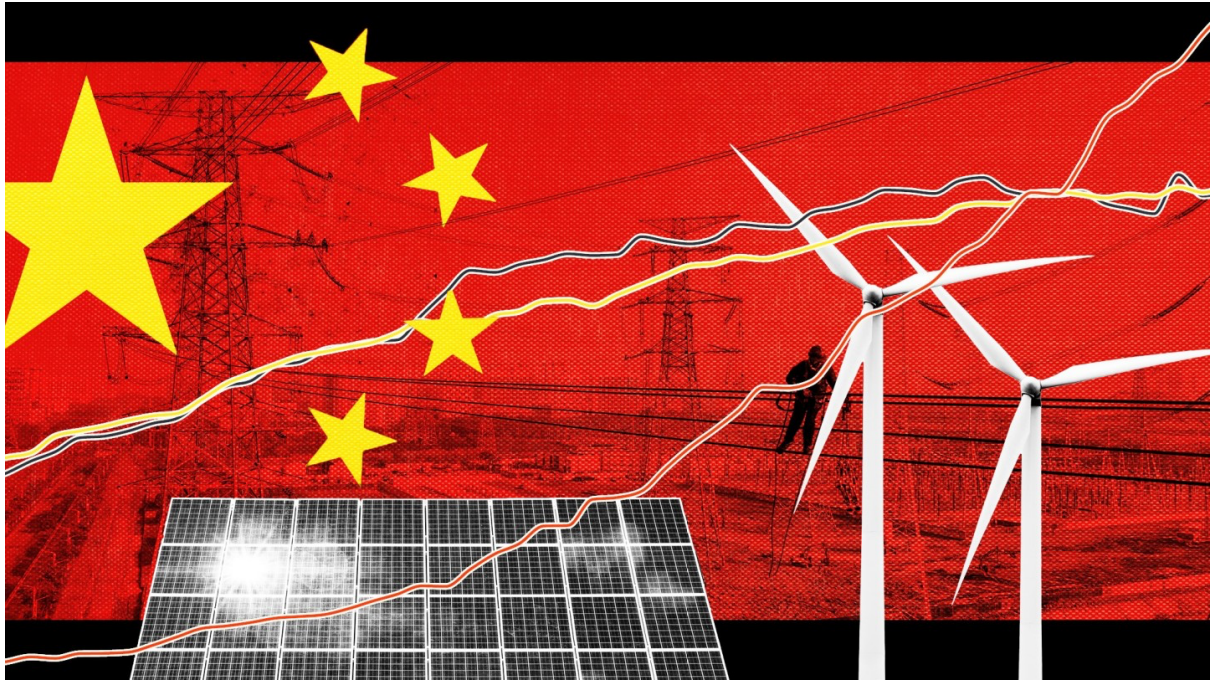


How Xi sparked China's electricity revolution

Beijing's aggressive pursuit of energy self-sufficiency could give it the upper hand in the trade war with the US



Nassos Stylianou & Jana Tauschinski in UK and Edward White in Shanghai FT 12 May 2025

When Xi Jinping took over the leadership of the Chinese Communist party in late 2012 he quickly identified a national security vulnerability.

China had just leapfrogged Japan to become the world's second-biggest economy and was fast becoming America's chief rival nuclear-armed superpower. But the country of 1.4bn people was highly dependent on foreign nations for energy.

Reliance on oil and coal imports had surged to record highs, exposing China to potential supply disruptions via chokepoints in trade channels from the disputed waters of the Taiwan Strait and the South China Sea to the Strait of Malacca and the Indian Ocean.

Today, as the world is rocked by Donald Trump's trade war, the view from the CCP's leadership compound in Beijing's Zhongnanhai is starkly different.

