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China's Hydrogen Economy Five Years On

Kevin Jianjun TU

Center for Energy
and Climate

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Abstract

China's hydrogen sector is not new. It is the world's largest industrial hydrogen system, rooted in ammonia, methanol, refining, coal chemicals and by-product gas streams.

Five years after Ifri published ["Prospects for a Hydrogen Economy with Chinese Characteristics"](#), China has moved from hydrogen enthusiasm to a more structured, state-guided phase of industrial deployment. The shift is now reinforced by the 15th Five-Year Plan (FYP) cycle. The *2026 China Hydrogen Development Report* provides a clearer 2025 baseline: total hydrogen production capacity exceeded 51 million tons (Mt)/year, and output exceeded 39 Mt, while commissioned renewable-hydrogen capacity exceeded 250,000 tons (t)/year and accounted for more than half of global renewable-hydrogen capacity. The market remains overwhelmingly fossil-based: coal-derived hydrogen output was about 23 Mt, natural-gas hydrogen about 7.9 Mt and industrial by-product hydrogen about 7.7 Mt.

The 15th FYP changes the policy framework. Renewable-energy hydrogen production scale is to reach 2 Mt by 2030, roughly eight times the 2025 commissioned renewable-hydrogen capacity. This is an indicative policy benchmark rather than a binding obligation, and its success will depend on demand-side policy, credible offtake, project economics and carbon-accounting rules.

The key question is now as much economic as technological: who will pay for the green molecules? China's existing industrial hydrogen demand can physically absorb 2 Mt of renewable hydrogen, but that does not make the target automatically bankable. Bankability will depend on credible offtake, subsidies or performance-based rewards, green-product premiums, robust carbon accounting, and whether state-owned and private-sector buyers are willing, or required, to replace cheaper captive fossil hydrogen with higher-cost clean hydrogen.

This target is ambitious but should be read with care. It is a scale target, not proof of actual production, high utilization or fossil-hydrogen displacement. This paper argues that China's hydrogen strategy is best understood as a green hydrogen-ammonia-methanol and industrial-substitution strategy: green molecules are intended to convert low-cost renewable electricity into chemical feedstocks, shipping fuels and industrial inputs, while Chinese equipment suppliers seek to translate scale into global competitiveness. The main risks are not technological impossibility, but grey-hydrogen lock-in, capacity without utilization, weak carbon accounting, storage and transport bottlenecks, water and ecological constraints, and geopolitical fragmentation of hydrogen standards and clean-technology supply chains.

China's strongest position is in alkaline electrolyzers, engineering execution, renewable-energy equipment and scale manufacturing. Its weaker links remain high-end Proton Exchange Membrane (PEM)/Solid Oxide Electrolysis Cell (SOEC) materials, long-distance logistics, liquid hydrogen, fuel-cell components, carbon accounting and international certification.

For international observers, the question is no longer whether China can build hydrogen projects. It can. The test is whether the 15th FYP can convert scale into verified production, bankable demand, credible carbon intensity and real displacement of fossil hydrogen.

Résumé

Le secteur de l'hydrogène en Chine n'est pas nouveau. Il s'agit du plus grand système industriel d'hydrogène au monde, qui s'appuie sur l'ammoniac, le méthanol, le raffinage, la chimie du charbon et les flux de gaz dérivés. Cinq ans après la publication par l'Ifri de l'étude « [Prospects for a Hydrogen Economy with Chinese Characteristics](#) », la Chine est passée d'un enthousiasme pour l'hydrogène à une phase de déploiement industriel plus structurée et guidée par l'État.

Cette évolution est désormais renforcée par le cycle du 15^e plan quinquennal. L'échelle de production d'hydrogène issu des énergies renouvelables a pour objectif d'atteindre 2 millions de tonnes d'ici 2030. Son succès dépendra des politiques menées du côté de la demande, de la fiabilité des débouchés, de la rentabilité des projets et des règles de comptabilisation du carbone.

Pour les observateurs internationaux, la question n'est plus de savoir si la Chine est capable de mettre en œuvre des projets liés à l'hydrogène ; elle l'est. Le véritable défi consiste à déterminer si ce 15^e plan quinquennal permettra de transformer cette envergure en une production avérée, une demande financièrement viable, une intensité carbone crédible et un remplacement réel de l'hydrogène issu des énergies fossiles.

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Introduction: From the 2020 hydrogen boom to the 15th FYP industrial strategy

Five years after Ifri published “Prospects for a Hydrogen Economy with Chinese Characteristics”,¹ China has moved from hydrogen enthusiasm to a more structured, state-guided phase of industrial deployment. The shift is now reinforced by the 15th Five-Year Plan (FYP) cycle. Hydrogen is no longer framed mainly as a fuel-cell vehicle demonstration agenda; it is being embedded across China’s new energy system, renewable-energy non-power use, industrial green transition, freight transport, green fuels and climate-policy architecture. In 2025, China’s total hydrogen production capacity exceeded 51 million tons (Mt)/year and output exceeded 39 Mt, while commissioned renewable-hydrogen capacity exceeded 250,000 tons (t)/year and accounted for more than half of global renewable-hydrogen capacity.²

The author’s 2020 Ifri report identified a paradox that still defines China’s hydrogen economy. China had the industrial scale, low-cost manufacturing base and local-government activism to accelerate hydrogen deployment, but it also had a coal-reliant hydrogen system, relatively weak high-end technologies and fragmented governance. The danger at the time was overheating: local governments, industrial parks and state-owned enterprises were rushing into hydrogen before cost, safety, infrastructure and demand fundamentals had been established.

The first update is institutional. The 2022 “Medium- and Long-Term Plan for the Development of the Hydrogen Energy Industry” defined hydrogen as an important component of the future national energy system and set 2025 targets of around 50,000 fuel-cell vehicles and 100,000-200,000 t/year of renewable-hydrogen production. In 2024, the Energy Law stated that China should “actively and orderly” promote hydrogen development and utilization. This reduced the ambiguity created by treating hydrogen only as a hazardous chemical, although permitting and safety supervision still remain partly fragmented.³

1. K. J. Tu, “Prospects for a Hydrogen Economy with Chinese Characteristics”, *Ifri Studies*, Ifri, October 2020, available at: www.ifri.org.

2. National Energy Administration (NEA) — Department of Energy Conservation and Technology Equipment, National Development and Reform Commission (NDRC) — Department of Innovation and High-tech Development, and Guoneng Hydrogen Innovation Technology Co., *China Hydrogen Development Report 2026*, August 2026, available at: www.nea.gov.cn.

3. NDRC and NEA, “Medium- and Long-Term Plan for the Development of the Hydrogen Energy Industry (2021-2035)”, March 2022, available at: <https://zfxgk.nea.gov.cn>; National People’s Congress, Energy Law of the People’s Republic of China, adopted on November 8, 2024, and in force from January 1, 2025, available at: www.gov.cn.

The second update is strategic. Under the 15th FYP, hydrogen is not being promoted through a single standalone hydrogen plan. It is distributed across the national development plan, the new energy system plan, the renewable-energy plan, the new power system agenda, industrial green-transition policy, the carbon-peak action plan and transport policy. This matters because the policy question has changed: hydrogen is now expected to link renewable-power expansion, chemical feedstock substitution, green ammonia and methanol, heavy transport corridors, port fuels, long-duration storage and industrial competitiveness.

