China's Hydrogen Strategy: National vs. Regional Plans

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While the US and European medias have dedicated significant bandwidth to the topic of low-carbon hydrogen in the United States and Europe, they have reported far less on unfolding developments around that topic in China. This disparity is especially notable because China stands as the foremost global player in hydrogen production and consumption.[1] The country's substantial market size and extensive industrial infrastructure not only facilitate fast technological advancements in the hydrogen space, but also offer the potential to achieve economies of scale—two developments that can significantly influence the global hydrogen market landscape. In light of these circumstances, it is essential to understand China's hydrogen strategy, including how the country plans to start decarbonizing its current hydrogen consumption and expand future use and production.

A notable feature of China's hydrogen strategy is that it is not, in fact, singular, but instead comprised of a national strategy and a multitude of regional strategies. Since the release of China's Medium and Long-Term Strategy for the Development of the Hydrogen Energy Industry (2021–2035) (referred to as "the National Plan") in March 2022,[2] there has been significant development in the country's hydrogen space. However, the National Plan's targets for renewable hydrogen production may appear conservative given the scale of hydrogen consumption in the country: a range of 100,000 to 200,000 tons per year by 2025 represents only 0.3 to 0.6 percent of the 33 million tons (Mt) of fossil-based hydrogen consumed in China in 2020.[3] (For context, in 2022, electrolytic hydrogen's production level was still below 100,000 tons globally, and as of early 2023 about 4.5 Mt of renewable hydrogen globally by 2025 has been committed to, planned, and

announced.[4] Some regions appear more bullish, including the EU with its aspirational renewable hydrogen target of up to 1 Mt by 2024.[5]) By contrast, provinces, cities, and municipalities across China have introduced their own hydrogen development plans that establish far more ambitious renewable hydrogen goals. Hence, the provincial plans viewed together may offer a more accurate picture of China's hydrogen industry over the coming decades than the National Plan.

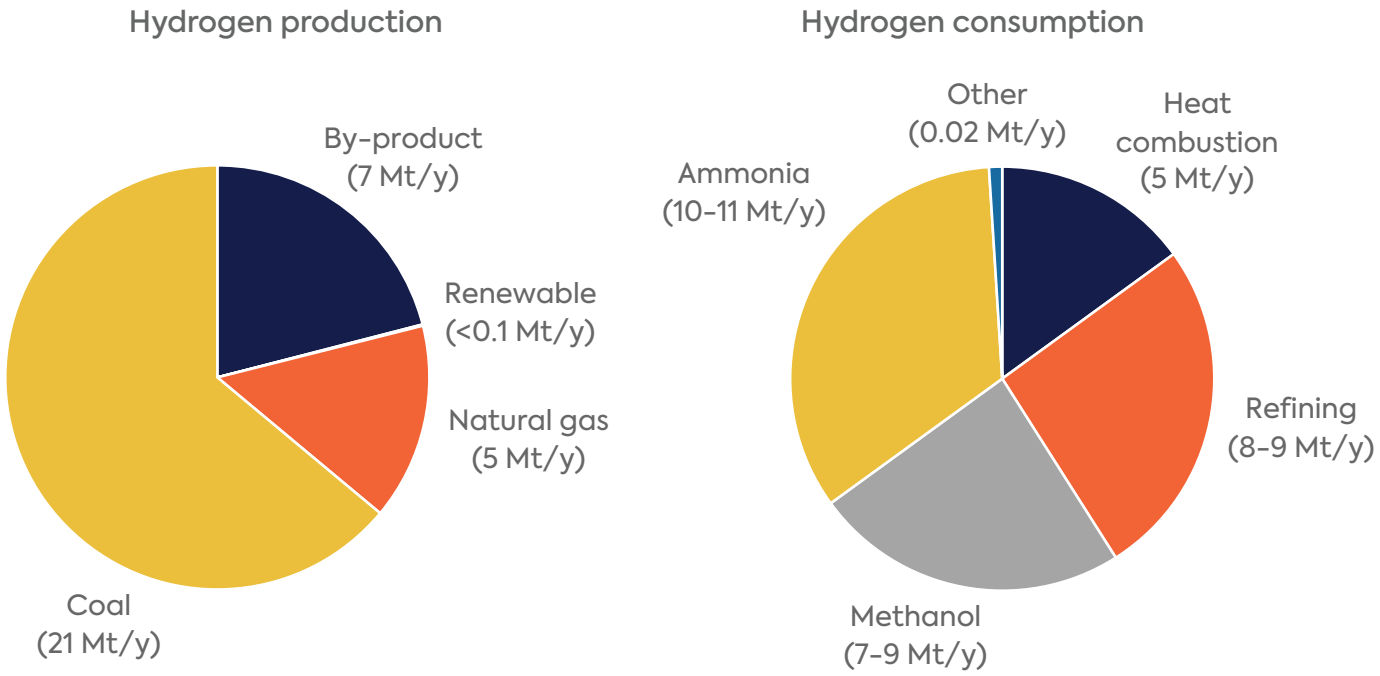
This commentary analyzes these somewhat divergent national and local hydrogen strategies comparatively to provide a nuanced understanding of China's evolving hydrogen landscape. Its key findings are as follows:

- The targets of China's provinces combined are far more ambitious than its national targets, with Inner Mongolia leading the way. The latter province is aiming to reach 480,000 tons of renewable hydrogen production per year by 2025 (2.5 to 5 times the national target). China may have set a conservative national renewable hydrogen target to test the waters, allowing local governments to charge ahead.
- Inner Mongolia could reach around 60 percent of its 2025 target based on projects that are currently under construction (and excluding those still in the planning stage, which may or may not materialize). This region alone would largely meet the national target for renewable hydrogen. While the provinces' targets may not be fully met, they provide a more realistic view of what China can accomplish.
- Though climate mitigation is certainly one key underlying driver of China's hydrogen strategy, industrial and economic motivations seem more prominent in the short term. China has placed less emphasis on carbon intensity than the EU and the US, as evidenced by the Chinese government's lack of a formal definition of renewable hydrogen.