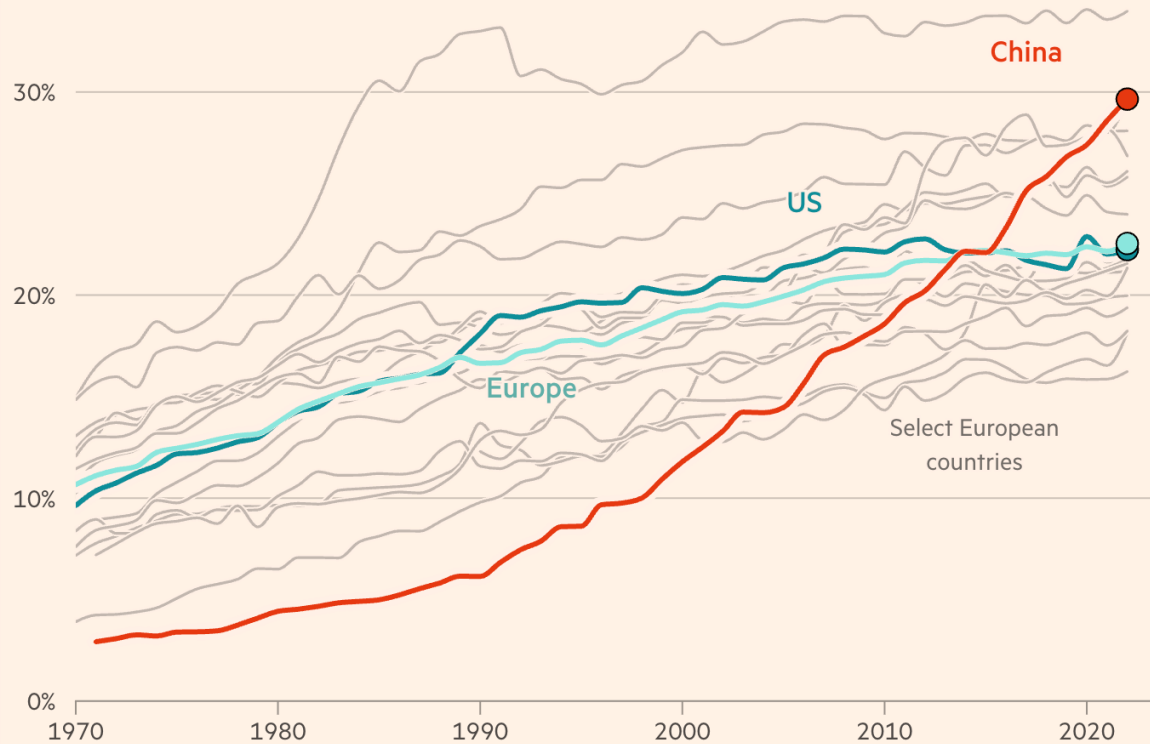
China is on its way to becoming the world's first "electrostate", with a growing share of its energy coming from electricity and an economy increasingly driven by clean technologies. It offers China a strategic buffer from trade decoupling and rising geopolitical tensions with the US.

The country is not only rapidly advancing towards self-sufficiency in energy from secure domestic sources, but also wields vast power over the markets for the resources and materials that underpin technologies of the future.

"Nobody had been seriously worrying about energy security or supply chains for armaments and critical industries and food because everyone thought that went with the cold war," says Andrew Gilholm, head of China analysis at consultancy **Control Risks**. "Meanwhile, China has been working on that for years."

China paces ahead in electrification, while Europe and the US flatline

Electricity's share of final energy consumption



Source: RMI analysis of IEA data

Earlier industrial revolutions were led first by the UK and then by the US, including the so-called information age more recently. But it is China that now leads the latest global technology revolution in electrification and renewable energy, say analysts from US-based energy think-tank RMI and other independent research groups.

And just as oil and gas drives a petrostate's economy, clean energy technologies are making a significant contribution to Chinese growth.

This has been particularly welcome for Beijing in the context of a slowing economy. Clean energy sectors accounted for a record 10% of the country's GDP and drove a quarter of its growth last year, according to analysis of official government statistics by the Helsinki-based **Centre for Research on Energy and Clean Air**.

