy-duty trucks. (People's Government of Guangzhou Municipality, 2019)

Shanghai Jiping New Energy Technology Co., Ltd. is China's first company to achieve mass production of hydrogen and fuel cell catalysts, accounting for 95% of the domestic catalyst market in 2021. Their products include, among others, hydrogen fuel cell catalysts, PEM catalysts, AEM catalysts, ALK electrodes. (Jiping, 2025)

Sinoscience Fullcryo Technology Co., Ltd. (hereinafter referred to as "Fullcryo"), founded in 2016, specialises in the R&D and manufacturing of large-scale cryogenic equipment. Fullcryo offers full-set solutions for hydrogen liquefaction, liquefied hydrogen storage and transport, and hydrogen refuelling stations, aiming at reducing hydrogen storage and transportation costs. Fullcryo has become one of the few companies globally, alongside Linde and France's Liquid Air, to manufacture ultra-low temperature liquefaction equipment. The company specialises in hydrogen liquefaction at -253° C. (Fullcryo, 2025)

Beijing Tianhai Hydrogen Energy Equipment Co., Ltd., established in 1993, specialises in the production of Type III and Type IV carbon fiber-wrapped hydrogen storage cylinders, as well as refuelling and gasification stations. (Tianhai Industry, 2025)

10 SMEs selected by MIIT as leaders in their respective industries, all of whom have high market influence and technological innovation capabilities. As of October 2024, there are 14,600 such enterprises in China.

11 MEAs are critical components in PEM fuel cells and electrolysers.

Figure A.5: Ultra-Low Temperature Hydrogen Container by Fullcryo.
Source: (Fullcryo, 2025)

Hydrogen Application

Beijing SinoHytec Science & Technology Co., Ltd., established in 2012, is the leading enterprise for R&D and commercialisation of hydrogen fuel cells in China, holding key patents and producing fuel cell engines and stacks at scale. SinoHytech was the first to develop a hydrogen fuel cell bus in China. (SinoHytech, 2025)

Weichai Power Co., Ltd., established in 2002, specialises in manufacturing engines for powertrain systems, commercial vehicles, and agricultural equipment. At the 2024 Hannover Motor Show, Weichai presented a 300-kW fuel cell engine, one of the most powerful in the world. (Weichai Power, 2025a; Weichai Power, 2025b)

Shanghai Reshaping Energy Technology Co., Ltd., established in 2015, specialises in manufacturing at scale for fuel cell technologies under the brand Re-fire. Hydrogen fuel cell systems by Re-fire are used in 5,900 fuel cell vehicles in China in 2024. (Re-fire, 2025)

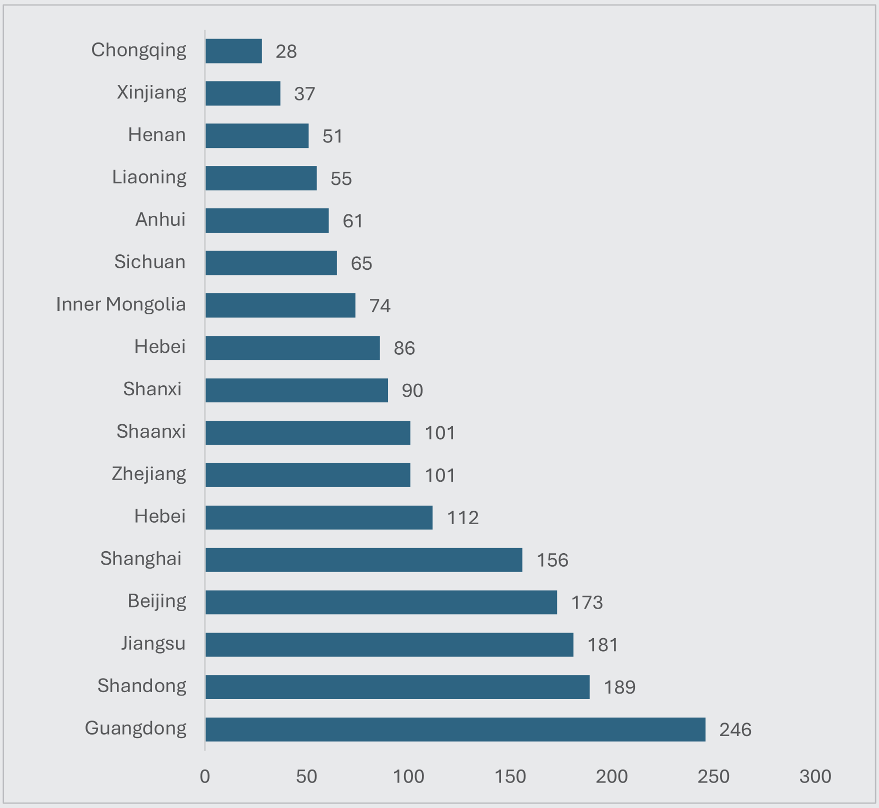


Figure A.6: Number of Chinese companies active in the hydrogen sector by province.

