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China's wind and solar megabases face a coal test

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Key points

- **China is building more wind and utility-scale solar than the rest of the world combined, concentrated in northwestern and northern regions.** Over 500 gigawatts (GW) of China's vast 1,360 GW of prospective utility-scale solar and wind capacity is already under construction. Six provinces and autonomous regions — Xinjiang, Inner Mongolia, Gansu, Qinghai, Ningxia, and Shaanxi — hold 714 GW, or more than half of China's prospective wind and utility-scale solar pipeline.
- **China's wind and solar deployment has moved from an installation race to a system-integration test.** China's wind and solar megabases constitute the largest renewable-energy deployment project in the world but grid bottlenecks and electricity market arrangements that limit system flexibility are preventing that capacity from being fully used. The result is rising curtailment: wind and solar output that could have been generated under prevailing weather conditions, but was instead reduced or withheld. The question is no longer whether China can build renewable capacity at scale, but whether it can transmit, store, price, and consume that power in ways that reduce coal use.
- **Coal remains embedded in the UHV delivery system.** Wind and solar's share of power carried on ultra-high voltage direct current (UHVDC) transmission lines has barely risen above 20% since 2021. Planned transmission is also coal linked: Eleven prospective lines dedicated to megabases pair 129 GW of wind and solar with 40 GW of coal power. Coal is framed as supporting capacity but risks becoming more than a backstop and part of the architecture of China's next power system.
- **Local use of wind and solar generation could strengthen industrial decarbonization, but the risks of entrenching coal remain.** With over 10 GW of operating wind and solar capacity associated with green hydrogen production and an additional 53 GW in development, China's green hydrogen sector could help turn megabase power into industrial decarbonization. But coal-based fuels and chemicals risk absorbing green hydrogen as a marginal feedstock with little emissions benefit. Whether megabases displace coal or subsidize it is the open question of the 15th Five-Year Plan period.

China retains its lead for planned utility-scale solar and pulls ahead in wind

As of June 2026, China has 664 gigawatts (GW)[1] of prospective utility-scale solar across announced, pre-construction, and construction phase projects, according to Global Energy Monitor's Global Solar Power Tracker. This represents about one third of the global total,[2] and roughly on par with the next five countries combined.[3]

China also holds a larger proportion of prospective utility-scale solar in the construction phase compared to the rest of the world (nearly 40% vs 14%). This means China has around 25% more utility-scale solar capacity under construction (262 GW) compared to the rest of the world.

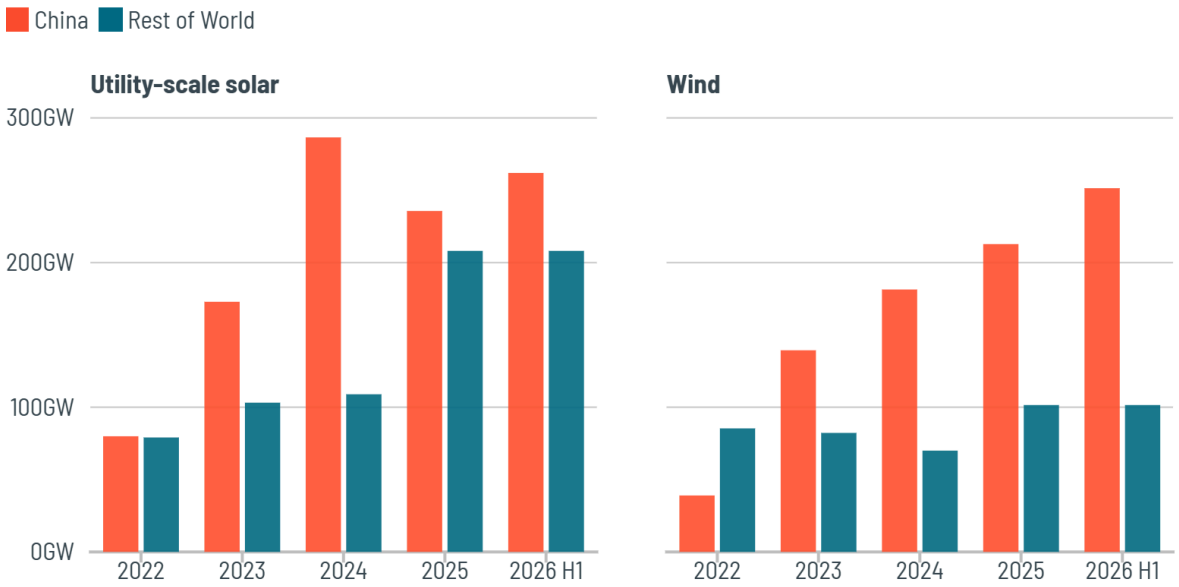
Data from GEM's Global Wind Power Tracker show that while the rest of the world's wind development pipeline remained almost unchanged between 2025 and 2026 (-1%), China's pipeline increased by 37% in that same timeframe, and the pipeline is currently up over 18% since June of last year. China has 698 GW of prospective wind capacity, more than a quarter of the global total and more than 2.5 times that of the second-largest country, Brazil (278 GW).