Beyond energy security, electrification — the process of swapping processes and technologies reliant on fossil fuels with electrically powered alternatives — will play a critical role in efforts to tackle climate change.

"We cannot see any way to a zero-carbon economy except through massive electrification," says Lord Adair Turner, head of the **Energy Transitions Commission**, an alliance of global companies focused on net zero. Electricity is "much more efficient in a number of applications", adds Turner, particularly in road transport and residential heating.

China remains the world's biggest greenhouse gas producer and its power sector emissions reached a new high last year, driven by a rise in coal consumption. But the advances in electrification mean it stands to make significant progress in cutting emissions if it begins to phase out coal, still the dominant fuel in its electricity mix, despite a surge in renewable capacity additions.



Coal, solar, wind and hydropower make up the majority of China's total installed capacity — which grew by 15% to over 3,300GW in 2024 — and are spread across the country according to geographic suitability and power needs



China accounts for 80% of coal-fired power under construction globally, with additional plants set to come online near population centres and industrial hubs

Planned solar (utility-scale)

● under construction: 234GW

○ in development: 437GW



*Some announced mega projects have as much as 8.5GW, enough to power more than 5 mn homes**

*based on average annual household electricity use in China
Source: Global Energy Monitor

With 70% of the world's utility-scale solar under construction in China, many of the most ambitious solar projects are clustered inland in regions such as Xinjiang and Inner Mongolia



Similarly, most wind power in construction is in the north, while offshore projects are dotted along the south-eastern coast



More than half of the world's planned hydropower is in China, with projects distributed across most of its central and eastern provinces

Xi's first direct order to "revolutionise" China's energy system came in mid-2014, two years into his leadership. According to state media at the time, Xi told leaders at a key internal party economic working group that China's energy system suffered from "technological backwardness" and that the country must boost its energy security.

China's journey to becoming an economic powerhouse had been underpinned by oil and coal. The country has accounted for more than half global oil demand growth for decades.

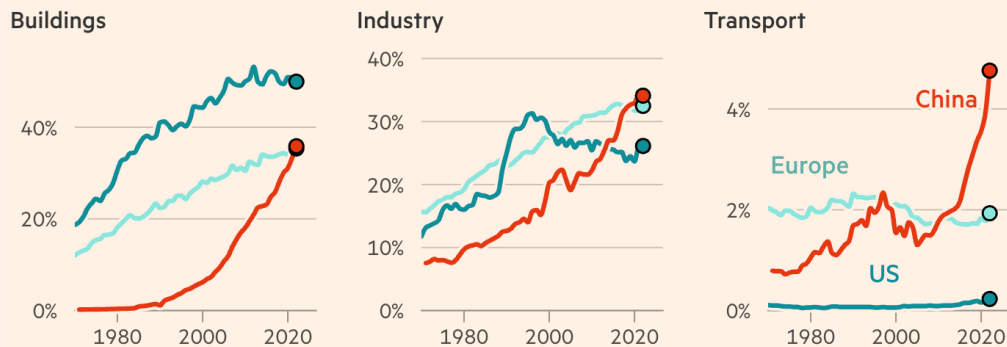
Yet even a decade ago, China's rate of electrification was ahead of Europe and the US. Since then, those rival economies have seen electricity as a final share of energy plateau at around 22%, while electrification in China has surged to 30%.

"Many western countries are spending a lot of time and attention on decarbonising electricity generation but are lagging on wider system electrification," says Marie Claire

Brisbois, professor of energy policy at the **University of Sussex**. Key requirements for electrification such as market adjustments, consumer behaviour changes and interventions in private purchasing decisions have proved easier for Beijing to accomplish, she adds.