Source: (New Capital News, 2024)

Extended list of hydrogen companies:

Fuel cell technology companies	
Region	**Company**
East China	Weishi Energy, Shangran Power, Shanghai Hydrogen, Edelman Hydrogen, Reshaping Technology, Qingneng, Tomorrow Hydrogen, CRRC Hydrogen Power, Meijin Energy, Hydrogen Technology, Shanghai Xinyuan Power, Hydraulic Technology, Wind Hydrogen Yang, Jie Hydrogen Technology, Weichai Power, Infineon, Shanghai Electric, Rui Hydrogen Power (Chery Automobile), Ningbo Lvdong Hydrogen Energy, Wuhu National Hydrogen, Anhui Yuanjun Hydrogen, Shanghai Electric Drive, Suzhou Hua Chang Energy, Deran (Zhejiang) Power, Yangzhou Hydrogen Blue Times, Xiamen Nexans, Runfeng Hydrogen Engine, Jiangsu Xingbang
Central China	Wuhan Xiongtao Hydrogen Hero, Wuhan Tiger, Zhixin Technology (Dongfeng Motor), Zhongyu Power, Wuhan Lvdong Hydrogen Energy, Hubei Haiyi, Yu Hydrogen Power
South China	Xiongtao Hydrogen Hero, Guangdong Guohong, Guohong Remodeling, Guangdong Exploration, Qingji Energy, Guangzhou Hydrogen Chi, Guangdong Himalaya, CRRC Hydrogen Power (Guangzhou), Guangdong Edelman Hydrogen Energy, Dongguan Hydrogen Yu, Guangdong Xiongtao Hydrogen Constant, Dayang Motor, Guangdong Tairos, Shenzhen Hydrogen Blue Times, Shenzhen Guohydrogen, Guangxi Yuchai, Shenzhen Hydrogen Times, Guangdong Hongli Hydrogen Power, Guangdong Taiji Power, Shenzhen Xiaolong, Nanke Power, Guangdong Mingyuan, Xiongchuan Hydrogen Energy, Guangzhou Zhi Hydrogen
North China	Wei Shi Energy Hebei, Hydrogen Hero Cloud Ding, Yihuatong, Yihuatong Power, Beijing Tomorrow Hydrogen Energy, Tianjin New Hydrogen Power, Zhangjiakou Himalaya, Meijin Energy, Guodian Hydrogen Energy, Beijing Hydrogen, China Energy Engineering Hydrogen Energy, Lu'an Aspen Hydrogen Power, Deran (Shanxi) Power, Shanxi Hydrogen Blue Era
Southwestern China	Chengdu Yihuatong, Chongqing Tomorrow Hydrogen Energy, Dongfang Hydrogen Energy, Chongqing Tiger Hydrogen Energy, Deran (Chongqing) Power
Northeastern China	Xinyuan Power, Dalian Qingyan, Mingyuan Technology

Fuel cell membrane electrode companies	
Region	**Company**
East China	Weishi Energy, Qingneng Co., Ltd., Edelman Hydrogen Energy, Tomorrow Hydrogen Energy, Yanchang Sunlight, Weifu High-tech, Yihydrogen Technology, Shanghai Yunliang (Reshaping Technology), Tangfeng Energy, Dynamic Technology, Jie Hydrogen Technology, Suzhou Nelson, Yanan Electric
South China	Hongji Chuangneng, Guangdong Himalayas, Dow's Spruce, Taiji Power, Nanke Fuel

Central China	Wuhan Polytechnic Hydrogen Power, Henan Qingdong, Wuhan Green Power Hydrogen, Guoxiong Hydrogen
Southwest	Chongqing Tomorrow Hydrogen Energy, Dongfang Hydrogen Energy
North China	Weishi Energy Hebei, Beijing Tomorrow Hydrogen Energy, Wuli Hydrogen Innovation, State Power Investment Hydrogen Energy, Shanxi Qingdong
Northeastern China	Xinyuan Power