For wind in China, 251 GW is already under construction, more than twice the 102 GW of the rest of the world combined. Once fully operational, that capacity could generate roughly as much electricity annually as Germany generated from all sources in 2025. Over one-third of China's capacity in development is already under construction, versus just 5% elsewhere, where projects remain overwhelmingly at the announced stage (46%).

[1] All solar capacities are reported using alternating current (AC) ratings.
[2] Global total data are from the Global Solar Power Tracker and Global Wind Power Tracker February 2026 release.
[3] India: 183 GW, U.S.: 137 GW, Brazil: 123 GW, Australia: 117 GW, and Spain: 109 GW, totaling 669 GW.

China has more utility-scale solar and wind under construction than the rest of the world combined

Utility-scale solar and wind capacity under construction, in gigawatts (GW)



Source: Global Energy Monitor, Global Solar Power Tracker and Global Wind Power Tracker, June 2026
Note: Data cover solar project phases ≥20 MW and wind project phases ≥10 MW. Solar capacity in MWac.

Six northwestern and northern regions hold more than half of China's wind and solar pipeline

Six northwestern and northern provinces and autonomous regions — Xinjiang, Gansu, Qinghai, Ningxia, Shaanxi, and Inner Mongolia — hold a combined 714 GW of prospective utility-scale solar and wind, over 50% of the national total. Xinjiang accounts for 241 GW and Inner Mongolia a further 261 GW, nearly a fifth of the national pipeline each.

Prospective utility-scale solar and wind projects in these six regions are also much larger than those in other regions, averaging nearly 0.5 GW each, more than three times larger than planned wind and solar projects elsewhere in China.

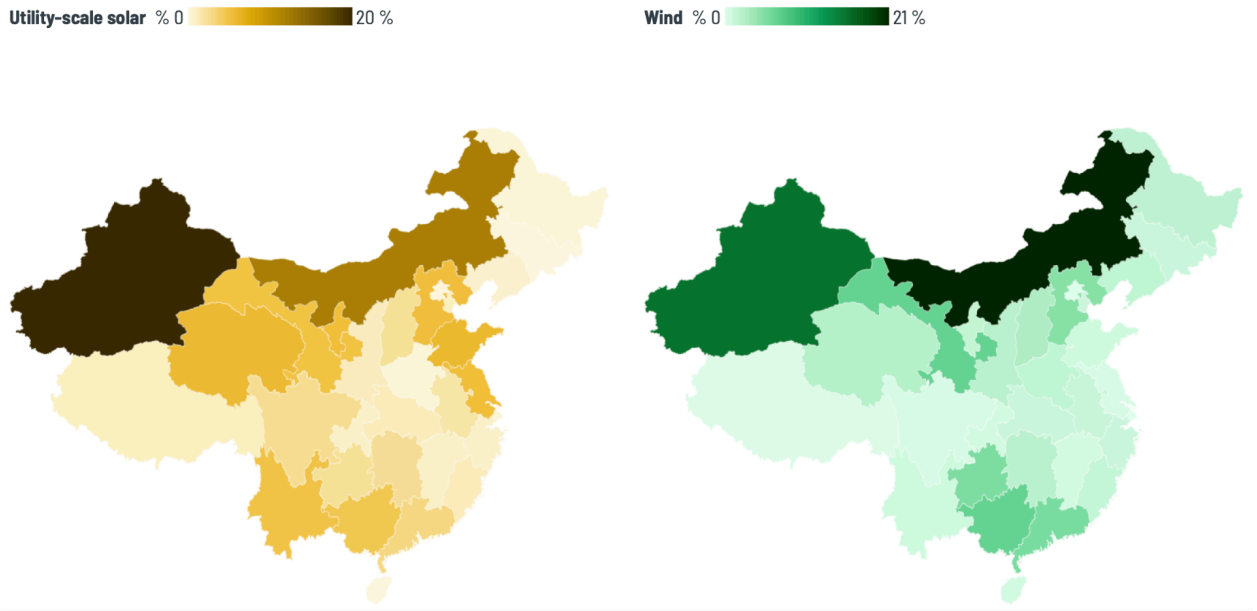
This concentration reflects China's energy megabases policy, a state-led strategy that clusters electricity generation in resource-rich regions in the northwest and north and