This paper assesses the status of China's hydrogen economy and prospects under the most recent 15th FYP policy cycle.

The statistical picture: 2025 official data and 2030 targets

A central weakness in China hydrogen analysis is statistical inconsistency. Hydrogen is simultaneously an industrial feedstock, an energy carrier, a chemical, a by-product gas and an intermediate stream inside refineries, coke ovens and coal-chemical plants. Many hydrogen users are also hydrogen producers. This creates double counting and makes production, consumption, capacity and renewable-hydrogen figures easy to misread. This paper therefore treats 2025 official data in the *2026 China Hydrogen Development Report* as the status-quo baseline and uses national 15th FYP documents for 2030 policy benchmarks.⁴

Table 1. Snapshots of China's hydrogen economy: 2020 baseline, 2025 official data and 2030 15th FYP target

Indicator	2020 baseline	2025 official data	2030 15th FYP target
Total hydrogen production and capacity	About 34.1 Mt of hydrogen output; mostly fossil-based and already the world's largest hydrogen system.	Production capacity exceeded 51 Mt/year; output exceeded 39 Mt, up about 7.3% year on year.	No single official total-output target; hydrogen is positioned as a future industry and a component of the new energy system.
Main supply structure	Coal gasification, coke-oven gas, natural gas, oil-refining streams and chlor-alkali by-product hydrogen.	Coal-derived hydrogen output was about 23.0 Mt; natural-gas hydrogen about 7.9 Mt; methanol cracking about 0.4 Mt; industrial by-product hydrogen about 7.7 Mt.	Policy emphasis shifts toward renewable hydrogen, by-product hydrogen purification and cleaner use of fossil-based hydrogen in transition.
Industrial demand structure	Ammonia, methanol and refining were already the demand anchors; transport was politically visible but small.	Methanol used about 12.5 Mt of hydrogen, ammonia 10.5 Mt, refining 6.0 Mt and modern coal chemicals 4.1 Mt.	Industrial substitution, green ammonia, green methanol, selected steel applications and green fuels remain the core demand priorities.
Renewable/green hydrogen capacity	Demonstration scale.	Commissioned renewable-hydrogen capacity exceeded 250,000 t/year, more than double the 2024 level and more than half of global renewable-hydrogen capacity.	Renewable-energy hydrogen production scale: 2 Mt/year.
Built plus under-construction renewable-hydrogen capacity	Not material.	Exceeded 1 Mt/year by end-2025, including more than 250,000 t/year commissioned and more than 900,000 t/year under construction.	The pipeline is sufficient on paper; actual output, utilization and offtake are decisive.
Green derivatives	Limited demonstration.	Green ammonia capacity reached about 700,000 t/year and green methanol about 380,000 t/year.	15 th FYP promotes green hydrogen-ammonia-methanol bases and green-fuel infrastructure.
Hydrogen infrastructure	Refueling network emerging; pure-hydrogen pipelines limited.	More than 590 refueling stations; more than 70 commercial hydrogen supply centers; more than 350 km of operating pure-hydrogen pipelines and over 5,500 km planned.	Cross-regional pipelines, regional clusters, ports and green-fuel corridors become central implementation tests.
Fuel-cell electric vehicles (FCEVs)	7,355 FCEVs; refueling network emerging.	FCEV stock reached around 32,000; nearly 8,000 vehicles were added in 2025.	Comprehensive pilots aim for FCEV stock to double from 2025 and strive for 100,000 by 2030; transport remains corridor-specific.

4. NEA et al., *China Hydrogen Development Report 2026*, NEA, pp. 10-18.

Indicator	2020 baseline	2025 official data	2030 15th FYP target
Hydrogen prices	High and subsidy-dependent in transport applications.	At end-2025, the production-side hydrogen price index averaged 26.2 yuan/kg; the consumption-side average was 44.5 yuan/kg.*	Comprehensive pilots target end-use hydrogen prices below 25 yuan/kg by 2030, and around 15 yuan/kg in advantaged regions.
Standards and certification	Early-stage standards system.	146 national standards, 71 industry standards, 61 local standards and more than 720 association standards have been issued cumulatively; clean low-carbon hydrogen, green ammonia and green methanol standards were released in 2025.	Lifecycle carbon accounting, tracing and international mutual recognition have become essential for trade and finance.

*: The production-side index tracks high-purity ex-works hydrogen prices from electrolysis, industrial by-product purification and methanol cracking plants; it excludes coal-based hydrogen. The consumption-side index reflects retail fuel hydrogen prices at refueling stations and integrated energy stations.

Source: Synthesis based on NEA et al., China Hydrogen Development Report 2026; K. J. Tu, "Prospects for a Hydrogen Economy with Chinese Characteristics", *Ifri Studies*, Ifri, October 2020; and relevant 15th FYP documents.

The 2025 supply mix is the key empirical point. Coal-derived hydrogen, natural-gas hydrogen and industrial by-product hydrogen together still accounted for nearly the entire market. Renewable-hydrogen capacity is growing quickly, but commissioned capacity of more than 250,000 t/year remains small relative to more than 39 Mt of total hydrogen output. The 2 Mt 2030 target would be a major scale-up of clean supply, but it would not transform the whole hydrogen economy on its own.⁵

Demand remains overwhelmingly industrial. Methanol, ammonia, refining and modern coal chemicals were the four largest hydrogen-consuming segments in 2025, together using about 33 Mt of hydrogen. This confirms that China's clean-hydrogen transition will be decided first in industry and green fuels, not in passenger mobility or building heat.⁶

Data note: capacity, output and decarbonization are not the same

A renewable-hydrogen project can be announced, under construction, commissioned, operating or actually displacing fossil hydrogen. These are different states. China's 2030 target of 2 Mt/year renewable-hydrogen scale is important, but it should be judged by actual annual production, utilization hours, electricity sourcing, delivered carbon intensity, offtake contracts and displacement of coal- or gas-based hydrogen.

5. Ibid., pp. 10-18.

6. Ibid., pp. 10-18.

What the 15th FYP actually changes

The 15th FYP does not replace the 2022 hydrogen plan. It changes the operating environment around it. Hydrogen is now embedded in a wider system of plans that connect future industries, renewable-energy consumption, industrial low-carbon transformation, electricity-system flexibility, transport corridors and green fuels. The result is a distributed policy architecture: no single hydrogen document governs the whole sector, but multiple sectoral plans now create supply, infrastructure and demand signals.

Importantly, the 2 Mt/year renewable-hydrogen target should be understood as an indicative policy benchmark rather than a binding obligation. Implementation risk is therefore higher than for fully regulated industrial obligations, and actual delivery will depend on the strength of accompanying demand-side policies, credible offtake, supportive market mechanisms and project-level economics.