Rapid electrification across various sectors in China

Electricity's share of final energy consumption



Source: RMI analysis of IEA data

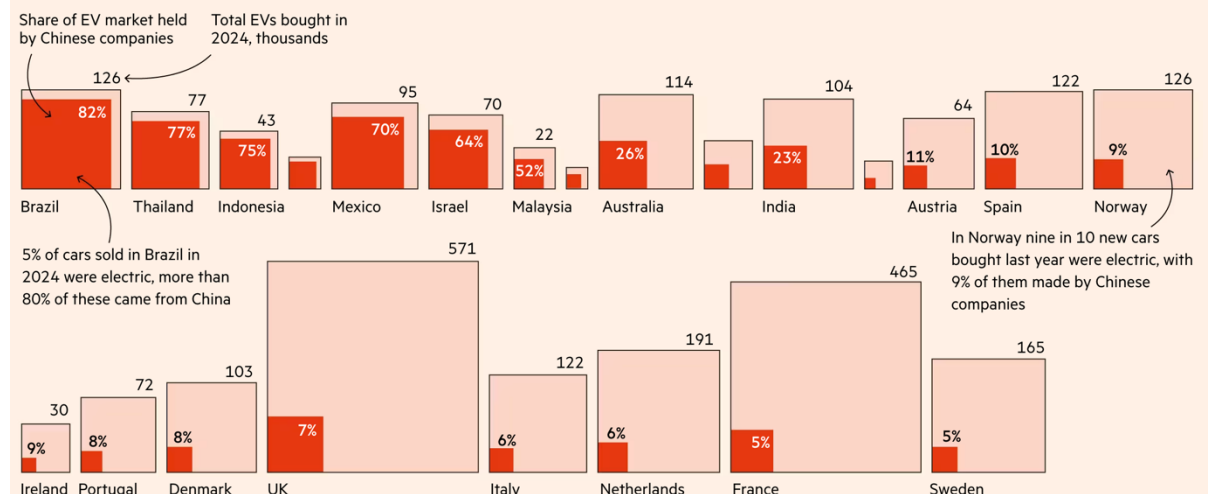
China's advances reflect a hydra of policies aimed at fulfilling Xi's call for an energy revolution. Beijing has poured hundreds of billions of dollars into the clean tech sector, both to state-owned developers and the private sector, almost five times as much as the US and 15 times Japan.

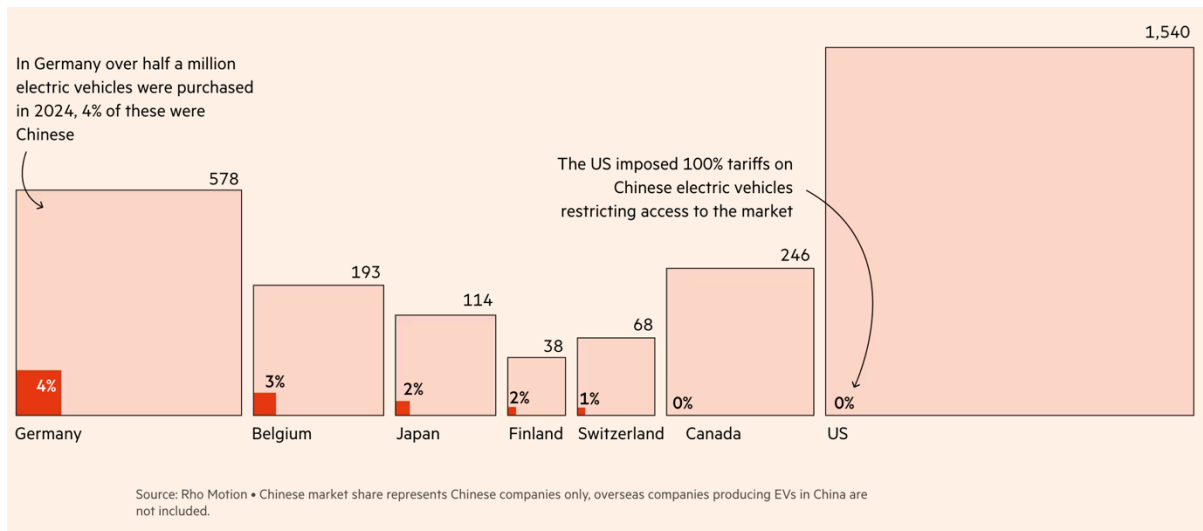
This sparked a new phase of rapid growth of companies manufacturing wind turbines, solar panels and batteries and those developing green power projects, and turbocharging the electrification of the country's fleet of cars, trucks, trains, ships and factories.