transmits the bulk of the power to major population and industrial centers in the east through long-distance ultra-high voltage (UHV) transmission lines.

The megabases constitute the largest geographically-concentrated renewable energy deployment undertaking in the world. An initial group of projects totalling about 97 GW was mostly commissioned by 2024. A larger plan for 455 GW of desert and Gobi wind and solar capacity is set to come online by 2030, nearly 70% of which is planned for export to other provinces.

China's utility-scale solar and wind pipeline is overwhelmingly western and northern

Capacity under construction, pre-construction, or announced, % of national total



Source: Global Energy Monitor, Global Solar Power Tracker and Global Wind Power Tracker, June 2026
Data cover solar project phases ≥20 MW and wind project phases ≥10 MW.

Record additions reinforce China's northwestern and northern megabases — but curtailment is rising

Last year, China's strong project pipeline translated into record operational capacity, with 317 GW of solar and 120 GW of wind capacity added in 2025, lifting fleets to 1,200 GW and 640 GW, respectively.

Despite these record figures, solar capacity additions were 70% lower year-over-year in the first five months of 2026 — a key reason being China's 2025 on-grid tariff reform. The reform set a mid-2025 cutoff, after which new solar and wind projects face a less certain pricing arrangement that is more market based. This triggered a rush to connect projects before the deadline, pulling volumes forward into 2025 and depressing the early-2026 comparison.

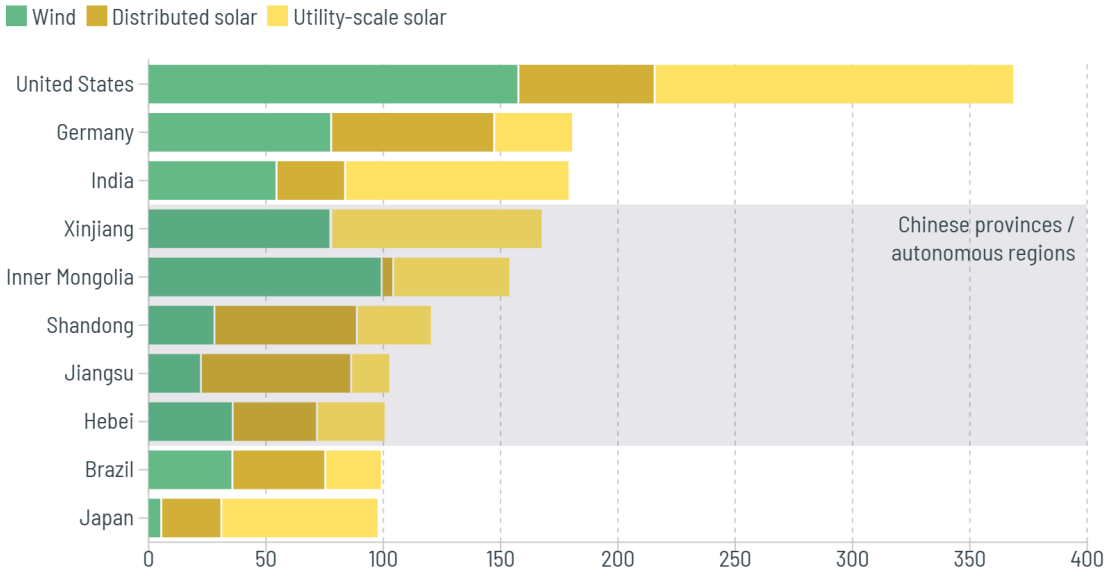
Wind deployment in China slowed less than solar so far in 2026, down 47% year-over-year, and GEM data suggest a strong year for wind buildout in China, with 119 GW of new wind capacity targeting 2026 commissioning.