Table 2. Hydrogen in the 15th FYP policy architecture

Policy document/policy area	Hydrogen-related content	Policy significance
National 15 th FYP outline	Hydrogen is included among future-oriented industries and new growth points.	Frames hydrogen as industrial policy as well as energy policy.
New Energy System Construction 15 th FYP Plan	Calls for whole-chain hydrogen development; 2 Mt/year renewable hydrogen by 2030; green hydrogen-ammonia-methanol bases; hydrogen pipelines and green-methanol transport options.	Creates the national energy-system frame for hydrogen, green fuels and cross-regional infrastructure.
Renewable Energy Development 15 th FYP Plan	Sets the 2025-2030 indicator from 250 kt/year to 2 Mt/year renewable-hydrogen scale; promotes green hydrogen-ammonia-methanol bases in Northeast China, the Yellow River Jiziwan, northern North China and the northern Tianshan region.	Makes renewable hydrogen a non-power use of renewable energy, not merely a transport fuel.
New power system agenda	Links hydrogen to electricity-hydrogen coordination, flexible loads, renewable-energy direct supply and long-duration storage.	Positions electrolyzers as potential flexible demand but not a substitute for direct electrification.
Carbon peak and climate policy	Promotes green hydrogen-ammonia-methanol, biodiesel and sustainable aviation fuels; strengthens carbon control, product footprints and climate finance.	Determines whether green hydrogen receives a credible carbon-value premium over grey hydrogen.
Industrial green transition	Prioritizes metallurgy, ammonia, methanol, refining, green industrial microgrids and substitution of fossil hydrogen in key sectors.	Confirms that industry, not passenger mobility, is the central demand anchor.
Transport and comprehensive application pilots	Supports heavy commercial vehicles, green fuels, hydrogen corridors, ports, ships, mining trucks and selected innovation scenarios.	Keeps transport relevant but places hydrogen within a broader freight transition alongside electrification and battery swapping.

Source: Synthesis based on national 15th FYP energy, renewable-energy, new-energy-system, industrial and climate-policy documents.

The central policy innovation is not one target but a spatial and industrial logic. Resource-rich regions are expected to convert renewable electricity into hydrogen, ammonia and methanol; industrial clusters and ports are expected to consume or trade those molecules; and cross-provincial pipelines and green-fuel logistics are expected to move China beyond local point-to-point demonstrations.⁷

7. NDRC and NEA, “New Energy System Construction 15th Five-Year Plan”, June 2026, available at: www.ndrc.gov.cn; NDRC and NEA, “Renewable Energy Development 15th Five-Year Plan”, July 2026, available at: www.ndrc.gov.cn.

Renewable hydrogen and green molecules: from projects to molecules

Renewable hydrogen is now the strategic increment of China's hydrogen economy, but it remains small relative to total hydrogen demand. The best way to understand the sector is to distinguish announced projects, projects under construction, commissioned renewable-hydrogen capacity and actual annual output. The 2026 report states that by the end of 2025, built and under-construction renewable-hydrogen capacity exceeded 1 Mt/year, including more than 250,000 t/year commissioned and more than 900,000 t/year under construction. Commissioned projects were still dominated by small demonstrations, with average project capacity around 4,900 t/year and more than half of individual projects at 1,000 t/year or below.⁸

The regional pattern is becoming clearer. Among commissioned renewable-electrolysis projects, Northeast China accounted for 46% of national capacity, followed by North China at 30%, Northwest China at 22%, and other regions at about 2%. At the provincial level, Jilin and Inner Mongolia led the market, with commissioned capacity exceeding 90,000 t/year and 80,000 t/year, respectively.⁹ This distribution suggests that China's renewable-hydrogen deployment is being shaped less by a uniform national rollout than by a resource-and-cluster strategy, anchored in regions where renewable-energy availability, industrial demand and local policy support can be combined.

The 15th FYP therefore turns renewable hydrogen into a green-molecule strategy. Green ammonia and methanol matter because they can absorb large hydrogen volumes, use existing chemical know-how and logistics, and serve as potential shipping fuels or internationally traded low-carbon products. By the end of 2025, China had built 380,000 t/year of green methanol capacity and 700,000 t/year of green ammonia capacity, while sustainable aviation fuel capacity had reached 1.7 Mt/year. These figures are capacity measures, but they show that policy and industry are no longer focused on gaseous hydrogen alone.¹⁰

8. NEA et al., *China Hydrogen Development Report 2026*, op. cit., pp. 10-18.

9. Ibid.

10. "Cultivating New Drivers of Energy Transition and Building a New Blue Ocean for Green Fuels", *China Energy News*, reprinted by NEA, August 5, 2026, available at: www.nea.gov.cn.

The economics remain demanding. Chinese alkaline electrolyzers are cost-competitive by international standards, but project economics are set by the delivered molecule, not by the electrolyzer stack alone. Electricity price, utilization hours, storage, conversion losses, water availability, certification and offtake determine whether a project becomes a low-carbon industrial input or a stranded asset. A 2 Mt/year renewable-hydrogen target implies roughly 100-110 terawatt-hours (TWh) of low-carbon electricity if system electricity consumption is around 50-55 kilowatt-hours (kWh) per kilogram of hydrogen. That is manageable within China's renewable build-out, but only if power, electrolyzers, storage, chemical synthesis and buyers are sequenced together.

China could therefore simultaneously create three markets: direct substitution of fossil hydrogen in refining, ammonia, methanol and coal chemicals; green ammonia and methanol for chemicals, shipping and trade; and selective new demand in steel, heavy-duty corridors, ports, mines and long-duration storage. The 15th FYP will be judged by whether those markets become bankable, not by how many projects are announced.

Economics and demand creation: who will buy the 2 Mt?

The physical size of China's hydrogen market is not the binding constraint. The four largest industrial consuming segments—methanol, ammonia, refining and modern coal chemicals—used roughly 33 Mt of hydrogen in 2025. A 2 Mt/year renewable-hydrogen target would equal only about 6% of that demand pool. The harder question is not whether potential buyers exist, but whether they will be required, rewarded or commercially motivated to buy verified low-carbon molecules instead of cheaper captive fossil hydrogen.

Cost remains the starting point for demand creation. China's green hydrogen costs have fallen as electrolyzer manufacturing has scaled, renewable power prices have declined, and project integration has improved. However, the evidence base does not support a single national cost curve. Production costs vary sharply by region, electricity source, utilization hours and logistics model, while delivered prices can be much higher than production-side costs once compression, storage, transport, conversion losses and certification are included. This is why low-cost resource regions and integrated industrial clusters matter more than a uniform national rollout.

If the 2 Mt renewable-hydrogen target is achieved by 2030, absorption will be driven overwhelmingly by existing industrial hydrogen users, not by diffuse new end-use markets. In China, near-term demand is more likely to come from substitution within existing industrial systems and from green ammonia and methanol as tradable molecules. Table 3 summarizes the main demand pools, their drivers and caveats.