The most obvious manifestation of this growth is [China's electric vehicle boom](#). This year domestic EV sales — including pure battery cars and plug-in hybrids — will hit about 12.5mn, more than double that of 2022. This would mark the first time EVs outsell cars with internal combustion engines in a major auto market.

Chinese EVs dominate several overseas markets

Sales of battery electric and plug-in hybrid electric vehicles in select countries, 2024

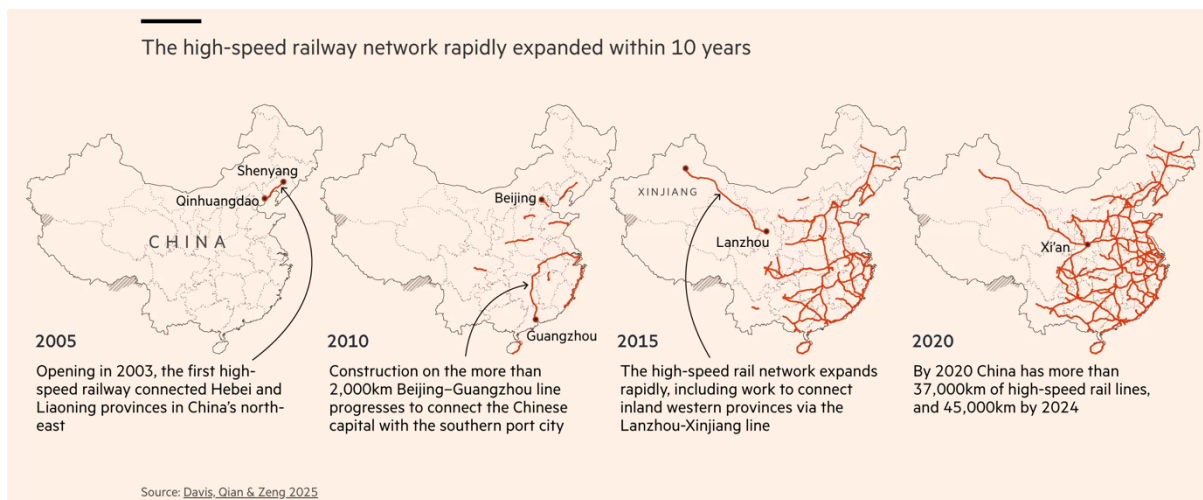




The path to electrification has also been supercharged by the rapid expansion of the country’s modern rail network.

According to official data China’s railways handled more than 4bn passenger trips last year, a record high. The network of high-speed rail spans 45,000km — five times the size of the EU’s — and is forecast to expand to about 60,000km by 2030. This year, the state rail group expects to complete more than \$80bn in rail infrastructure investments.

But perhaps the central pillar of China’s electrification plans is its decades-long plan to upgrade and expand China’s electricity grid. The country is forecast to spend as much as \$800bn by 2030 upgrading the system’s hardware and software.



Electricity infrastructure spending in many countries tracks economic growth. However, Ken Liu, head of China renewables, utilities and energy research at **UBS**, forecasts overall grid capex in China as high as 10% this year. Grid spending will continue at a compound annual growth rate of about 5% through to 2030, significantly faster than forecast economic growth “due to the trend of electrification”, he says.