Capacity installed in 2025 follows the same northwestern and northern concentration as prospective capacity, with GEM data suggesting nearly 60% of wind and utility-scale solar capacity that came online in 2025 falls within the same six northwestern and northern provinces and autonomous regions.

This regional concentration is large enough to put both Xinjiang and Inner Mongolia immediately behind the U.S., Germany, and India in a global ranking of operating solar and wind capacity, while China's immense buildout of distributed solar propels three additional provinces into the top ten.

China's largest provincial wind and solar fleets rival major countries

Top five Chinese provinces / autonomous regions and top five countries outside China, ranked by operating solar and wind capacity at the end of 2025, in gigawatts (GW)



Source: Global Energy Monitor, Global Solar Power Tracker and Global Wind Power Tracker, June 2026, IRENA

China's wind and solar buildout is beginning to deliver results. Record renewable generation, led by wind and solar, met all of China's electricity-demand growth in 2025, helping push coal-fired generation and power-sector CO_2 down for the first time in a decade.

But not all available renewable generation is making it onto the grid. Transmission bottlenecks remain a major constraint, while dispatch practices, electricity-market arrangements, and coal-related incentives — including long-term contracts — can further limit system flexibility. The result is rising curtailment: wind and solar output that could have been generated under prevailing weather conditions, but was instead reduced or withheld.

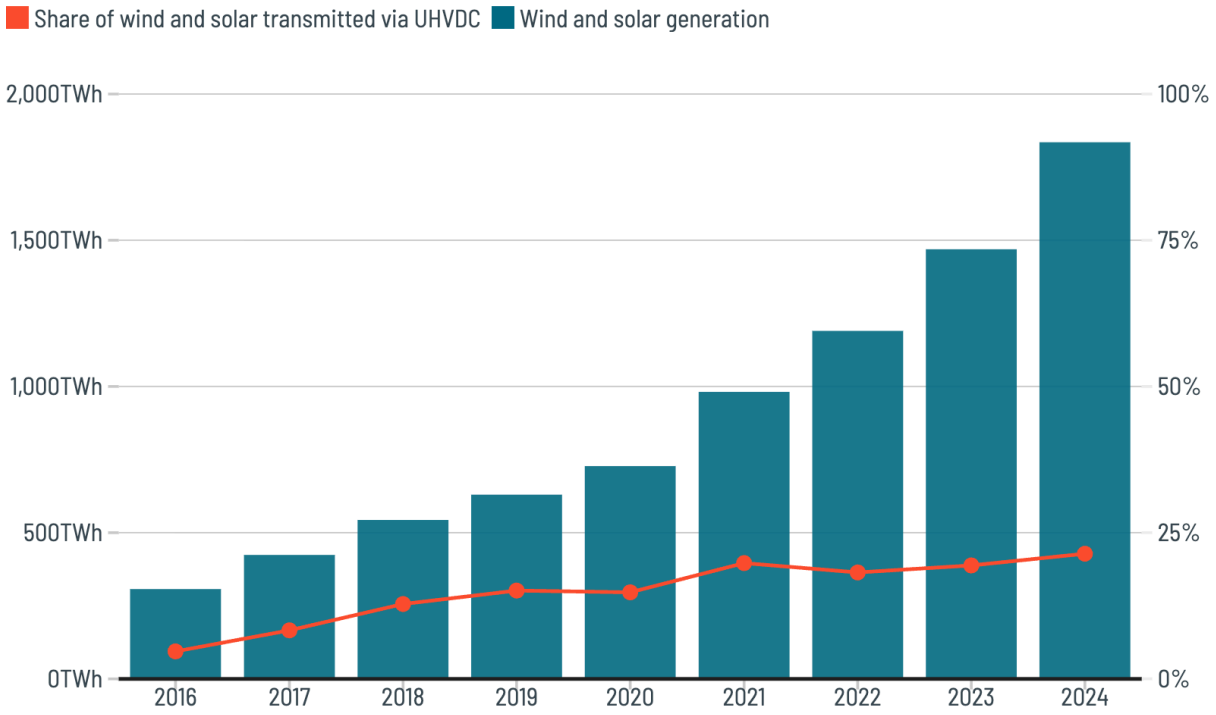
Curtailment shows signs of rising nationally, but is concentrated in the resource-rich northwest and north and is particularly severe for solar, reaching between 10–17% in Qinghai, Xinjiang, and Gansu in 2025. Wind curtailment was less extreme, between 4–9% across Xinjiang, Qinghai, Gansu, Ningxia, Inner Mongolia, and Shaanxi. However, true curtailment rates are likely higher than those reported.