Table 3. Potential buyers of China's 2 Mt/year renewable-hydrogen target

Potential demand pool	Why it matters	Likely policy/economic driver	Main caveat
Ammonia	Existing large hydrogen demand; green ammonia can serve fertilizer, chemicals and fuel markets.	Green ammonia pilots, SOE procurement, product standards, export certification.	Needs a green premium, compliance value or procurement mandate.
Methanol	China is already a major methanol producer and consumer; green methanol has shipping-fuel potential.	Green fuel pilots, port bunkering, shipping demand, Shanghai/Tianjin/Dalian green-fuel infrastructure.	Carbon accounting for hydrogen, CO ₂ and biomass inputs must be credible.
Refining and petrochemicals	Existing hydrogen users with operating experience and large balance sheets.	Refinery decarbonization, product carbon footprints, possible future carbon constraints.	Unlike Europe, China does not yet have a strong binding refinery mandate.
Modern coal chemicals	Large hydrogen and syngas users often located near renewable-rich regions.	Industrial substitution and green hydrogen-ammonia-methanol bases.	Risk that small green additions legitimize new coal-chemical expansion.
Steel and hydrogen metallurgy	Strategic hard-to-abate sector and politically important industrial use.	Demonstration projects, low-carbon steel demand, SOE industrial policy.	Should remain conditional and not crowd out scrap, EAF and efficiency options.
Heavy transport and ports	Potential for high-utilization fleets, ports, cold-chain logistics and corridors.	City-cluster pilot rewards, toll exemptions, refueling and green-fuel infrastructure.	Station utilization and delivered price remain uncertain.
Power and long-duration storage	Potential future flexibility role in renewable-heavy systems.	New power system pilots and industrial microgrids.	Likely smaller near-term offtake than chemicals and green fuels.

Source: Synthesis based on NEA et al., China Hydrogen Development Report 2026; MIIT, Ministry of Finance and NDRC, "Notice on Carrying Out Comprehensive Hydrogen Application Pilots", 2026; and International Energy Agency (IEA), Global Hydrogen Review 2025/2026.

China's route differs from Europe's. Europe is creating early clean-hydrogen demand partly through regulatory obligations, especially in refining and transport fuels. China has not yet established a broad national mandatory renewable-hydrogen incorporation requirement for refineries, chemical producers or coal-chemical companies. Its emerging demand architecture is softer and more state-guided: application pilots, central and local fiscal rewards, state-owned enterprise (SOE)-led offtake, green-product standards, green-fuel trials, green finance, carbon-accounting rules and possible future carbon-market linkages. This may launch projects faster, but it is not yet equivalent to a durable compliance market.¹¹ Table 4 maps the core instruments.

11. IEA, *Global Hydrogen Review 2026*, executive summary, 2026, available at: www.iea.org.

Table 4. Main demand-creation and support instruments

Instrument	Producer-side or consumer-side?	What it supports	Assessment
Comprehensive hydrogen application pilots	Mainly application side.	City clusters, end-use products, demand scale, multi-scenario applications.	Most important national mechanism; rewards performance rather than nameplate capacity.
Green liquid fuel pilots	Both production and market creation.	Green methanol, green ammonia, SAF and other green fuels.	Helps create green-molecule markets, especially shipping and fuel trade.
Green power direct connection	Producer-side cost reduction.	Lower-cost electricity for green hydrogen, ammonia and methanol.	Critical for cost reduction, but not sufficient without offtake.
Local toll exemptions and vehicle support	Consumer/application side.	Hydrogen trucks and logistics corridors.	Helps mobility economics but does not make hydrogen trucks universally competitive.
Green finance catalogs and policy finance	Capital-cost reduction.	Equipment, infrastructure, green fuels and hydrogen projects.	Supports build-out but can worsen overcapacity if not tied to utilization.
CCER methodology and certification	Market-value creation.	Carbon attributes of renewable hydrogen and derivative products.	Potentially important, but value depends on credibility, liquidity and avoiding double counting.
SOE procurement and industrial pilots	Demand side.	Refining, chemicals, steel, ports and green fuels.	Likely more important in China than formal mandates in the near term.

Source: Synthesis based on MIIT et al., "Notice on Carrying Out Comprehensive Hydrogen Application Pilots"; NEA et al., China Hydrogen Development Report 2026, and relevant 15th FYP energy-policy documents.

The centerpiece is the March 2026 Comprehensive Hydrogen Application Pilot program, operated on a four-year cycle across five city clusters with a 1.6 billion yuan central reward cap per cluster. It is explicitly application-led rather than purely production-led, using a points-based system linked to verified hydrogen consumption and end-use product adoption, with additional incentives for renewable hydrogen. Funds are pre-allocated and then cleared annually based on performance, with phase-down mechanisms intended to encourage cost reduction and avoid ongoing subsidy dependence.¹²

The support logic is therefore not a simple national producer tax credit. It combines application-side rewards with producer cost-reduction tools such as green power direct connection, green finance, local operating support, SOE anchor procurement and emerging China Certified Emission Reduction (CCER) carbon-market linkages. This package can launch projects, but it still needs to evolve into durable demand signals.

12. Ministry of Industry and Information Technology (MIIT), Ministry of Finance and NDRC, "Notice on Carrying Out Comprehensive Hydrogen Application Pilots", March 6, 2026, available at: www.miit.gov.cn.

The demand architecture shapes the investment landscape. Large Chinese clean-hydrogen projects are therefore unlikely to be financed mainly by independent merchant hydrogen developers. Leading investors will be central SOEs, local SOEs, power-generation groups, oil and refining companies, chemical and coal-chemical incumbents, steel groups, ports and equipment manufacturers with affiliated demand or strategic industrial-policy mandates.

This SOE-centred investment model matters because many relevant sectors, including power generation, refining, chemicals, steel and transport infrastructure, remain heavily state-influenced and can be mobilized to adopt green hydrogen before fully commercial economics are established. China's domestic market will therefore be shaped not only by price signals, but also by SOE procurement, industrial policy, local implementation capacity and the willingness of large industrial incumbents to absorb early green premiums.

China's model is less a merchant-gas model than an industrial-cluster model: investors build hydrogen where they can also control renewable power, electrolyzer deployment, chemical conversion, logistics, industrial offtake or local policy support. This can accelerate deployment, but it can also obscure true market prices and utilization if internal offtake falls short.

In sum, the 2 Mt target is physically achievable with plausible demand pools and policy instruments behind it, but bankability cannot be assumed. The green-grey cost gap remains large, demand relies heavily on state guidance and SOE procurement, and the market is still transitioning from demonstration projects to industrial scale.

Demand priorities: where renewable hydrogen should and should not be used

Looking ahead, renewable hydrogen should be allocated according to where it delivers the greatest decarbonization value relative to competing options. Because hydrogen is costly to produce, difficult to transport and inefficient when used simply as a fuel, China should avoid treating it as a universal clean-energy solution. A more disciplined approach distinguishes between near-term substitution, strategic but conditional uses, corridor-specific applications and poor-fit uses.