An Overview of China's Hydrogen Landscape

China holds a substantial share of global hydrogen production, contributing roughly one-third of total output at around 33 Mt per year.[6] This production heavily relies on fossil fuels (79 percent)—and about 21 percent of it originates as industrial by-product—resulting in 360 Mt of CO_2 emissions.[7] Meanwhile, the contribution of renewable hydrogen remains marginal, accounting for less than 0.1 percent of production.[8] As shown in Figure 1, China's industrial sector plays a pivotal role in driving the country's hydrogen consumption.[9]

Figure 1: China's hydrogen production and sectoral consumption (2020)



Source: Adapted from International Energy Agency (IEA), "Opportunities for Hydrogen Production with CCUS in China," November 2022, https://iea.blob.core.windows.net/assets/9c01430d-9e8f-4707-862c-35453b9e7d89/OpportunitiesforHydrogenProductionwithCCUSinChina.pdf.

Rather than evenly distributed across the country, hydrogen production in China is concentrated in the northwest and northeastern regions (see Figure 2). The highest production levels are in the Autonomous Region of Inner Mongolia (hereafter "Inner Mongolia") and Shandong, each of which accounts for more than 4 Mt per year, followed by Xinjiang, Shaanxi, and Shanxi, at more than 3 Mt per year.

Figure 2: Distribution of existing hydrogen demand, industrial clusters, and renewable hydrogen projects in China

Note: Project numbers are based on July 2022 data and may not cover all projects. See note 17 for detailed information about the scope of this work.

Source: Adapted from Ping An Securities (平安证券), "Hydrogen Series Report (1) Hydrogen Production: By-Product Hydrogen Takes the Lead, Green Hydrogen Is Expected to Open a New Era" (氢能系列报告(一)制氢篇：副产氢占先机，绿氢有望开新局), December 2021, https://dfscdn.dfcfw.com/download/A2_cms_f_20211223134624381328&direct=1&abc6969.pdf; Tu et al., "Prospects of Renewable Hydrogen in China and Its Role in Industrial Decarbonization," EnergiePartnerSchaft, 2022, https://www.energypartnership.cn/fileadmin/user_upload/china/media_elements/publications/2022/Agora/Prospects_of_Renewable_Hydrogen.pdf; Xiaohan Gong, Rainer Quitzow, and Anatole Boute, "China's Emerging Hydrogen Economy: Policies, Institutions, Actors," RIFS Study, January 2023, https://doi.org/10.48481/rifs.2023.001.

The northwest and northeast regions are also known for high coal output, underscoring the strong link between hydrogen production and coal resources. Abundant coal reserves in places like Inner Mongolia, Shanxi, and Shandong (north China), which cater to the nearby petrochemical and chemical sectors, support hydrogen production and consumption, which typically occur within the same facility.[10] The northwest is also positioned to become a hub for renewable hydrogen supply due to its high abundance of renewable energy resources.[11] However, given that east and southeast China are anticipated to emerge as significant demand centers soon, a new challenge in the form of a geographical disjuncture between hydrogen supply and demand will likely present itself. China's lack of transport infrastructure represents an additional challenge: the country currently possesses only 400 kilometers of hydrogen pipelines.[12] Recent initiatives to develop infrastructure such as short-distance hydrogen pipelines, hydrogen refueling stations, and liquid hydrogen storage facilities are primarily concentrated in four major industrial clusters—the Beijing-Tianjin-Hebei Region, the Yangtze River Delta, the Pearl River Delta, and the Ningdong Energy and Chemical Industry Base (see Figure 2)—so may not be able to connect renewable hydrogen supplies with primary demand centers.

China's National and Regional Hydrogen Development Strategies Compared

In September 2021, China announced what it called its "dual carbon goal" of carbon peak by 2030 and carbon neutrality by 2060.[13] As a first step toward achieving that goal, China's State Council introduced an Action Plan for Carbon Dioxide Peaking Before 2030, which emphasized the role of hydrogen in sectors such as steel, petrochemicals, and transportation (including heavy-duty freight), as well as technologies such as renewable hydrogen production.[14] This was soon followed by the announcement of China's National Plan, which lays out the vision for China's hydrogen industry by 2035. The National Plan strategically positions hydrogen as: (1) an important part of China's future energy system; (2) an important carrier for achieving a low-carbon energy transition in China; and (3) a key emerging industry and development direction of future industries in China.[15] While most of China's specific targets in this strategic plan are for 2025, many other countries' national hydrogen strategies outline quantified targets for 2030 (and beyond), which can create the perception that their strategies are more ambitious. China's plan, however, includes the long-term vision to fully establish the hydrogen industry value chain by 2035. Nonetheless, among the most important of these 2025 targets is the deployment of 50,000 fuel cell vehicles and the production of 0.1 to 0.2 Mt of renewable hydrogen toward a broader goal of reducing annual CO_2 emissions by 1 million to 2 million tons by 2025.[16]