Power transmission for megabases is lagging and remains coal dependent

GEM's analysis shows that across China's ultra-high voltage direct current (UHVDC) network, wind and solar power only account for around one-fifth of transmitted electricity, while coal power accounts for 42%. Despite rapid renewable expansion, the share of wind and solar in transmitted electricity has changed little since 2021.

China's transmission lags wind and solar growth

Share of wind and solar in Ultra High Voltage DC (UHVDC) transmission and wind and solar generation in terawatt-hours (TWh)



Source: National Energy Administration

Under current plans, around 315 GW of megabase capacity will depend on outbound transmission by 2030. Based on existing transmission designs, moving that volume of electricity would require approximately 27 dedicated UHVDC lines.

Between 2021 and 2025, only six UHVDC lines dedicated to megabases were completed or entered construction. The State Grid Corporation of China has announced plans for fifteen additional lines in the next five-year period (2026–2030), yet, even if fully delivered, transmission expansion would still lag behind megabase deployment needs.

At present, long-distance transmission continues to be paired with coal-fired generation in the name of balancing and system flexibility. Eleven planned UHV lines serving wind and solar megabases are associated with 129 GW of wind and solar capacity and 40 GW of coal capacity.

Although the supporting capacity of wind and solar is significantly higher than that of coal, projected electricity dispatch through most UHVDC corridors is split almost evenly between coal and renewable sources, suggesting coal continues to play a central, rather than supporting role in transmitted electricity flows, constraining renewable dominance.

Megabases learn to "stand on two legs"

Facing transmission restraints and rising curtailment at a time when supportive policies are fading, renewable generators are increasingly left to compete on the open market. Policymakers are encouraging renewables-rich regions to utilize green electricity locally by attracting high-consumption industries close to where it is generated. Alongside outbound transmission as the primary pillar, local industrial use forms a "second leg" for the megabase model.

These industries fall into two categories: direct electricity users, such as data centers, computing facilities, and advanced manufacturing; and indirect users, including heavy industry that relies on renewable-derived feedstocks and fuels such as green hydrogen, green ammonia, and green methanol.

China's rapidly expanding, standalone battery storage and green hydrogen sectors best illustrate these trends. Standalone battery projects are increasingly used to provide around-the-clock power to industrial users requiring a stable electricity supply. Following the removal of mandatory storage requirements for new renewable projects in 2025 and the introduction of capacity payments for standalone storage in 2026, investment has shifted from co-located storage toward grid-tied standalone battery systems.

In the first quarter of 2026, standalone storage capacity increased by 8.7 GW, accounting for 83% of total new-type energy storage additions. In comparison, only 11% of planned wind and utility-scale solar projects have plans for co-located storage, according to GEM data.

Green hydrogen is also expanding rapidly. According to GEM, China already has more than 10 GW[4] of wind and solar capacity dedicated to green hydrogen production, yielding at least 250,000 tonnes per year, nearly eight times the operating green hydrogen capacity across the rest of the world.

[4] This is wind and solar capacity dedicated to green hydrogen production, not electrolyzer capacity.