Table 5. A disciplined hierarchy for renewable-hydrogen applications in China

Category	Main applications	Policy reading
Promising near-term substitution	Refining, ammonia, methanol, coal chemicals and selected petrochemical feedstocks	These sectors already use hydrogen at scale. Renewable hydrogen can substitute for fossil hydrogen without first creating a new end-use market. The priority should be displacement of existing grey hydrogen, not expansion of new fossil-based petrochemical capacity with a small green label.
Strategic but conditional/last resort	Hydrogen metallurgy, hydrogen-based direct-reduced iron (DRI), residual primary ironmaking and selected high-temperature processes	High-value decarbonization potential, but should follow scrap recycling, electric-arc furnaces, material efficiency, demand reduction and direct electrification where feasible. Hydrogen should be reserved for residual primary processes where other routes are insufficient.
Debatable and corridor-specific	Heavy-duty trucks, ports, mines, cold-region logistics, inland shipping, rail niches, backup power and long-duration storage pilots	Can be justified where operating intensity is high, and alternatives are weak. Hydrogen trucks should be treated as fleet and corridor businesses, not a generalized replacement for battery-electric road transport.
Poor fit/bad ideas	Passenger cars, district heating, building heat and diffuse low-temperature applications	Direct electrification, heat pumps, electric boilers, geothermal, solar thermal, waste heat and thermal storage are usually cheaper and more efficient. Hydrogen blending and heat pilots should not drive national strategy.

Source: Author's assessment, informed by China's 2026 comprehensive hydrogen application pilot, consultations with industry experts, and international literature on hydrogen-use prioritization.

This hierarchy is consistent with the 2026 comprehensive application pilot, but more selective. The pilot includes fuel-cell commercial vehicles, green ammonia and methanol, hydrogen-based chemical feedstock substitution, hydrogen metallurgy, hydrogen blending and several innovation scenarios. It also requires city clusters to avoid all-at-once, low-level duplicate construction. The useful policy signal is that support is moving from equipment purchase toward end-use products and actual hydrogen use. The analytical caution is equally important: inclusion in a pilot list does not mean every application deserves large-scale support.¹³

13. MIIT et al., "Notice on Carrying Out Comprehensive Hydrogen Application Pilots", op. cit.

Infrastructure and regional geography: pipelines, ports, clusters and bottlenecks

China can build electrolyzers more easily than it can build a cost-effective hydrogen logistics system. The dominant near-term mode remains compressed gaseous hydrogen by tube trailer, which is flexible but expensive and ill-suited to large-volume, long-distance movement from renewable-rich regions to eastern industrial demand centers. The five-year update confirms the warning made in 2020: storage and transport are binding constraints that determine whether green hydrogen remains a local demonstration or becomes an industrial input.¹⁴

Infrastructure is expanding quickly. In 2025, China piloted 30 Megapascal (MPa) hydrogen tube trailers that reduced single-vehicle hydrogen transport costs by about 30%; developed 52 MPa Type IV storage cylinders and tube containers with more than 1,000 kg of onboard hydrogen capacity; built more than 70 commercial hydrogen supply centers; operated more than 350 km of pure-hydrogen pipelines; and planned more than 5,500 km of long-distance pure-hydrogen pipelines. More than 590 hydrogen refueling stations had been built by the end of 2025, while six ports had green ammonia or green methanol bunkering capability.¹⁵

The 15th FYP gives more geographic specificity than the earlier policy. Northeast China and eastern Inner Mongolia are emerging as green ammonia and methanol bases with potential port access. The Yellow River Jiziwan—especially Inner Mongolia, Ningxia, Shaanxi and Shanxi—combines renewable resources with coal chemicals, ammonia, methanol and heavy industry. North China links Zhangjiakou, Ulanqab and Beijing-Tianjin-Hebei demand. The northern Tianshan region has large resource potential but faces long-distance logistics and water constraints. Shanghai and other coastal ports are being positioned as green-fuel bunkering, trading and international maritime-fuel nodes.

Pipeline planning is the clearest sign of a move beyond local demonstrations. The New Energy System plan calls for construction of the Ulanqab-Beijing-Tianjin-Hebei hydrogen pipeline and planning of Ordos-Yulin and Bayannur-Ningdong cross-provincial hydrogen pipeline networks, while also studying green-methanol pipeline options. These projects could reduce reliance on tube trailers, but their commercial model

14. K. J. Tu, “Prospects for a Hydrogen Economy with Chinese Characteristics”, op. cit.

15. NEA et al., *China Hydrogen Development Report 2026*, op. cit., pp. 13-15.

remains unresolved: third-party access, capacity booking, tariff regulation, hydrogen purity, safety liability and carbon-accounting rules will matter as much as pipeline steel.¹⁶

The safer near-term model is clustering. Produce and consume hydrogen near renewable resources and existing industrial demand where possible; use ammonia, methanol or other carriers when the final product is itself a chemical or fuel; and reserve long-distance pure-hydrogen pipelines for corridors with multiple creditworthy anchor users. Without such sequencing, western or northern green hydrogen will not automatically decarbonize coastal industry.

16. NDRC and NEA, *New Energy System Construction 15th Five-Year Plan*, June 2026.

Technology competitiveness: scale leadership, selective gaps

China's technology position is best described as uneven rather than simply ahead or behind. It is globally strong in alkaline electrolyzers, engineering integration, industrial-park execution and cost reduction. It remains weaker in higher-performance electrolysis systems, core materials, long-distance logistics, liquid hydrogen, high-end fuel-cell components and globally trusted certification.

Table 6. Evidence-based reading of China's hydrogen technology position

Technology field	China position	Assessment
Alkaline electrolysis	Strong/globally cost-competitive	China has the manufacturing base, supply chain and project scale to keep alkaline systems low-cost, but overcapacity and quality differentiation are rising risks.
PEM electrolysis	Improving but weaker in core materials	The 2026 report notes 50 MW-scale PEM applications. Membranes, catalysts and titanium-based components remain cost and supply-chain bottlenecks.
Anion Exchange Membrane (AEM) and SOEC	Promising but early	Megawatt-level AEM has been tested, and SOFC/SOEC-related demonstrations are advancing, but commercial bankability requires long-duration operating evidence.
Compressed storage and tube trailers	Mature for short distance	Adequate for pilots and industrial clusters, insufficient for national-scale green-hydrogen redistribution.
Liquid hydrogen and liquid organic hydrogen carrier (LOHC)	Strategic gap/selective progress	Civil liquid-hydrogen and organic carrier systems are progressing but remain less mature than leading US and Japanese experience.
Fuel cells and components	Rapid localization in systems; weaker in high-end materials	Progress is real in stacks and systems, but membranes, catalysts, carbon paper, air compressors and long-life components remain areas for catch-up.
Patents, standards and certification	Large quantity, mixed value	China reports more than 100,000 hydrogen-related patent applications, but international patent families, safety certification and lifecycle accounting remain key tests for global credibility.

Source: Synthesis based on NEA et al., China Hydrogen Development Report 2026; IEA, Global Hydrogen Review, 2025-2026.