Other highlights from the National Plan include an aim to establish a hydrogen supply system that

uses both industrial by-product hydrogen and renewable hydrogen; meanwhile, the use of carbon capture and storage technologies to produce hydrogen from fossil fuels is absent from the strategy. The short-term emphasis on utilizing by-product hydrogen (which is unique to China) is due to the substantial volume of wasted by-product hydrogen (largely fossil-based) extracted from industrial waste gas in sectors such as coking, chlorine, and propane dehydrogenation. Aligned with this plan, numerous local governments (e.g., Anhui, Shanxi, Jilin, Hebei, Shandong, and Hunan) prioritize by-product hydrogen as the primary supply source through 2025. The development of collection and purification technologies for this hydrogen is also given priority across regions.

The National Plan marked a significant shift in China's overall energy strategy by making hydrogen a fundamental component of its emerging energy system, positioning the country well to achieve global leadership in hydrogen technologies such as fuel cell vehicles and electrolyzers. Out of the 34 regions that make up China,[17] 18 have independently introduced their own hydrogen industry 14th Five-Year Plan, a strategic blueprint outlining a province's economic and social development goals over a five-year period, while the others have incorporated hydrogen into their broader industrial strategies (see Table 1). Given their consideration of diverse provincial resources, infrastructure capacities, and strengths, these regional-level strategies hold valuable insights. One critical conclusion that can be drawn from them is that local policy and industry developments are already moving far beyond the conservative targets of the National Plan. The regions' cumulative targets for renewable hydrogen amount to over 1.1 to 1.2 Mt by 2025, or 5 to 12 times the national target (see Table 1).[18] For instance, Inner Mongolia has an ambitious objective of 480,000 tons of renewable hydrogen by 2025, more than twice the national target.

Table 1: China's regional hydrogen development plans

	Planning phase	Hydrogen value chain and infrastructure			Application	Ref
		Production		Hydrogen fueling stations	Transportation	
		Renewable (tons)	By-product/ other (tons)		Fuel-cell vehicles*	
Municipalities						
Beijing 北京市	2023			37	3,000	[19]
	2025			74	10,000	
Chongqing 重庆市	2025			30	2,000	[20]
Tianjin 天津市	2022			10	1,000	[21]
	2025				900	
Shanghai 上海市	2025			70	10,000	[22]
	2035					
Northeast (东北)						
Heilongjiang Province 黑龙江	2025			5		[23]
Jilin Province 吉林	2025	60,000–80,000		10	500	[24]
	2030	300,000–400,000		70	7,000	
	2035	1.2–1.5 mill.		400	70,000	
Liaoning Province 辽宁	2025			30	3,000	[25]
	2035			500	150,000	
North (华北)						
Hebei Province 河北	2025	100,000	200,000	100	10,000	[26]
Shanxi Province 山西	2025				10,000	[27]
	2030				50,000	
East (华东)						
Jiangsu Province 江苏	2025			50	10,000	[28]

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	Planning phase	Hydrogen value chain and infrastructure			Application	Ref
		Production		Hydrogen fueling stations	Transportation	
		Renewable (tons)	By-product/ other (tons)		Fuel-cell vehicles*	
East (华东) (cont'd)						
Zhejiang Province 浙江 ●	2025			50	5,000	[29]
Anhui Province 安徽	2025			30	5,000	[30]
	2030			120	20,000	
●	2035					
Fujian Province 福建	2025			40	4,000	[31]
Jiangxi Province 江西 ●	2025	1,000		10	500	[32]
Shandong Province 山东	2022			30	3,000	[33]
	2025			100	10,000	
●	2030			200	50,000	
South Central (中南)						
Henan Province 河南	2025				5,000	[34]
Hubei Province 湖北	2025			10	1,250	[35]
Hunan Province 湖南	2025			10	500	[36]
Guangdong Province 广东	2025	100,000		300	10,000	[37]
Guangxi Zhuang Autonomous Region 广西	2025		2000	10	500	[38]
Hainan Province 海南	-					[39]
Southwest (西南)						
Sichuan Province 四川	2025			60	6,000	[40]

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	Planning phase	Hydrogen value chain and infrastructure			Application	Ref
		Production		Hydrogen fueling stations	Transportation	
		Renewable (tons)	By-product/ other (tons)		Fuel-cell vehicles*	
Southwest (西南) (cont'd)						
Guizhou Province 贵州	2025		10,000	15	1,000	[41]
Yunnan Province 云南 ●						[42]
Tibet Autonom-ous Region 西藏						[43]
Northwest (西北)						
Shaanxi Province 陕西	2024	30,000		50	5,000	[44]
	2025			100	10,000	
Gansu Province 甘肃 ●	2025	200,000				[45]
Ningxia Hui Autonomous Region 宁夏	2025	80,000		10	500	[46]
	2030	300,000				
Qinghai Province 青海	2025	40,000		3 to 4	100	[47]
Xinjiang Uygur Autonomous Region 新疆 ● ●	2025	10,000			1,500	[48]
Inner Mongolia Autonomous Region 内蒙古 ● ●	2025	480,000	1,120,000	60	5,000	[49]
Renewable Hydrogen Production by 2025		**1,101,000 to 1,121,000**				

Quantified goals/objectives

Mentioned in the plan

● Ranked in top five wind-based energy production

● Ranked in top five coal-based energy production

● Ranked in top five solar-based energy production

*Note: Major coal, solar, and wind power producers are defined as any province/region ranked as a top five producing region in China according to 2020 data. Tianjin published its 14th Five-Year Plan for the energy industry in 2022, which included a target of 900 fuel cell vehicles by 2025. This is an update and a reduction from the target set for 2022, published in its hydrogen industry development action plan in 2020. *Types of fuel-cell vehicles aren't specified. They could encompass passenger vehicles, buses, heavy-duty trucks, forklifts, or other.*

Source: Authors' analysis of government reports.