Key material suppliers	
Material	**Company**
Catalyst	Yanchang Sunlight, Zhongke Kechuang, Jiping New Energy, Nanjing Dongyan, Qingdong Technology, Zhongzi Environmental Protection, Ningbo Green Energy Hydrogen Energy, Gaocheng Green Energy, Zhangjiakou Himalayas, State Power Investment Hydrogen Energy Guangdong Himalaya, Hydrogen Power Zhongke, Guangdong Jiping New Energy, Wuhan Himalayas, Guiyan Platinum, Xi'an Kalik
Proton exchange membrane	Dongyue Future Hydrogen Energy, Suzhou Kerun Membrane Materials, Wuhan Green Energy Hydrogen Energy (State Power Investment Hydrogen Energy), Huayi Group, Zhejiang Hancheng, Wuhan Lvdong Hydrogen Energy (State Power Investment Hydrogen Energy), Henan Huiqiang, Dongcai Technology, General hydrogen
Gas diffusion layer	Jiangsu Tianniao, Huayi Group, Shanghai Jiazi, Wuhan Lvdong Hydrogen Energy (State Power Investment Hydrogen Energy), General hydrogen

Hydrogen refuelling station equipment	
Equipment Type	**Supplier**
Hydrogen refuelling station integration	Guofu Hydrogen Energy, Shanghai Hydrogen Maple, Shanghai Shunhua, Hedlyson, Air Liquide Hopu, Henan Hydrogen Equipment, Berken Energy, CIMC Enric, Perihua Hydrogen, Zhengxing Hydrogen Power
Hydrogen compressors	Zhongding Hengsheng, Dongde Industrial, Forset, Beijing Tiangao, Jingcheng Compressor, Fengdian Jinkaiwei, Compris, Jiangsu Hengjiu Machinery, CIMC Enric, Berken Energy
Hydrogenation equipment	Guofu Hydrogen Energy, Shanghai Hydrogen Maple, CIMC Enric, Air Liquide Houpu, Chongqing Houhai
Hydrogen storage containers for hydrogen refuelling stations	Sinoma Technology, Juhua, CIMC Enric, Zhejiang Lanneng, Dongfang Boiler, Kaiyuan Veken
Pipe valves	Bocaike, Shanghai Han hydrogen, Furui special equipment

Hydrogen storage and transportation equipment	
Company	**Business**
R&D and sales of hydrogen supply system and hydrogenation equipment	Shanghai Shunhua New Energy System Co., Ltd.
Construction of hydrogen refuelling stations	Beijing Yihuatong Technology Co., Ltd.
Hydrogen production, storage, transportation and filling integrated systems	Xiongtao Hydrogen Xiong Fuel Cell Technology Co., Ltd.
Design of hydrogen production and refuelling stations	Shenzhen Kaihaoda Hydrogen Energy Co., Ltd.
Normal temperature and pressure organic liquid hydrogen storage	Wuhan Hydrogen Sun Energy Co., Ltd.
High pressure hydrogen storage	Sinoma Technology Co., Ltd.
High pressure hydrogen storage	Beijing Haitian Industry Co., Ltd.
Hydrogen transport	Air Liquide China Investment Co., Ltd.
Hydrogen delivery	Linde Gas (Chengdu) Co., Ltd.
High pressure hydrogen storage and hydrogenation systems	Beijing Peruihua Hydrogen Energy Technology Co., Ltd.
Hydrogen refuelling station construction, hydrogen storage and transportation equipment	Meijin Energy Co., Ltd.
Hydrogen storage alloy powder	Xiamen Tungsten Industry Co., Ltd.
Rare earth hydrogen storage	China North Rare Earth High-Tech Co., Ltd.
Hydrogen transportation, hydrogen storage equipment	Dongfang Electric Group Co., Ltd.
Hydrogen tanks, hydrogen production equipment, hydrogen storage and transportation equipment	Edelman Hydrogen Energy Equipment Co., Ltd.
Construction of hydrogen refuelling station	Guangdong Guohong Hydrogen Energy Technology Co., Ltd.
Hydrogen storage and hydrogenation technology	Great Wall Hydrogen Energy Technology Center
Construction of hydrogen refuelling station	Chengdu Huaqi Houpu Electromechanical Equipment Co., Ltd.
Communication base station backup power supply	Xinyuan Power Co., Ltd.