The electrolyzer manufacturing picture merits particular attention. The IEA's 2025 *Global Hydrogen Review* reported that China accounted for nearly 60% of global electrolyzer manufacturing capacity, with existing Chinese manufacturing capacity of about 20 GW/year, far above domestic demand of around 2 GW in 2024. Electrolyzer systems manufactured and installed in China are also estimated to cost around \$600-1,200/kW,

compared with \$2,000-2,600/kW for systems installed outside China. This gives Chinese manufacturers a substantial cost advantage, especially in alkaline systems and integrated domestic projects.¹⁷

IEA's 2026 update confirms that China remained the central driver of electrolysis deployment in 2025: global installed electrolysis capacity doubled to surpass 4 GW, with China accounting for nearly three-quarters of new installations. Yet the manufacturing story is becoming more difficult as industry estimates suggest that broader Chinese nameplate manufacturing capacity may be substantially higher than commissioned operational capacity.¹⁸ Such estimates should be treated cautiously because they often include ramp-up lines, announced capacity and under-construction facilities. Slow demand formation, surplus capacity and aggressive domestic competition are pushing the sector toward consolidation, while Chinese manufacturers are increasingly looking overseas to maintain business continuity. The cost advantage of Chinese electrolyzers remains significant inside China, but it narrows abroad once engineering, procurement, construction, adaptation to local standards, transport, tariffs, maintenance, performance guarantees and warranty risks are included.¹⁹

The domestic market will remain the primary anchor for Chinese electrolyzer manufacturers, but exports are likely to become more important if Chinese manufacturing capacity continues to run ahead of bankable domestic demand. The official *China Hydrogen Development Report 2026* points in the same direction, noting that Chinese electrolyzers, fuel cells and hydrogen refueling equipment have been exported to more than 30 countries and regions, and that Chinese companies are moving from simple equipment exports toward broader packages of technology, equipment, engineering, operations and hydrogen-derived product trade. The implication is not that overseas markets will replace China's domestic 15th FYP build-out, but that export demand will become an increasingly important outlet unless domestic projects are matched by credible offtake, high utilization and durable green-product demand.

The scale implied by the 2030 target also deserves discipline. If 2 Mt/year of renewable hydrogen were produced with electrolyzers operating between 2,500 and 4,000 full-load hours per year, China would need roughly 25-45 GW of operating electrolyzer capacity by 2030, depending on system

17. IEA, *Global Hydrogen Review 2025*, available at: www.iea.org; Ibid., Executive Summary, pp. 10-11.

18. Tianxia Industry Research Institute, "China Green Hydrogen and Electrolyzer Equipment Industry Observation 2026: 3 GW Tender Volume, 58 GW Capacity and Upstream Order Landscape", July 10, 2026, available at: <https://faxiangongchang.com>. The IEA's 20 GW figure refers to commissioned operational manufacturing capacity. The 58 GW figure is a broader measure of total nameplate capacity including ramp-up lines and under-construction capacity, tracked by domestic industry analysts. Either way, capacity utilization is very low relative to annual domestic demand.

19. IEA, *Global Hydrogen Review 2026*, available at: www.iea.org; IEA, *Global Hydrogen Review 2025*, op. cit.

efficiency and utilization. This would create a substantial domestic market, but not necessarily one large enough to absorb every manufacturing expansion if project execution outpaces bankable demand. The next phase of competition will therefore be less about headline factory capacity and more about durability, dynamic operation, stack degradation, digital control, safety performance, certification, warranty credibility and the ability to deliver bankable projects at home and abroad.

Representative Chinese electrolyzer manufacturers include traditional alkaline specialists, renewable-energy and power-electronics entrants, heavy-equipment groups and SOE-linked platforms. The competitive landscape remains fluid. What matters analytically is that China's alkaline-electrolyzer industry is moving from demonstration supply toward a more contested domestic and international market, where quality, reliability and verifiable project performance will increasingly matter alongside cost.

Governance and risks after 2025

The central government has strengthened coordination, but implementation remains local and heavy on state-owned enterprises. This is not necessarily a weakness: China's clean-technology success has often depended on controlled local experimentation. The risk is undisciplined duplication. The 15th FYP's most important governance task is therefore to shift from project announcement to operating performance.

Risks are ranked below by likelihood and potential impact. High-priority risks (capacity without utilization, demand creation without green premium, local overcapacity and price wars) are already materializing. Medium-priority risks (grey-hydrogen lock-in, transport bottlenecks, weak statistical transparency, water and ecological constraints) are emerging. Lower-priority longer-term risks (technology controls and standards divergence) remain on the horizon.

- **Capacity without utilization.** China can build electrolyzers, refueling stations and integrated projects quickly, but capacity is not production, and production is not bankable demand. Indicators to watch are annual output, utilization hours, take-or-pay offtake, delivered price and verified carbon intensity.
- **Demand creation without green premium.** China can physically absorb 2 Mt of renewable hydrogen, but this does not guarantee bankable demand. Without mandatory incorporation, credible carbon prices, green-product premiums, SOE procurement or consumer-side rewards, projects may rely on administrative targets rather than commercial willingness to pay.
- **Local overcapacity and price wars.** The same competition that cuts costs can create redundant capacity, weak margins and quality dispersion. Policy support should reward verified performance, safety, durability, system efficiency and after-sales capability, not only factory capacity or lowest-price bids.
- **Grey-hydrogen lock-in.** Renewable-hydrogen pilots should not legitimize new coal-chemical or coal-to-liquids capacity. The policy test is displacement, not addition: green hydrogen should replace existing unabated fossil hydrogen or high-emission reducing agents, not become a green label attached to new carbon-intensive assets. For instance, a new coal-to-chemicals plant can add 5% renewable hydrogen by volume and market itself as "low-carbon", while 95% of its hydrogen remains coal-based. The policy test is therefore displacement, not addition.

- **Transport bottlenecks and regional mismatch.** Low-cost renewable hydrogen resources are concentrated in northern and western regions, while high-value industrial demand is often coastal or central. Pipelines, green-fuel carriers and local conversion must be planned around anchor demand, not administrative enthusiasm.
- **Weak statistical transparency.** China's data quality is improving, but projects are still described by electrolyzer capacity, hydrogen production capacity, actual output, renewable-power capacity or investment value. A credible system must distinguish capacity from output, commissioned from planned projects, renewable hydrogen from generic electrolysis, and feedstock use from fuel use.
- **Water and ecological constraints.** The same regions with low-cost renewable resources often face water stress or ecological limits. Large projects should prioritize recycled water, mine water, seawater desalination where relevant, and transparent water-intensity reporting.
- **Technology controls and standards divergence.** Certification, local-content rules, tariffs, export controls, cybersecurity requirements and warranty expectations increasingly shape hydrogen trade. If China, Europe, the United States and Japan develop incompatible carbon-intensity and equipment-safety systems, the result could be parallel markets rather than a scalable global one.

**Table 7. Implementation scorecard
for the 15th FYP hydrogen phase**

Implementation test	What to monitor during the 15 th FYP period
Real production	Annual renewable-hydrogen output, not only nameplate capacity
Utilization	Operating hours of electrolyzers, refueling stations, chemical synthesis units and pipelines
Offtake	Signed industrial contracts, take-or-pay provisions and green-product buyers
Carbon integrity	Electricity sourcing, additionality or equivalent rules, lifecycle emissions, conversion losses and double-counting controls
Infrastructure	Pipeline utilization, third-party access, tariffs, purity standards and safety rules
Cost	Delivered hydrogen or green-fuel cost by application, not only production-side cost
Resource constraints	Water source, land use, ecological impacts and local permitting

Source: Author's framework, informed by the China Hydrogen Development Report 2026, China's 15th FYP energy-policy documents, the 2026 comprehensive hydrogen application pilot, and IEA global hydrogen-market monitoring.