Localized hydrogen strategies are tailored to leverage regional advantages and infrastructure, leading to varied approaches across provinces. Regions with abundant renewable resources, such as Sichuan with its hydropower potential, prioritize renewable hydrogen production via hydropower. In contrast, coal-rich regions, such as Shanxi, primarily focus on industrial by-product hydrogen from coal-chemical production. Regions with an abundance of both renewable and coal resources, such as Inner Mongolia, adopt a diversified approach.

Different regions also prioritize different applications according to their unique needs. For instance, Inner Mongolia, Shanxi, and Shaanxi aim to deploy hydrogen for fuel cell forklifts and trucks to contribute to mining operations, while Zhejiang focuses on leveraging hydrogen for combined power and heating as well as fuel cell electric vehicles (FCEVs) in its public and port logistics transportation system. On the other hand, all regions emphasize establishing hydrogen refueling stations and deploying FCEVs (see Table 1), with many identifying specific quantities of each that should be achieved. This is consistent with China's longstanding policy of promoting FCEV development, both passenger vehicles and trucking, through the expansion of hydrogen refueling infrastructure and other related technological innovations.[50] The National Plan only reinforces this policy.

Overall, China's regional strategies show that local governments will play a crucial role in the early stages of China's hydrogen development, enabling the central government to "test the waters" in the hydrogen sector.[51] Local government officials and senior management in state-owned enterprises are also collaborating with central ministries to implement hydrogen-related policies, such as incentivizing FCEV development and establishing demonstration projects for other hydrogen applications, and the potential for career advancement incentivizes them to align with the national government's development objectives, which include the advancement of a hydrogen economy and aligning the "dual carbon" goal.[52]

Inner Mongolia: A Leader in Renewable Hydrogen Development

Inner Mongolia occupies a distinctive position among China's regions: its 14th Five-Year Plan on hydrogen development, announced in 2022, sets the most ambitious renewable hydrogen production target by far at 480,000 tons per year by 2025. The region has undergone rapid expansion in terms of installed renewable hydrogen production capacity, often developed by major state-owned enterprises (SOEs), and will host the world's largest renewable hydrogen coal-to-chemical project, which is currently under construction.[53]

Several factors contribute to Inner Mongolia's ability to assume a leadership role in hydrogen development in China. The region:

- possesses substantial solar and wind potential, with a technically exploitable wind and solar energy resources of around 57 percent and 21 percent of China's potential, respectively, making it ideal for renewable hydrogen production.[54]
- has a pre-existing local hydrogen demand. Local industries, such as steel manufacturing, ammonia production, and oil refining, are known to demand significant amounts of hydrogen.[55] The region's 14th Five-Year Plan for hydrogen development highlights that over 1.3 Mt of industrial by-product hydrogen (from coal-chemical processes) is generated annually, 87 percent of which is consumed by industries.[56] Replacing coal-based hydrogen ensures a substantial near-term demand for renewable hydrogen.
- benefits from its proximity to the eastern economic hub (Beijing-Tianjin-Hebei region). The 400-kilometer Ulanqab-Beijing pipeline is not only China's first long-distance hydrogen pipeline, but also the first to be included in national planning. With an initial capacity of 0.1 million tons per annum (Mtpa) and the potential to expand to 0.5 Mtpa, it connects Ulanqab in Inner Mongolia to Yanshan in Beijing.[57]

In order to determine whether local targets are a better benchmark than the national renewable hydrogen target, it is crucial to estimate whether Inner Mongolia will achieve its 2025 target.

Based on publicly accessible statistics, Inner Mongolia hosts 50 renewable hydrogen projects, of which three, yielding a combined 10,884 tons/year hydrogen production capacity, are operational. Moreover, 21 projects with a cumulative capacity of over 300,000 tons/year are under construction and projected for completion by 2023 or 2024 (see Table 2). This represents 63 percent of the 480,000 tons/year by 2025 goal established by the province's five-year plan. Another 26 projects with an aggregate production potential of 1 million tons/year are planned, with around 460,000 tons expected to be online by 2025.

Inner Mongolia may still fall short of its ambitious 2025 target, since there is uncertainty whether planned projects will actually materialize. The region's ability to reach its ambitious target depends on projects currently under construction as well as additional planned projects that are supposed to begin construction soon (see Table 2). Given that planned projects may never materialize, they can be excluded from the 2025 framework, but those under construction should be included because they are expected to be completed by 2024 at the latest. Based solely on operational projects and those already under construction, Inner Mongolia's anticipated annual hydrogen output surpasses the national 2025 target of 100,000–200,000 tons/year. With planned projects included, Inner Mongolia's potential annual renewable hydrogen production capacity could reach 1.4 million tons, exceeding the aggregated renewable hydrogen production targets announced across all regions. Most projects are located within the industrial zone adjacent to the

petrochemical plants in which they would replace gray hydrogen.