Workers upgrading transmission lines in eastern China



The improvements to the network are part of ambitious government plans to expand the country's electricity grid

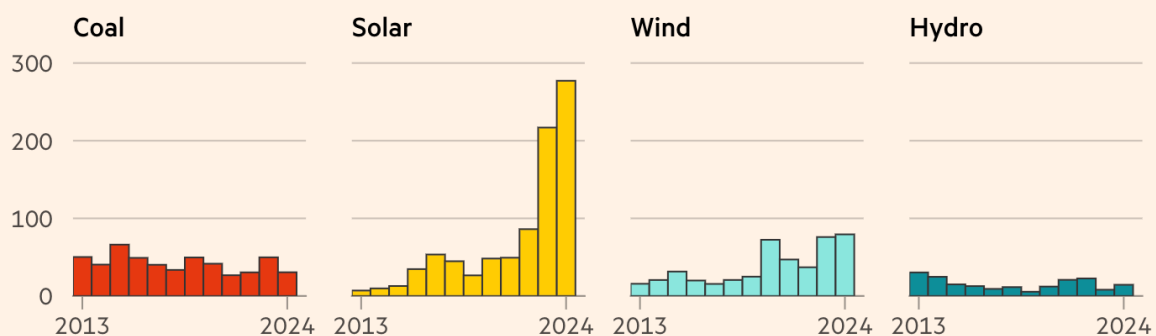
A big chunk of that planned spending on the grid, around Rmb100bn (\$13.8bn) this year and Rmb110bn in the years following is expected for ultra-high-voltage lines, according to UBS.

China has more than 40 such lines, which means solar and wind electricity generated in the western deserts of Xinjiang and Gansu can be delivered to the factory hubs in southern and eastern China where it is needed.

Supported by these long-term state investments in the power grid, China is on course to source 50% of its power from low-carbon energy including hydro, solar, wind, nuclear and battery storage systems by 2028. About 10 years later combined solar and wind capacity are on track to reach a historic inflection point, exceeding coal-fired power generation for the first time.

China is adding many different power sources, with solar dominating

Annual power capacity additions by source, in gigawatts (GW)



Source: China Electricity Council, Centre for Research on Energy and Clean Air, Global Energy Monitor • Coal, solar, wind and hydro make up around 90% of China's total installed capacity

The push to electrify has shaped the country's industrial policy. A handful of leading Chinese solar groups are pouring billions of dollars each year into R&D spending.

This includes a pivot away from the polysilicon needed for solar panels — where China already dominates 80% of the market — into potentially groundbreaking new materials, such as perovskite cells, which are up to 20 times thinner.

Similarly, in wind, a clutch of rival Chinese companies are vying to produce ever bigger turbines at a lower cost.

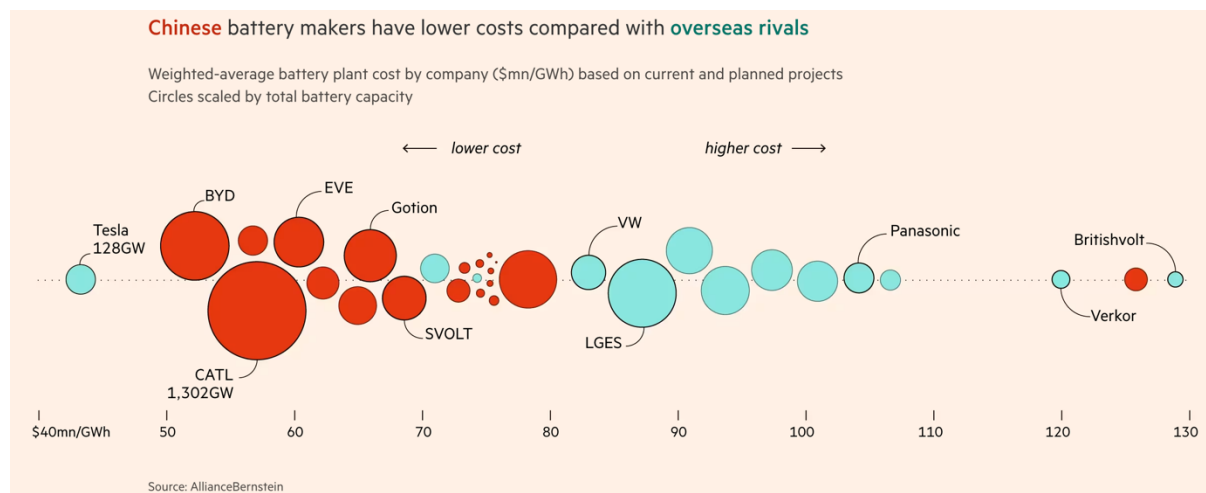
Last September, Guangdong-based **Ming Yang Wind Power Group** announced what it claimed will be the world's largest offshore wind turbine, at 20MW, near the resort island of Hainan, marking a more than doubling in size from then world-beating projects developed by European and American engineers just 10 years ago. A month later, Chengdu's **Dongfang Electric** said it had built an even bigger turbine, at a factory in Fujian, in the country's south-east.