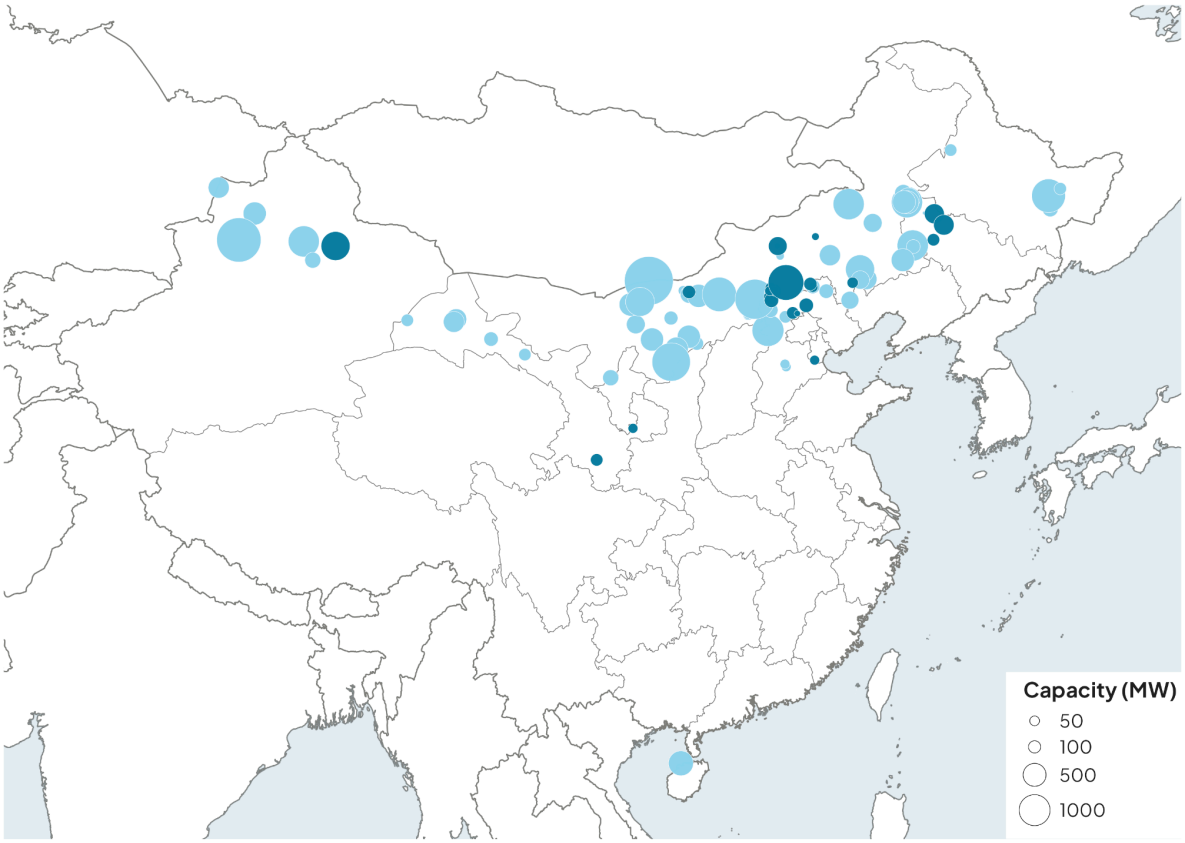
GEM data show an additional 53 GW of wind and solar capacity dedicated to green hydrogen production under development, capable of producing 1.6 million tonnes annually. The sector is transitioning from pilot projects to early-stage, commercial-scale deployment.

Producing one kilogram of hydrogen typically requires around 55–60 kilowatt-hours (kWh) of electricity, making power the dominant cost component in green hydrogen production. As renewable electricity costs continue to decline, green hydrogen is expected to become increasingly competitive.

Green hydrogen projects are currently concentrated in provinces with high renewable penetration and strong policy support. In Inner Mongolia, for example, around 12% of all prospective wind and utility-scale solar capacity is earmarked for green hydrogen production.

Most of China's green hydrogen projects are in megabase provinces

Locations of **operating** and **prospective** green hydrogen installations, as of June 2026; circles sized by megawatt (MW) capacity



Source: Global Energy Monitor, Global Solar Power Tracker, Global Wind Power Tracker • Note: Showing wind and solar capacity dedicated for green hydrogen production, not electrolyzer capacity.

Coal lock-in risks cast a shadow over megabase localization

Many of China's renewables-rich regions are also major coal-producing areas. While renewable development creates opportunities for economic diversification and industrial transformation, it can also provide a new rationale for expanding coal-based industries. The coal-to-chemicals[5] sector illustrates this risk.

[5] Coal-to-chemicals is the process of converting coal into liquid fuels, industrial gases and chemical feedstocks, including methanol, ammonia, olefins, and ethylene glycol, etc.

According to new GEM research, all coal-to-olefins projects currently under construction in China's northwestern and northern regions include planned associated green hydrogen facilities, as regulators increasingly require renewable integration as a condition for project approval. However, in many cases, the renewable component represents only a small fraction of overall energy use.