SOEs are heavily involved in the development of renewable hydrogen projects (see Appendix). Within Inner Mongolia, 32 of the 50 existing projects are spearheaded by SOEs, and an additional 6 involve collaborative efforts between SOEs and private enterprises. In contrast, private companies are responsible for only 12 projects. This pattern indicates that China's approach to advancing renewable hydrogen is characterized by state-driven facilitation of the market.

Table 2: Renewable hydrogen projects in Inner Mongolia by status and expected completion year

Project status	2023 (tons)	2024 (tons)	2025 (tons)	After 2025 (tons)
Operational	10,884			
Under construction	68,871	222,782		25,600
Aggregated w.o. planned	*79,755*	*302,537*	*302,537*	*328,137*
Planned	60,450	323,225	81,000	643,300
Aggreated w. planned	*140,205*	*686,212*	*767,212*	*1,436,112*

Note: "Operational" refers to projects that are in production at the time of the writing. "Planned projects" include projects that have been announced, planned, and/or committed to with or without final government approval; "Aggregated w.o. planned" refers to the cumulative projected annual hydrogen production volume in tons from projects that are operational and under construction; "Aggregated w. planned" refers to the cumulative projected annual hydrogen production volume in tons from projects that are operational, under construction, and planned. The planned projects are not yet in the construction phase, contributing to the uncertainty around them.

Source: See Appendix, Table A-1, for detailed reference information.

Defining Hydrogen

Questions may be raised about the extent to which the hydrogen produced from these plants will be renewable. The China Hydrogen Alliance, a state-backed think tank, proposed the Standard and Evaluation of Low-Carbon Hydrogen, Clean Hydrogen, and Renewable Hydrogen framework in 2021. However, this framework establishes a relatively unambitious threshold of 14.51 kilograms carbon dioxide equivalent ($kgCO_2e$) per kilogram hydrogen (kgH_2) for low-carbon hydrogen (a value that is above the current carbon intensity of fossil-based hydrogen produced through steam methane reforming) and 4.9 $kgCO_2e/kgH_2$ for renewable hydrogen (while the EU's threshold is 3.38

$kgCO_2e/kgH_2$).[58] Moreover, the differentiation between hydrogen produced from renewable sources and other variants remains ambiguously addressed in official Chinese government documents, including the recently published hydrogen industrial guideline.[59]

Indeed, both the central government and local governments refer to "hydrogen" and "green hydrogen" without providing explicit definitions. Ambiguity around hydrogen production methods is also reflected in the PRC Energy Law (Draft), which does not differentiate between various hydrogen production approaches.[60] Consequently, China's current hydrogen policy lacks mechanisms to regulate the sources or carbon intensity of hydrogen (e.g., by requiring that "renewable hydrogen" be produced exclusively from renewable electricity to power the electrolyzer).

This lack of a precise definition is not so surprising given that many regions and countries are still in the process of considering how to precisely define renewable hydrogen. The EU approved a definition only in June 2023 in a Delegated Act,[61] while the US is still considering how to calculate the carbon intensity of hydrogen in the Inflation Reduction Act. However, on the provincial level in China, there does seem to be an attempt to articulate a definition for renewable hydrogen. In 2023, the Inner Mongolia government, as well as several other provincial governments, began to distinguish between grid-connected and off-grid hydrogen production projects. Grid-connected projects are able to use grid electricity, while off-grid electrolyzers use direct power supply from wind and solar plants.[62] However, one notice published by the Inner Mongolia Bureau of Energy states that "grid-connected projects, in principle, should not purchase electricity from the grid....the electricity purchased by the power grid company shall not exceed 20 percent of the total renewable power generated by the project."[63] If "grid-connected" projects do not use grid electricity, these new projects would notably satisfy the definition of "temporal correlation" (as used in Europe), which emphasizes that hydrogen producers must ensure that renewable electricity generation and hydrogen production coincide temporally. Despite limited focus on carbon intensity in Chinese discussions of renewable hydrogen production in official government documents, this rule in Inner Mongolia indicates an attempt to produce electrolytic hydrogen solely from renewable energy.

Conclusion

Local policy and industry developments in China are already moving far beyond the national strategy and its conservative targets, making them a better indicator of China's ambitions, especially related to renewable hydrogen development. Notably, Inner Mongolia's hydrogen production target is more than twice the national target and seems potentially within reach based on projects under construction.

Unlike strategies employed in the EU and the US, China's current hydrogen development strategy

is still primarily driven by the desire for economic and industrial growth rather than immediate climate mitigation, as evidenced by the limited emphasis it places on measuring hydrogen's carbon intensity. While several regions have suggested restrictions on fossil-based hydrogen, such as banning coal-based production as part of a gradual, long-term shift toward renewable hydrogen, there is limited broader effort to stop fossil-based hydrogen. However, climate mitigation does exert influence. This is visible at the national level through the National Plan's elevation of hydrogen as a key component of China's low-carbon energy transition, and even more so at the regional level, such as Inner Mongolia's promotion of renewable hydrogen to replace gray hydrogen utilized by various coal-chemical industries.