This competition has driven down the cost of offshore wind projects, on a dollar per megawatt-hour basis, from \$95 in 2020 to \$55 last year, implying a lower cost of production than conventional coal, data from **Wood Mackenzie**, a consultancy, shows.



Wind turbine towers being assembled at a factory in China's eastern Jiangsu province

It is a similar story with energy storage. China's two biggest battery groups, **CATL** and **BYD**, each channel about 5% of their annual revenues — \$50bn and \$100bn last year, respectively — towards efforts targeted at incremental gains in cutting-edge materials, chemistry and manufacturing processes, as well as longer-term foundational research.



Their tech gains coupled with expansive economies of scale benefits have led to steep reductions in the cost of lithium batteries for both EVs and battery storage for supporting wind and solar use in China.

These successful policies are being supported by the establishment of a market-based system for dispatching electricity across China's regions. In a landmark move, Beijing has decided that from June this year new renewable projects will be subject to market pricing.

The policy is expected to lead to some short-term hit to some large-scale wind, solar and battery developments, as new prices are factored into investment plans. But the introduction of competitive electricity markets — putting fossil fuels and renewables in direct price competition — is viewed as a necessary step in the gradual reduction of electricity fuelled by coal and gas over coming decades.

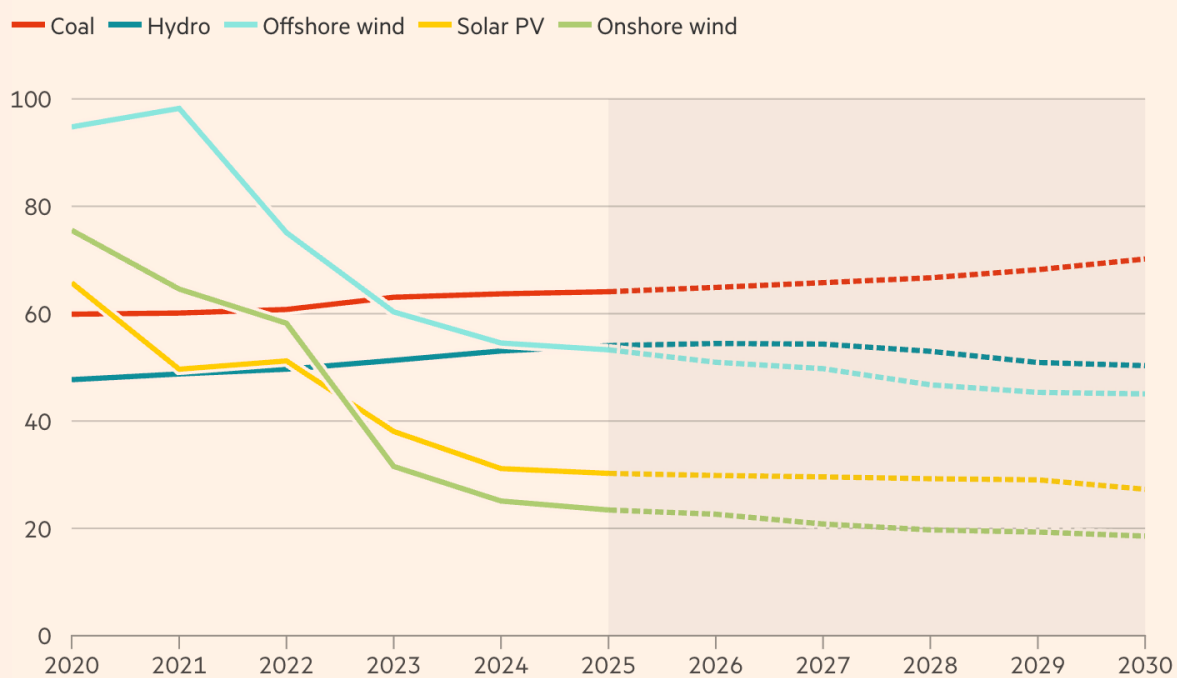
China's commitment to fossil fuels is a mixed picture. On the one hand, there are signs that the country is [on the cusp of hitting peak oil](#) after imports last year swung into decline for the first time in decades, excluding the pandemic.