Policy recommendations

China's hydrogen policy has entered a new phase. The priority is no longer to prove that hydrogen has strategic potential, but to ensure that deployment is disciplined, measurable and aligned with decarbonization, both for China's own energy transition and for its role in the global hydrogen economy. The next stage should therefore shift from capacity targets and demonstration projects toward utilization, emissions performance and bankable demand, understood not merely as domestic policy metrics but as the foundation of international credibility.

For Chinese policymakers

China's hydrogen policy faces a different test than in 2020. The strategic case for hydrogen is no longer in question, and neither is China's capacity to build electrolyzers, refueling stations and industrial demonstration projects at scale. The domestic challenge is discipline: converting an increasingly crowded pipeline of announced capacity into verified low-carbon production, credible offtake and real displacement of fossil hydrogen. This requires policy tools that reward performance rather than announcement, and that treat the 15th FYP not as a capacity-building exercise but as the start of a measurable, accountable transition. The stakes, however, extend well beyond China's borders.

As Chinese electrolyzers, green ammonia and methanol, and hydrogen-derived fuels increasingly compete in global markets, how China builds its domestic system will shape international perceptions of its reliability, climate credibility and fairness as a trading partner. Domestic discipline and international interoperability are therefore not separate agendas: a hydrogen economy that is measurable, verifiable and demand-led at home is also the one most likely to be trusted, welcomed and competitively durable abroad. Policymakers should treat the 15th FYP as an opportunity to align China's industrial upgrading with the standards, certification systems and market expectations of its trading partners, rather than treating international acceptance as a downstream problem to be solved later.

- **Make hydrogen policy demand-led rather than capacity-led.** Public support should prioritize projects with credible offtake, high utilization and clear emissions-reduction value. Industrial substitution in ammonia, methanol, refining, coal chemicals, selected steel applications and heavy transport corridors should take precedence over speculative production capacity or low-throughput refueling infrastructure.
- **Count delivered low-carbon hydrogen, not merely installed capacity.** The 2030 target should be accompanied by annual reporting

on actual output, utilization hours, electricity sourcing, delivered carbon intensity and fossil-hydrogen displacement. Projects that produce little renewable hydrogen or cannot document their emissions profile should not be treated as successful: a discipline that will also make China's output more credible to external buyers and regulators.

- **Create green-product demand before expanding capacity further.** Green ammonia, methanol, low-carbon steel, refinery products and shipping fuels need buyers willing to pay for verified emissions reduction. Public procurement, SOE purchasing, carbon contracts, green-fuel standards and product carbon footprints can do more for bankability than another round of equipment targets.
- **Clarify the support architecture.** China should be explicit about where support is placed: producer cost reduction, consumer-side rewards, industrial procurement, transport corridors or carbon credits. The current application-pilot model is promising because it rewards use, but it should evolve into durable demand signals rather than temporary administrative campaigns.
- **Prevent grey-hydrogen lock-in.** Renewable hydrogen should displace existing fossil hydrogen and high-emission reducing agents, not legitimize new coal-based industrial capacity. New coal-chemical, coal-to-liquids or coal-to-gas projects should not rely on marginal green-hydrogen additions as proof of low-carbon alignment.
- **Focus infrastructure on clusters and corridors.** Hydrogen transport should be planned around industrial geography rather than administrative targets. Prioritize regional clusters, pipeline corridors with anchor users, and conversion into ammonia or methanol where those molecules are the final product or the most economical carrier.
- **Use competition policy to upgrade the industry, not merely expand it.** China's manufacturing scale and alkaline-electrolyzer cost advantage should be consolidated, but excessive local competition can create redundant capacity and uneven quality. Public support should reward verified performance, durability, safety, system efficiency, lifecycle cost and after-sales capability, while R&D targets PEM materials, catalysts, membranes, carbon paper, high-pressure and liquid-hydrogen equipment, pipeline materials, metrology, safety testing and lifecycle certification.
- **Prioritize international interoperability.** China's hydrogen industry will be more valuable globally if its products, carbon accounting and certification systems are trusted abroad. China should strengthen intellectual-property protection, expand third-party testing, participate actively in international standards bodies, and seek mutual intelligibility with European, Japanese, Korean and other certification systems—treating international trust not as a constraint on industrial policy, but as a core objective of it.

For European and international stakeholders

China's rise in hydrogen should not be viewed only through the lens of competition. It is also a test case for whether global clean-technology deployment can be accelerated while maintaining credible climate standards, resilient supply chains and fair industrial competition. Just as Chinese policymakers should recognize that domestic discipline underpins international credibility, international stakeholders should recognize that constructive engagement, not blanket suspicion, is most likely to secure the climate and commercial benefits of Chinese scale. The challenge is selective engagement: neither accepting dependence uncritically, nor allowing geopolitical rivalry to fragment the emerging hydrogen economy.

- **Engage China where scale can accelerate decarbonization.** China's manufacturing base, renewable-energy deployment and industrial demand make it central to global hydrogen cost reduction. Cooperation should focus on practical emissions reductions: electrolyzer manufacturing, industrial demonstrations, hydrogen-derived fuels, port infrastructure, safety testing and project engineering.
- **Defend climate integrity through robust certification.** Imported hydrogen, ammonia, methanol and synthetic fuels should meet transparent lifecycle-emissions rules, including electricity sourcing, conversion losses, transport emissions and final end-use. The aim should not be to exclude China, but to ensure that low-cost supply is genuinely low-carbon—a standard that disciplined Chinese producers should welcome rather than resist.
- **Avoid replacing fossil-fuel dependence with clean-tech dependence.** Chinese equipment, engineering capacity and finance can reduce costs and accelerate deployment, especially in third markets where Chinese stakeholders already play major roles. The goal should not be exclusion, but disciplined engagement. Public procurement, industrial policy and project finance should balance cost, resilience, local value creation, cybersecurity, warranty credibility and supply-chain diversification. Cooperation with key Chinese firms and financiers may be necessary, but it should be structured around transparency, environmental integrity and fair competition.
- **Compete on high-value segments, not only on volume.** Europe, Japan, South Korea and the United States are unlikely to beat China in every mass-manufacturing segment. They should focus on advanced PEM and SOEC technologies, power electronics, industrial process integration, high-pressure and cryogenic equipment, hydrogen turbines, safety systems, metrology, certification, digital monitoring and high-performance materials.

- **Build interoperability before markets fragment.** Hydrogen trade will only scale if carbon-intensity rules, safety standards, equipment testing and certification systems are mutually intelligible. Mutual recognition should be earned through transparent testing, third-party verification and comparable lifecycle accounting—an agenda that aligns naturally with Chinese policymakers' own stated interest in international interoperability.
- **Use trade policy carefully.** Trade defense may be justified where subsidies, dumping or forced localization distort markets, but broad protectionism could raise hydrogen costs and slow deployment. The strongest position is rules-based openness combined with enforceable climate, labor, safety and transparency requirements.
- **Make hydrogen finance conditional on bankable demand and transparent performance.** Europe and international financial institutions should focus on offtake structures, contracts for difference, green public procurement, maritime fuel standards, industrial product standards and carbon contracts for hard-to-electrify sectors. Project finance should require disclosure of utilization, electricity sourcing, carbon intensity, water impacts, technology origin and offtake contracts.
- **Keep technical climate cooperation open.** Hydrogen will sit at the intersection of climate action, industrial policy and geopolitics. Friction is unavoidable, but channels for technical dialogue on safety, methane leakage, lifecycle accounting, green fuels and industrial decarbonization should be preserved and, where possible, expanded.