Hydrogen refuelling station solutions	Anhui Tomorrow Hydrogen Energy Technology Co., Ltd.
Hydrogen transport	National Energy Group
Hydrogen transport	Sinopec
Hydrogen and oxygen mixing and separation equipment	Guangzhou Sinohydrogen Energy Technology Co., Ltd.
Skid-mounted hydrogenation facilities	Wuhan Zhongji Hydrogen Energy Industry Innovation Center Co., Ltd.
Transport of liquid hydrogen	Zhangjiagang Furui Special Equipment Co., Ltd.
Construction of hydrogen refuelling stations	Hydrogen Maple New Energy Co., Ltd.
Construction of hydrogen refuelling stations	Jinhong New Energy Co., Ltd.
Hydrogen production, hydrogen storage and transportation, hydrogen refuelling and other infrastructure construction	Shenzhen Guohydrogen New Energy Technology Co., Ltd.

Table A.1: List of Selected Hydrogen Companies in China.
Source: Own Research.

Appendix B:
City cluster subsidy evaluation system

Area	Key Performance Indicator	City Cluster Demonstration Objectives	Reward Point Criteria	Subsidy Cap (in Points)
Promotion and Application of Fuel Cell Vehicles	Promotion and Application of Vehicle Technologies and Quantities	1. Breakthroughs and industrialization should be achieved in key areas including fuel cell stacks, membrane electrode assemblies (MEAs), bipolar plates, proton exchange membranes, catalysts, gas diffusion layers (carbon paper), air compressors and hydrogen circulation systems during the demonstration period. The total deployment scale of fuel cell vehicles shall exceed 1,000 units. 2. The rated power of the fuel cell system shall be no less than 50kW, with a ratio to the drive motor's rated power of at least 50%. 3. Fuel Cell Vehicles must demonstrate cold start capability at temperatures no higher than -30°C . 4. For passenger vehicles: the rated power density of the fuel cell stack must achieve a minimum of 3.0 kW/L, and the system must achieve a rated power density of at least 400 W/kg; For commercial vehicles: the rated power density of the fuel cell stack must achieve a minimum of 2.5 kW/L, and the system must achieve a rated power density of at least 300 W/kg. 5. All fuel cell vehicles must achieve a minimum pure hydrogen range of 300 km. Exceptions may be granted for freight vehicles with maximum design weights of 31 tonnes or more, as well as vehicles operating in mines or airports, where the minimum range may be reduced to no less than 200 km upon approval.	1. In 2020, 1.3 points per vehicle (standard vehicle, same below); in 2021, 1.2 points per vehicle; in 2022, 1.1 points per vehicle; and in 2023, 0.9 points per vehicle. For freight vehicles with a fuel cell system rated power greater than 80 kW, the points are calculated based on the maximum design weight as follows: vehicles with a total weight of 12-25 tonnes (inclusive) will be calculated at 1.1 times the standard points, vehicles with a total weight of 25-31 tonnes (inclusive) will be calculated at 1.3 times the standard points, and vehicles exceeding 31 tonnes will be calculated at 1.5 times the standard points. 2. To qualify for additional points, key component products must pass comprehensive third-party testing, be applied across demonstration city clusters for no less than 500 units, accumulate more than 20,000 km of real-world operation and receive approval from an expert committee for technical reliability. For fuel cell stacks and bipolar plates: 0.20 points/vehicle; for MEAs, air compressors, proton exchange membranes: 0.25 points/ vehicle, for catalysts, gas diffusion layers (carbon paper), hydrogen circulation systems: 0.30 points/vehicle. Each key component product can earn a maximum of 1,500 additional points. A nationwide comprehensive evaluation will be conducted based on factors including technology, quality and safety levels of key component products. A maximum of 5 products per component category may qualify for additional points.	15000