China's approach to hydrogen development also sets it apart from other countries, as it emphasizes utilizing industrial by-product hydrogen, particularly in coal-producing regions, in the short term. Moreover, its approach to developing hydrogen applications is pragmatic, with a strong short-term emphasis on the transportation sector (particularly fuel and heavy-duty trucks), building on the success of China's electric vehicles industry.

Overall, China's hydrogen development landscape presents a complex mix of challenges and opportunities. As the global community navigates the intricacies of the hydrogen economy, understanding China's unique approach, characterized by a blend of centralized directives and regional initiatives, is paramount, providing insights into the future trajectory of the world's largest hydrogen market.

Appendix

Table A-1: Renewable hydrogen projects in Inner Mongolia

Status	Project name	Estimated hydrogen production capacity (tons/year)	SOE	Holding company	Location	Expected project completion date	Ref.
In production	Ordos Jungar Banner Narisong Photovoltaic Hydrogen Industry Demonstration Project (准格尔旗纳日松光伏制氢产业示范项目)	10,000	Yes/No	Three Gorges Corporation & Manshi Investment Group	Ordos	2023	64, 65, 66
	Ejin Horo Banner Shengyuan Energy Wind-Solar Hydrogen Integration Project Phase 1 (伊金霍洛旗圣圆能源风光制氢加氢一体化项目一期)	500	Yes	Inner Mongolia Shengyuan Energy Group	Ordos	2022	64, 67, 68
	Jingneng Chengannur 'Wind-Solar-Hydrogen Storage' Integrated Demonstration Project (京能查干淖尔"风光火储氢"一体化示范项目配套制氢站)	384	Yes	Beijing Energy Holding	Xilingol League	-	64, 65, 67, 69
	Total in production	**10,884**					
Planned	Envision Zero Carbon Technology (Chifeng) 1.52 Million Tons/Year Zero Carbon Hydrogen Ammonia Project (远景零碳技术（赤峰）152万吨/年零碳氢氨项目)	320,000	No	Envision Group	Chifeng	2028	65, 70
	Inner Mongolia Shenfeng Green Ammonia Chemical Annual Output of 150,000 Tons of Green Hydrogen Synthetic Green Ammonia Project (内蒙古深丰绿氨化工有限公司年产15万吨绿氢合成绿氨项目)	150,000	No	Inner Mongolia Shenfeng Green Ammonia Chemical	Chifeng	2024	71
	Ulanqab 100,000-Ton Wind-Solar Hydrogen Integration Demonstration Project (乌兰察布10万吨年风光制氢一体化示范项目)	100,000	Yes	China Sinopec Group	Ulanqab	2027	64, 65, 72
	Duolun County Integrated Wind-Solar Hydrogen Storage Green Ammonia Project (锡林郭勒盟多伦县风光储氢制绿氨项目)	90,000	Yes	Beijing Energy Holding	Xilingol League	-	64, 65, 67
	Manzhouli Wind-Solar Hydrogen Production Integrated Demonstration Project (满洲里市风光制氢一体化示范项目)	60,000	Yes	PowerChina	Hulunbeir	2025	65, 74
	Tongliao Million-Kilowatt Level Wind- Solar Hydrogen-Ammonia Integrated Zero Carbon Industrial Park Project (通辽千万千瓦级风光储氢氨一体化零碳产业园项目)	50,000	No	China Tianying Inc	Tongliao	-	64, 65, 75
	Annual Output of 50,000 Tons of Green Hydrogen and Hydrogen Energy Equipment Manufacturing Industry Project (年产5万吨绿氢暨氢能装备制造产业项目)	50,000	Yes/No	PowerChina & Rongke Hydrogen	Ulanqab	-	65, 76