For Europe and the wider international community, the right approach is neither naive openness nor defensive closure. China should be treated as a systemic competitor, especially for advanced economies; an indispensable deployment partner, especially for the global South; and a necessary participant in any credible global hydrogen market. The policy task, for Chinese and international stakeholders alike, is to align domestic discipline with international trust, capturing the benefits of Chinese scale while protecting climate integrity, industrial resilience and rules-based trade.²⁰ Achieving this will require sustained, pragmatic cooperation rather than either uncritical convergence or reflexive confrontation.

20. European Commission, “Renewable Hydrogen”, available at: <https://energy.ec.europa.eu> [accessed in August 2026]; European Commission, “European Hydrogen Bank”, available at: <https://energy.ec.europa.eu> [accessed in August 2026].

Conclusion

Five years after the author's 2020 Ifri report, China has moved from hydrogen enthusiasm to a more mature, strategic and complicated phase. The country is no longer merely exploring hydrogen; it is building supply chains, deploying electrolyzers, expanding refueling infrastructure, experimenting with industrial substitution, integrating hydrogen into energy law, and embedding it across the 15th FYP's energy, industry, transport and climate-policy architecture. What was once a technology narrative has become a governance and industrial-policy challenge. Yet the central paradox identified in 2020 remains intact. China's 2025 hydrogen economy remains the world's largest: more than 51 Mt/year of production capacity and more than 39 Mt of output. But it is still overwhelmingly a fossil-hydrogen economy rooted in coal chemicals, ammonia, methanol, refining and other industrial processes. Renewable hydrogen is growing quickly, but from a small base. The strategic challenge is therefore not to build a new green-hydrogen sector alongside the old one, but to transform the existing hydrogen economy—redirecting a large fossil-based industrial system toward verifiable decarbonization.

The 15th FYP makes this challenge concrete. The target of 2 Mt/year renewable hydrogen by 2030 is large enough to matter, but small relative to China's 2025 hydrogen output. Even if achieved, it will not by itself decarbonize China's hydrogen economy. Its real significance lies elsewhere: creating operating references, lowering equipment and engineering costs, building green ammonia and methanol supply chains, testing pipeline and port infrastructure, and beginning the long process of substituting fossil hydrogen in existing industrial demand.

One key research question—who will buy the 2 Mt?—is therefore policy-relevant. China has enough potential buyers in physical terms: methanol, ammonia, refining and modern coal chemicals alone use far more hydrogen than the 2030 renewable-hydrogen target. The uncertainty is whether these buyers will face mandates, incentives, procurement rules, carbon constraints or green-product premiums strong enough to pay for verified low-carbon molecules rather than cheaper captive fossil hydrogen.

China holds advantages few countries can match: the world's largest renewable-power build-out, deep manufacturing ecosystems, strong state-owned energy and industrial groups, low-cost alkaline electrolyzers, large industrial hydrogen demand, and local governments willing to experiment. These assets could make China a decisive force in lowering the global cost of hydrogen technologies and hydrogen-derived fuels. As with solar PV, batteries and electric vehicles, Chinese scale could accelerate learning curves and reshape international markets. They also

create conditions for overcapacity if manufacturing expansion runs ahead of bankable demand.

But scale alone is not transformation. Hydrogen can decarbonize hard-to-electrify sectors, but it can equally become a convenient label for business-as-usual industrial expansion. The risk is that China builds more equipment, more projects and more infrastructure without achieving sufficient utilization or fossil-fuel displacement. The coming years should therefore be judged less by headline capacity than by harder metrics: actual renewable-hydrogen production, electrolyzer operating hours, industrial offtake contracts, delivered low-carbon hydrogen costs, carbon-intensity certification, pipeline utilization and verified emissions reductions.

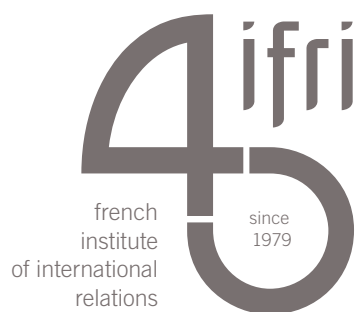
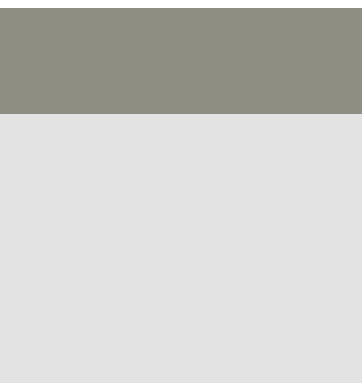
The most promising path is selective, industrial and disciplined. Hydrogen should not be pushed indiscriminately into every sector, but prioritized where direct electrification is difficult, where hydrogen demand already exists, and where emissions reductions are material. That points first to ammonia, methanol, refining, coal chemicals, selected steel applications, industrial clusters, ports, heavy-duty logistics, shipping fuels and long-duration storage. Passenger cars, low-temperature heating and scattered symbolic projects should not dominate policy attention.

For the international energy and climate community, China's hydrogen trajectory carries implications well beyond its borders. If successful, it could lower equipment costs, create large early markets, accelerate industrial decarbonization and build a more liquid global market for hydrogen-derived fuels. If poorly managed, it could also contribute to overcapacity, stranded infrastructure, limited emissions reductions and heightened trade frictions across clean-technology supply chains. The same industrial capabilities that give China a powerful role in hydrogen deployment could therefore either accelerate the global transition or intensify the market distortions and trade tensions already visible in earlier clean-tech booms.

The solar PV experience is a warning, not a prophecy. Within roughly a decade, Chinese manufacturers came to dominate nearly every stage of the solar supply chain, from polysilicon to modules, leaving European and other non-Chinese producers with a shrinking industrial base and triggering tariffs and anti-dumping measures that raised costs and fragmented markets without reversing China's underlying scale advantage. Hydrogen technologies remain early enough in their industrial life cycle to avoid this path. China, the European Union and other advanced economies could pursue joint ventures, third-country co-investment, reciprocal market access tied to verified standards, and shared certification systems that distribute value more evenly. This requires political will against the instincts of industrial nationalism, but shared interests in cost reduction and avoiding a hydrogen trade war

make it plausible. Absent such efforts, hydrogen risks reproducing the solar outcome: concentrated dominance, defensive protectionism, higher costs and a slower transition than either side wants.

The 15th FYP period will therefore test not whether China can build a hydrogen economy, but whether it can discipline and decarbonize the one it already has. China is already the world's largest hydrogen producer and consumer, with unmatched manufacturing capacity, renewable resources, industrial demand and policy mobilization. The question after 2025 is whether these strengths can be aligned behind verified emissions reduction, credible carbon accounting, bankable offtake and real displacement of fossil hydrogen. If so, China could become one of the most consequential engines of low-carbon hydrogen deployment globally. If not, hydrogen risks becoming another expansive industrial campaign whose scale is more impressive than its climate impact.



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