Area	Key Performance Indicator	City Cluster Demonstration Objectives	Reward Point Criteria	Subsidy Cap (in Points)
		6. Manufacturers of fuel cel passenger vehicles must provide warranties covering at least 8 years or 120,000 km (whichever comes first); manufacturers of commercial vehicles must provide warranties covering at least 5 years or 200,000 km. 7. The average cumulative mileage of hydrogen power per vehicle must exceed 30,000 km. 8. Demonstration projects such as utilizing high-pressure hydrogen storage systems rated at 70MPa are encouraged.		
Hydrogen Fuel Supply	Hydrogen Fuel Supply and its Economic Feasibility	1. The annual production of vehicle-grade hydrogen fuel should exceed 5,000 tonnes. Clean and low-carbon hydrogen production is encouraged, with the CO_2 emissions per kilogram of hydrogen being less than 15 kilograms. 2. The quality of vehicle-grade hydrogen fuel should meet the requirements of "Hydrogen Fuel for Proton Exchange Membrane Fuel Cell Vehicles" (GB/T 37244-2018). 3. The price of hydrogen for vehicles should decrease significantly, and the retail price of hydrogen at refuelling stations should not exceed 35 RMB per kilogram.	Points are awarded based on the actual hydrogen refuelling amount for vehicles: 1. 2020: 7 points per 100 tonnes; 2021: 6 points per 100 tonnes; 2022: 4 points per 100 tonnes; 2023: 3 points per 100 tonnes. 2. If cost standards are met: 1 point per 100 tonnes. 3. Clean hydrogen (with less than 5kg CO_2 emissions per kilogram of hydrogen): 3 points per 100 tonnes. 4. Transportation Radius < 200 km: 1 point per 100 tonnes.	2000

Table A.2: City cluster demonstration objectives and point-based evaluation system for fuel cell vehicles.
Source: (State Council of the People's Republic of China, 2020)

Appendix C:
List of national standards

National standards under the national hydrogen energy standardisation technical committee (SAC/TC309)		
Standard	Name	Implementation date
GB/T 45027-2024	General specification for liquid hydrogen valves	2025/04/01
GB/T 45092-2024	Performance testing and evaluation of electrodes for water electrolysis hydrogen production	2025/03/1
GB/T 44399-2024	Mobile metal hydride reversible hydrogen storage and release system	2024/12/1
GB/T 44242-2024	Hydrogen for PEM fuel cell vehicles – determination of inorganic halides and formic acid by ion chromatography	2024/11/1
GB/T 44243-2024	Hydrogen for PEM fuel cell vehicles – determination of sulphur compounds, formaldehyde, and organic halides by gas chromatography	2024/11/1
GB/T 44238-2024	Hydrogen for PEM fuel cell vehicles – determination of helium, argon, nitrogen, and hydrocarbons by gas chromatography	2024/11/1
GB/T 44244-2024	Hydrogen for proton exchange membrane fuel cell vehicles – determination of carbon monoxide and carbon dioxide by gas chromatography	2024/11/1
GB/T 44262-2024	Technical requirements for hydrogen sampling for proton exchange membrane fuel cell vehicles	2024/11/1
GB/T 43674-2024	General requirements for hydrogen refuelling stations	2024/10/1
GB/T 42857-2023	Safety requirements for pressure swing adsorption (PSA) hydrogen purification systems	2023/12/1
GB/T 42855-2023	Technical requirements for hydrogen refuelling protocol for fuel cell vehicles	2023/12/1
GB/T 29729-2022	Basic safety requirements for hydrogen systems	2023/4/1
GB/T 42177-2022	Technical requirements and test methods for hydrogen valves in hydrogen refuelling stations	2023/4/1
GB/T 31138-2022	Hydrogen dispenser	2022/10/12
GB/T 40045-2021	Liquid hydrogen fuel for hydrogen vehicle	2021/11/1
GB/T 40060-2021	Technical requirements for storage and transportation of liquid hydrogen	2021/11/1
GB/T 40061-2021	Technical specification for liquid hydrogen production system	2021/11/1
GB/T 39359-2020	Measurement of suspended liquid-solid photocatalytic hydrogen production by integrating sphere method	2021/6/1
GB/T 37563-2019	Safety requirements for pressurized water electrolysis hydrogen production system	2019/10/1
GB/T 37562-2019	Technical conditions of pressure type water electrolysis hydrogen production system	2020/1/1
GB/T 37244-2018	Proton exchange membrane fuel cell vehicle	2019/7/1
GB/T 34542.2-2018	Hydrogen storage and delivery systems - Part 2: Test methods for compatibility of metallic materials with hydrogen environments	2018/12/1
GB/T 34542.3-2018	Hydrogen storage and delivery systems - Part 3: Test method for hydrogen embrittlement susceptibility of metallic materials	2018/12/1