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Status	Project name	Estimated hydrogen production capacity (tons/year)	SOE	Holding company	Location	Expected project completion date	Ref.
Planned (cont'd)	Sany Heavy Energy Ulat Middle Banner Ganqimadu Port Wind-Solar Hydrogen-Ammonia Integrated Demonstration Project (三一重能乌拉特中旗甘其毛都口岸加工园区风光氢储氨一体化示范项目)	36,000	No	Sany Heavy Energy	Bayannur	2023	64, 65, 67
	Ulanqab Xinghe County Wind-Solar Power Generation Hydrogen Synthesis Ammonia Integration Project (乌兰察布兴和县风光发电制氢合成氨一体化项目)	25,700	Yes	China National Petroleum Corporation	Ulanqab	2024	64, 65, 67
	Xing'an League Beijing Energy Coal Chemical Renewable Energy Green Hydrogen Alternative Demonstration Project (兴安盟京能煤化工可再生能源绿氢替代示范项目)	26,816	Yes	Beijing Energy Holding	Hinggan League	2024	64, 65, 67, 77
	Chifeng Energy Internet of Things Zero-Carbon Hydrogen-Ammonia Integration Demonstration Project (赤峰市能源物联网零碳氢氨一体化示范项目)	24,200	Yes/No	Envision Group & Chifeng State-Owned Capital Operation (Group)	Chifeng	2023	64, 65, 67, 78
	Tengger 600MW Wind-Solar Hydrogen Integrated Demonstration Project (阿拉善腾格里60万千瓦风光制氢一体化示范项目)	20,827	No	Inner Mongolia Alxa Energy Co., Ltd.	Alxa League	2024	64, 65, 67
	Baotou Damaoqi Wind-Solar Hydrogen Green Chemical Integration Project (包头市达茂旗风光制氢绿色化工一体化项目)	22,321	Yes	Shuifa Group	Baotou	2024	64, 79
	Inner Mongolia Alashan Renewable Energy Complex Wind Farm (国能阿拉善高新区百万千瓦风光氢氨+基础设施一体化低碳园区示范项目)	22,300	Yes	China Energy Investment Corporation	Alxa League	2024	64, 65, 67
	China Nuclear Qahar Right Front Banner Wind Hydrogen-Ammonia Production-Storage Integrated Demonstration Project (中核科右前旗风储制氢制氨一体化示范项目)	21,600	Yes	China National Nuclear Power	Hinggan League	2024	64, 65, 67
	100,000 tons/year Liquid Sunlight-CO_2 Green Hydrogen Methanol Production Demonstration Project (10万吨/年液态阳光--二氧化碳加绿氢制甲醇技术示范项目)	21,000	Yes	China Coal Group	Ordos	2025	64, 65, 67, 80
	Energy China Bairin Left Banner Green Hydrogen-based Chemical Base Demonstration Project (中能建巴林左旗绿色氢基化工基地示范项目)	20,000	Yes	China Energy Engineering Corporation	Chifeng	-	65, 81
	PowerChina Chifeng Wind-Solar Hydrogen Integration Demonstration Project (中电建赤峰风光制氢一体化示范项目)	18,600	No	Chifeng Xincheng New Energy Co., Ltd.	Chifeng	2024	64, 65, 67
	Power Construction Bayannur Ulat Middle Banner Green Electricity Hydrogen-Ammonia Integrated Demonstration Project (中能建巴彦淖尔乌拉特中旗风光制氢制氨综合示范项目)	10,000	Yes	China Energy Engineering Corporation	Bayannur	2024	64, 65, 67

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Status	Project name	Estimated hydrogen production capacity (tons/year)	SOE	Holding company	Location	Expected project completion date	Ref.
Planned (cont'd)	Uxin Banner Wind, Solar and Hydrogen Storage Integrated Project (乌审旗风光氢储一体化项目)	10,000	Yes/No	Qingdao Holdings International Limited & Sino-Synergy Hydrogen Energy Technology & Uxin Banner People's Government	Ordos	-	82
	Ejin Horo Banner Shengyuan Energy Wind-Solar Hydrogen Integration Project Phase 2 (伊金霍洛旗圣圆能源风光制氢加氢一体化项目二期)	5,061	Yes	Inner Mongolia Shengyuan Energy Group	Ordos	2024	64, 83
	Fengzhen City Wind-Solar Hydrogen Production Integration Project (丰镇市风光制氢一体化项目)	3,300	Yes/No	Jiangsu Guofu Hydrogen Energy Equipment Co, Ltd. & China Energy Investment Corporation & China National Machinery Industry Corporation	Ulanqab	-	65, 84
	Tongliao State Power Investment Huolinhe Circular Economy Photovoltaic Hydrogen Demonstration Project (通辽国家电投霍林河循环经济光伏制氢示范项目)	250	Yes	State Power Investment Corporation	Tongliao	2023	64, 65, 85
	Wind Power Hydrogen Storage Industrialization Project (风电氢储产业化项目)	-	Yes	China Huaneng Group	Hinggan League	-	65, 86
	3000 Kg/Day Hydrogen "Production Storage Plus Transportation" Integrated Project (3000公斤/日氢能"制、储、加、运"一体化项目)	-	No	Tianjin Rongcheng Group & Inner Mongolia Jianyuan Energy Group	Ordos	2024	64, 65, 87
	Kubuqi Green Electricity and Green Hydrogen Project with an Annual Output of 100,000 Tons of Green Liquid Ammonia (库布其绿电绿氢年产10万吨绿色液氨项目)	-	Yes/No	State Power Investment Corporation & Elion Resources Group Limited	Ordos	2025	88
	Total planned	**1,107,975**					
Under construc-tion	Shenzhen Energy Chifeng Linxi Wind Power Hydrogen Production and Ammonia Integration Project (深能赤峰林西风电制氢合成氨一体化项目)	150,000	Yes	Shenzhen Energy Group	Chifeng	2024	65, 89
	International Hydrogen Metallurgy and Chemical Industry Demonstration Zone Renewable Co-Production of Hydrogen and Carbon-Free Fuel with Wind Integration Demonstration Project (国际氢能冶金化工产业示范区新能源制氢联产无碳燃料配套风光发电一体化示范项目)	28,009	No	Mingtuo Group & Beijing-Tsinghua Industrial R & D Institute	Baotou	2024	64, 65, 67, 90
	Otog Front Banner Wind-Solar Green Hydrogen Synthetic Ammonia Project (鄂托克前旗风光制氢一体化合成绿氨项目)	20,000	Yes	Shenzhen Energy Group	Ordos	2023	64, 65, 91
	Uxin Banner Wind-Solar Integration and Green Hydrogen Chemical Demonstration Project Phase II (乌审旗风光融合绿氢化工示范项目二期)	20,000	Yes	China Sinopec Group	Ordos	2024	64, 65, 92
	Ordos Kubuqi 400,000 KW Wind-Solar Hydrogen Production Demonstration Project (鄂尔多斯库布其40万千瓦风光制氢一体化示范项目)	15,460	No	Inner Mongolia Kubuqi Green Power Hydrogen Energy Technology Co., Ltd.	Ordos	2024	64, 65, 67, 93