Baofeng Energy, the world's largest coal-to-olefin producer, provides a notable example. Its flagship coal-to-olefins project in Inner Mongolia, commissioned in 2025, is paired with a 1 GW co-located wind and solar project that could reduce coal consumption by approximately 210,000 tonnes per year. Yet this represents just 2.2% of the facility's total annual coal consumption.

In such cases, renewable integration accounts for a relatively small cost of securing project regulatory approval. This raises the risk that renewable energy would only supplement, rather than replace, coal consumption, and could enable the continued expansion of fossil-based industries under a lower-emissions label.

The 15th Five-Year Plan for the energy sector sets modest renewable goals while leaving room for fossil fuels

China has demonstrated both the political commitment and industrial capability to deploy renewable energy at an unprecedented scale. The remaining question is whether this expansion can accelerate the transition away from coal.

The newly released Five-Year Plan for the energy sector (2026–2030) continues renewable expansion but also preserves room for fossil fuel growth to support energy security and economic development.

While the plan states that coal and oil consumption will peak during this period, coal-fired generation could still rebound if electricity demand growth outpaces renewable deployment due to constraints in grids, markets, storage, and demand response. Gas consumption is expected to continue increasing beyond 2030.

The target for wind and solar to exceed 50% of installed power capacity appears relatively modest and is likely to be surpassed by the end of this year based on GEM's prospective data.

One notable highlight is the target of 300 GW of new-type energy storage by 2030, more than double the 136 GW installed by the end of 2025. This positions storage as an increasingly important competitor to coal in providing system flexibility. If annual additions continue at the 2025 pace of 62 GW, the target could be achieved by the end of 2028.

The plan also targets 2 million tonnes of annual green hydrogen production by 2030 — modest relative to domestic momentum and requiring practically no new planned projects beyond what GEM is tracking. Still, this is well ahead of all other countries.

By contrast, the target to increase northwest–to–east power transmission capacity from 340 GW to 420 GW appears conservative. The additional 80 GW is equivalent to roughly ten UHVDC lines, and not all capacity would serve wind and solar megabases, as some would support hydropower exports.

This suggests that previously announced plans by State Grid to build fifteen new UHVDC transmission lines are not fully reflected in the 15th Five-Year Plan, and power transmission is likely to remain a bottleneck for renewable megabases.

Next steps should focus on accelerating decarbonization

While the megabases are learning to stand on two legs — power transmission and local utilization — multiple industries seek opportunities from this transition to maximize their interests. Amid competing priorities, policymakers should keep the original objective firmly in sight: The purpose of the renewable megabases is to accelerate decarbonization across the entire country.

This will require a decisive shift in policy toward prioritizing renewable energy over fossil fuels. Since 2022, China has followed the principle of "establishing the new before phasing out the old" to guide its energy transition. This approach has driven unprecedented investment in both renewable and fossil fuel infrastructure over the past four years.

As the carbon peak target approaches, policy emphasis will need to shift toward the second half of this principle, phasing out the old.

Ultimately, the success of China's renewable megabases will be measured not by how many gigawatts are added, but by how much coal they displace.

About the Global Solar and Wind Trackers

The Global Solar Power Tracker is a worldwide dataset of utility-scale solar photovoltaic (PV) and solar thermal facilities. It covers all operating solar farm phases with capacities of one megawatt (MW) or more and all announced, pre-construction, construction, and shelved projects with capacities greater than 20 MW. The Global Wind Power Tracker is a worldwide dataset of utility-scale, on- and offshore wind facilities. It includes wind farm phases with capacities of 10 MW or more.

Supplementary information on the methodology used for this briefing can be found on our Methodology wiki page.

About Global Energy Monitor

Global Energy Monitor (GEM) develops and shares information in support of the worldwide movement for clean energy. By studying the evolving international energy landscape and creating databases, reports, and interactive tools that enhance understanding, GEM seeks to build an open guide to the world's energy system. Follow us at www.globalenergymonitor.org and on X @GlobalEnergyMon.

GEM data serves as a vital international reference point that is being used by agencies including: Intergovernmental Panel on Climate Change, International Energy Agency, United Nations Environment Programme, U.S. Treasury Department and the World Bank. Furthermore, industry data providers such as Bloomberg Terminals and the Economist and academic institutions like University of Oxford and Harvard University draw on this data.

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