National standards under the national hydrogen energy standardisation technical committee (SAC/TC309)		
Standard	Name	Implementation date
GB/T 34537-2017	Compressed hydrogen and natural gas mixed gas for vehicles	2018/5/1
GB/T 34540-2017	Technical requirements for methanol conversion pressure swing adsorption hydrogen production system	2018/5/1
GB/Z 34541-2017	Regulations for the safe operation of hydrogenation facilities for hydrogen energy vehicles	2018/5/1
GB/T 34539-2017	Safety technical requirements for hydrogen and oxygen generators	2018/5/1
GB/T 34542.1-2017	Hydrogen storage and delivery systems - Part 1: General requirements	2018/5/1
GB/T 34544-2017	Safety test method for low pressure hydrogen storage device for small fuel cell vehicle	2018/5/1
GB/T 34583-2017	Safety technical requirements for hydrogen storage devices used in hydrogen refuelling stations	2018/5/1
GB/T 34584-2017	Safety technical specification for hydrogen refuelling station	2018/5/1
GB/T 33291-2016	Pressure-composition-isotherm (P-C-T) test method for reversible hydrogen absorption and desorption of hydrides	2017/7/1
GB/T 33292-2016	Metal hydride hydrogen storage system for fuel cell backup power	2017/7/1
GB/T 31138-2014	Compressed hydrogen dispenser for automobile	2015/1/1
GB/T 31139-2014	Safety technical specifications for mobile hydrogenation facilities	2015/1/1
GB/T 30718-2014	Compressed hydrogen vehicle filling connection device	2014/10/1
GB/T 30719-2014	Liquid hydrogen vehicle fuelling system interface	2014/10/1
GB/T 29729-2013	Basic requirements for hydrogen system safety	2014/1/1
GB/T 29411-2012	Technical requirements for water electrolysis hydrogen and oxygen generator	2013/10/1
GB/T 29412-2012	Adsorber for hydrogen purification by pressure swing adsorption	2013/10/1
GB/T 26915-2011	Energy conversion efficiency and quantum yield calculation of solar photocatalytic water splitting for hydrogen production	2012/3/1
GB/T 26916-2011	Performance evaluation method of small-scale hydrogen integrated energy system	2012/3/1
GB/T 24499-2009	Hydrogen, hydrogen energy and hydrogen energy system terminology	2010/5/1
GB/T 19773-2005	Technical requirements for pressure swing adsorption hydrogen purification system	2005/11/1
GB/T 19774-2005	Technical requirements for water electrolysis hydrogen production system	2005/11/1

Table A.3: List of national standards under the National Hydrogen Energy Standardization Technical Committee (SAC/TC309). Source: (SAC, 2025b)

National standards under the National Fuel Cell and Flow Battery Standardisation Technical Committee (SAC/TC342)		
Standard	Name	Implementation date
GB/T 20042.5-2024	Proton exchange membrane fuel cell – Part 5: Membrane electrode assembly testing methods	2025/7/1
GB/T 20042.7-2024	Proton exchange membrane fuel cell – Part 7: Carbon paper characteristic testing methods	2025/7/1
GB/T 20042.6-2024	Proton exchange membrane fuel cell – Part 6: Bipolar plate characteristic testing methods	2024/10/1
GB/T 43691.1-2024	Fuel cell modules – Part 1: Safety	2024/10/1
GB/T 23751.3-2024	Micro fuel cell power systems – Part 3: Fuel container interchangeability	2024/10/1
GB/T 43512-2023	Reliability evaluation methods for vanadium flow battery	2024/7/1
GB/T 42847.3-2023	Reversible mode fuel cell modules for energy storage systems – Part 3: Performance testing methods for electrical energy storage systems	2024/4/1
GB/T 42847.2-2023	Reversible mode fuel cell modules for energy storage systems – Part 2: Performance testing methods for reversible mode proton exchange membrane single cells and stacks	2024/3/1
GB/T 20042.2-2023	Proton exchange membrane fuel cell – Part 2: General technical requirements for fuel cell stacks	2023/10/1
GB/T 41986-2022	Design guidelines for all-vanadium redox flow batteries	2023/5/01
GB/T 20042.3-2022	Proton exchange membrane fuel cells - Part 3: Test methods for proton exchange membranes	2022/10/1
GB/T 28817-2022	Test method for single cell of polymer electrolyte fuel cell	2022/10/1
GB/T 27748.2-2022	Stationary fuel cell power generation systems - Part 2: Performance test methods	2022/10/1
GB/T 41134.1-2021	Fuel cell power generation systems for electrically driven industrial vehicles - Part 1: Safety	2022/7/1
GB/T 41134.2-2021	Fuel cell power generation systems for electrically driven industrial vehicles - Part 2: Performance test methods	2022/7/1
GB/T 38914-2020	Service life test and evaluation method of PEM fuel cell stack for vehicle	2020/12/1
GB/T 28816-2020	fuel cell term	2020/12/1
GB/T 38954-2020	Hydrogen fuel cell power generation system for drones	2020/12/1
GB/T 36544-2018	PEM fuel cell power supply system for substation	2019/2/1
GB/T 36288-2018	Fuel cell electric vehicles and Fuel cell stack safety requirements	2019/1/1
GB/T 34872-2017	Technical requirements for hydrogen supply system of proton exchange membrane fuel cell	2018/5/1
GB/T 34582-2017	Test methods for performance of single cells and stacks of solid oxide fuel cells	2018/4/1
GB/T 27748.3-2017	Stationary fuel cell power generation systems - Part 3: Installation	2018/4/1
GB/T 27748.1-2017	Stationary Fuel Cell Power Generation Systems Part 1: Safety	2018/2/1
GB/T 33983.1-2017	Direct methanol fuel cell systems Part 1: Safety	2018/2/1