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Status	Project name	Estimated hydrogen production capacity (tons/year)	SOE	Holding company	Location	Expected project completion date	Ref.
Under construction (cont'd)	SPIC New Future Damao Banner Integrated Wind-Solar Hydrogen and Green Chemical Production Demonstration Project (国家电投新未来达茂旗风光制氢与绿色灵活化工一体化示范项目)	17,800	Yes	State Power Investment Corporation	Baotou	–	64, 65, 94
	Uxin Banner Wind-Solar Integration and Green Hydrogen Chemical Demonstration Project Phase I (乌审旗风光融合绿氢化工示范项目一期)	10,000	Yes	China Sinopec Group	Ordos	2023	64, 95
	Dalad Banner Hydrogen Storage and Zero-Carbon Ecological Urban Demonstration Project (达拉特旗光储氢车零碳生态链示范项目)	9,300	Yes	China Hydrogen Corporation	Ordos	2023	64, 96
	Tongliao Horqin Left Middle Banner "Wind-Solar Hydrogen Production-Storage" Integrated (Phase I 200 MW) Demonstration Project (通辽华能科左中旗"风光储+制氢"一体化（一期200MW）经济多元化示范项目)	8,916	Yes	China Huaneng Group	Tongliao	2023	64, 65
	Huadian Damao Banner 200,000 kW New Energy Hydrogen Production Engineering Demonstration Project (华电达茂旗20万千瓦新能源制氢工程示范项目)	7,800	Yes	China Huadian Corporation	Baotou	–	64, 65, 97
	Otog Front Shanghai Miao Economic Development Zone Photovoltaic Hydrogen Production Project (鄂托克前旗上海庙经济开发区光伏制氢项目)	6,000	Yes	Shenzhen Energy Group	Ordos	2023	64, 65, 98
	Otog Front 250 MW Photovoltaic Power Station and Hydrogen Comprehensive Utilization Demonstration Project (鄂托克前旗250兆瓦光伏电站及氢能综合利用示范项目)	6,000	Yes	Beijing Energy Holding	Ordos	2023	64, 65, 99
	Duolun 150,000-Kilowatt Wind-Solar Hydrogen Production Integrated Demonstration Project (中国大唐集团新能源股份有限公司多伦15万千瓦风光制氢一体化示范项目)	5,419	Yes	China Datang Corporation Limited	Xilingol League	2024	64, 65, 67
	Huadian Zhengneng Shengyuan Wind-Solar Hydrogen Integration Demonstration Project (华电正能圣圆风光制氢一体化示范项目)	5,214	Yes	China Huadian Corporation	Ordos	2023	64, 65, 100
	Mingyang Duolun Industrial Park 100 MW Hydrogen Production Wind Farm (明阳多伦工业园区100MW风电制氢一体化示范项目)	3,500	No	MingYang Smart Energy Group Limited	Xilingol League	2024	64, 65
	China General Nuclear Hangjin Banner Yitai Chemical Wind/Solar/Hydrogen Complex 中广核杭锦旗伊泰化工20万千瓦风光制氢一体化示范项目	2,789	Yes	China General Nuclear Power Corporation	Ordos	2023	65
	Abaga Banner 500 MW Wind-Solar Hydrogen Production Project (锡林郭勒盟阿巴嘎旗500兆瓦风能光伏发电制氢项目)	652	Yes	Beijing Energy Holding	Xilingol League	2023	64, 65

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Status	Project name	Estimated hydrogen production capacity (tons/year)	SOE	Holding company	Location	Expected project completion date	Ref.
Under construction (cont'd)	Inner Mongolia Yihao Renewable Energy Hydrogen Production and Refueling Project (内蒙古伊颢新能源制氢加氢项目)	394	No	Inner Mongolia Yihao New Energy Co., Ltd.	Ordos	2024	64, 65, 101
	Inner Mongolia Baofeng 2.6 Million + 400,000 Tons/Year "Green Hydrogen + Coal" to Olefins Project (内蒙古宝丰260+40万吨/年"绿氢+煤"制烯烃项目)	-	No	Inner Mongolia Baofeng Coal-based New Material Co., Ltd.	Ordos	-	65, 102
	Ulanqab 1.5 Million kW "Wind-Solar-Fire(Combusion)-Hydrogen Integration" Project (乌兰察布150万千瓦"风光火储氢一体化"项目)	-	Yes	Beijing Energy Holding	Ulanqab	2024	64, 103
	Baotou 4MW Distributed Wind Power and Hydrogen Integration Project (包头市氢能产业与可再生能源一体化项目暨14MW分散式风电与氢能项目)	-	Yes	Shenergy Group & Baogang Group	Baotou	-	64, 104
	Total under construction	**317,253**					
	Grand Total	**1,436,112**					

Note: This list of projects may not be comprehensive, as new projects may have been initiated and exiting ones updated after the finalization of this paper. The following points should be noted: (1) Exhaustiveness and updates—details of the listed projects are represented to the best of our knowledge based on available data at the time of writing; (2) Project status accuracy—some projects may have transitioned from the "planned" phase to the "under construction" phase without formal announcements; and (3) Discrepancies in estimated production capacity—in instances where different sources provide varying estimates for hydrogen production capacity for the same project, the smaller, more conservative number was accepted as the default.

Source: Authors' analysis of industry and news reports.

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