National standards under the National Fuel Cell and Flow Battery Standardisation Technical Committee (SAC/TC342)		
Standard	Name	Implementation date
GB/T 23751.2-2017	Micro fuel cell power generation system - Part 2: Performance test method	2018/2/1
GB/T 33979-2017	Test method for low temperature characteristics of proton exchange membrane fuel cell power generation system	2018/2/1
GB/T 33978-2017	Proton exchange membrane fuel cell modules for road vehicles	2018/2/1
GB/T 27748.4-2017	Stationary fuel cell power generation systems - Part 4: Performance test methods for small fuel cell power generation systems	2018/2/1
GB/T 33983.2-2017	Direct methanol fuel cell systems - Part 2: Performance test methods	2018/2/1
GB/T 20042.1-2017	Proton exchange membrane fuel cells Part 1: Terminology	2017/12/1
GB/T 31886.1-2015	Test method for the effect of impurities in the reaction gas on the performance of proton exchange membrane fuel cells - Part 1: Impurities in the air	2016/4/1
GB/T 31886.2-2015	Test method for the effect of impurities in reactant gas on the performance of proton exchange membrane fuel cells - Part 2: Impurities in hydrogen	2016/4/1
GB/T 31035-2014	Test method for low temperature characteristics of proton exchange membrane fuel cell stack	2015/7/1
GB/T 31037.2-2014	Fuel cell power generation systems for industrial hoisting vehicles - Part 2: Specifications	2015/7/1
GB/T 31036-2014	Proton Exchange Membrane Fuel Cell Backup Power System Safety	2015/7/1
GB/T 31037.1-2014	Fuel cell power generation systems for industrial hoisting vehicles Part 1: Safety	2015/7/1
GB/T 20042.7-2014	Proton exchange membrane fuel cells - Part 7: Test methods for carbon paper properties	2015/7/1
GB/T 30084-2013	Portable Fuel Cell Power Generation System - Safety	2014/4/9
GB/T 27748.2-2013	Stationary fuel cell power generation systems - Part 2: Performance test methods	2014/3/7
GB/T 29838-2013	Fuel cell module	2014/3/7
GB/Z 23751.3-2013	Micro fuel cell power generation system Part 3: Fuel container interchangeability	2013/12/2
GB/T 28817-2012	Test method for single cell of polymer electrolyte fuel cell	2013/2/1
GB/T 20042.6-2011	Proton Exchange Membrane Fuel Cells Part 6: Test Methods for Bipolar Plate Characteristics	2012/5/1
GB/Z 27753-2011	Test method for suitability of membrane electrodes in proton exchange membrane fuel cells	2012/5/1
GB/T 28183-2011	Test method for fuel cell power generation system for passenger cars	2012/6/1
GB/T 25319-2010	Specifications for fuel cell power generation systems for automobiles	2011/5/1
GB/T 23751.1-2009	Micro Fuel Cell Power Generation System Part 1: Safety	2009/11/1
GB/T 23645-2009	Test methods for fuel cell power generation systems for passenger vehicles	2009/11/1

National standards under the National Fuel Cell and Flow Battery Standardisation Technical Committee (SAC/TC342)		
Standard	Name	Implementation date
GB/T 20042.4-2009	Proton Exchange Membrane Fuel Cells Part 4: Test Methods for Electrocatalysts	2009/11/1
GB/T 20042.5-2009	Proton exchange membrane fuel cells - Part 5: Membrane electrode test methods	2009/11/1
GB/T 20042.3-2009	Proton exchange membrane fuel cells - Part 3: Test methods for proton exchange membranes	2009/11/1
GB/Z 21742-2008	Portable proton exchange membrane fuel cell power generation system	2009/1/1
GB/T 20042.2-2008	Proton exchange membrane fuel cell - General specification for fuel cell stack	2009/1/1

Table A.4: List of national standards under the National Fuel Cell and Flow Battery Standardisation Technical Committee (SAC/TC342).

Source: (SAC, 2025d)

National standards under the Gas Cylinders Standardisation Technical Committee, Fiber Reinforced Cylinder Subcommittee (SAC/TC31/SC8)		
Standard #	Name	Implementation date
GB/T 42536-2023	Assembly valve on high pressure hydrogen storage cylinder for vehicles	2024/6/1
GB/T 42610-2023	Test method for evaluating hydrogen compatibility of plastic liner of high-pressure gaseous hydrogen cylinders	2024/6/1
GB/T 42612-2023	Fully wrapped carbon fibre reinforced cylinders with a plastic liner for the on-board storage of compressed hydrogen as a fuel for land vehicles	2024/6/1
GB/T 42626-2023	Periodic inspection and evaluation of fully wrapped fibre reinforced composite gas cylinders of compressed hydrogen gas for automotive vehicles	2023/12/1
GB/T 35544-2017	Fully wrapped carbon fibre reinforced cylinders with an aluminium liner for the on-board storage of compressed hydrogen as a fuel for land vehicles	2018/7/1

Table A.5: List of national standards under the Gas Cylinders Standardisation Technical Committee, Fiber Reinforced Cylinder Subcommittee (SAC/TC31/SC8).

Source: (SAC, 2025c)

National standards under the National Road Vehicles Standardisation Technical Committee, Electric Vehicles Subcommittee (SAC/TC 114/SC 27)		
Standard	Name	Implementation date
GB/T 26991-2023	Test methods for power performance of fuel cell electric vehicles	2024/7/1
GB/T 34425-2023	Fuel cell electric vehicles hydrogen refuelling nozzle	2024/7/1
GB/T 26990-2023	Fuel cell electric vehicles - Onboard hydrogen system technical specifications	2023/11/27
GB/T 43255-2023	Test methods for sub-zero cold start performances of fuel cell electric vehicles	2023/11/27
GB/T 43252-2023	Test methods of energy consumption and range for fuel cell electric vehicles	2023/11/23
GB/T 24554-2022	Performance test methods for fuel cell system	2023/7/1
GB/T 26779-2021	Hydrogen fuel cell electric vehicle refuelling receptacle	2021/10/1
GB/T 39132-2020	Fuel cell electric vehicle engineering approval evaluation programme	2021/5/1
GB/T 24549-2020	Fuel cell electric vehicles - Safety requirements	2021/4/1
GB/T 37154-2018	Fuel cell electric vehicles - Test methods of hydrogen emission	2019/7/1
GB/T 35178-2017	Fuel cell electric vehicles - Hydrogen consumption - Test methods	2018/7/1
GB/T 34593-2017	Test methods of hydrogen emission for fuel cell engine	2018/5/1
GB/T 29123-2012	Specifications for hydrogen fuel cell vehicles in demonstration	2013/7/1
GB/T 29124-2012	Hydrogen fuel cell vehicles facilities for demonstration specifications	2013/7/1
GB/T 24548-2009	Fuel cell electric vehicles - Terminology	2010/7/1

Table A.6: List of national standards under the National Road Vehicles Standardisation Technical Committee, Electric Vehicles Subcommittee (SAC/TC 114/SC 27).

Source: (SAC, 2025a)

Contact Us:

GIZ Office China
Tayuan Diplomatic Office Building 2-5
14 Liangmahe Nanlu, Chaoyang District, 100600 Beijing, PR China

Tel +86 10 8527 5589
Fax +86 10 8527 5591
Web www.giz.de
www.energypartnership.cn

WeChat

Website