Analysts at the **International Energy Agency** have noted that combustion uses of petroleum fuel in China have plateaued with “very limited” potential for future growth, a trend driven largely by the adoption of EVs in the transport sector and the country's gradual shift from manufacturing to more services-based growth.

But, in the same year, China started construction on the highest number of coal-fired plants in a decade, according to Global Energy Monitor and the country continues to finance coal projects abroad despite a 2021 pledge from Xi that it would stop.

Renewables have become cheaper than coal power in China

Average levelised cost of electricity (LCOE) in China, dollar per megawatt-hour (\$/MWh)



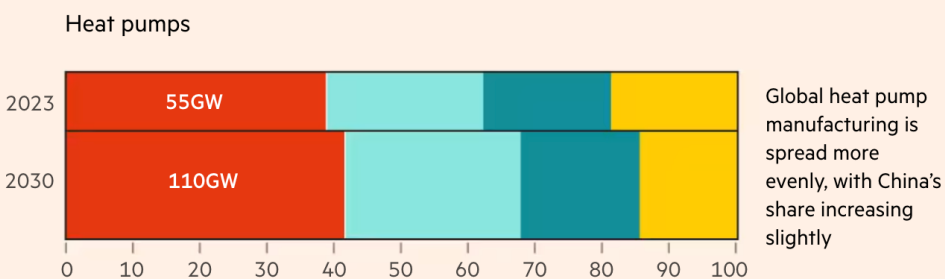
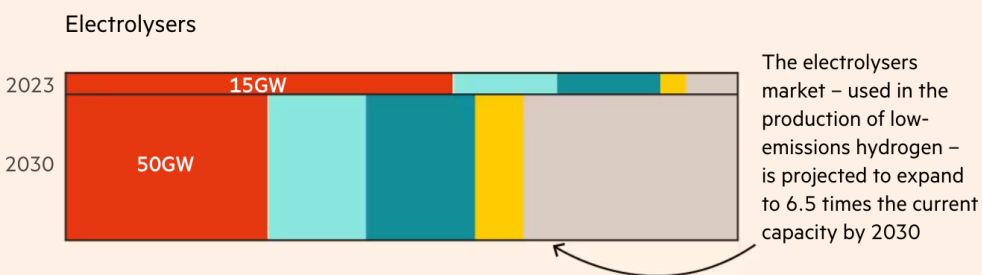
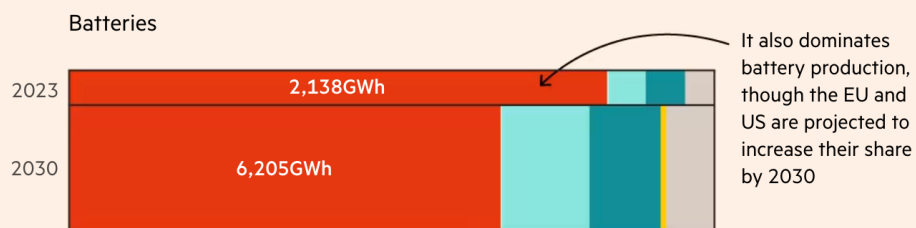
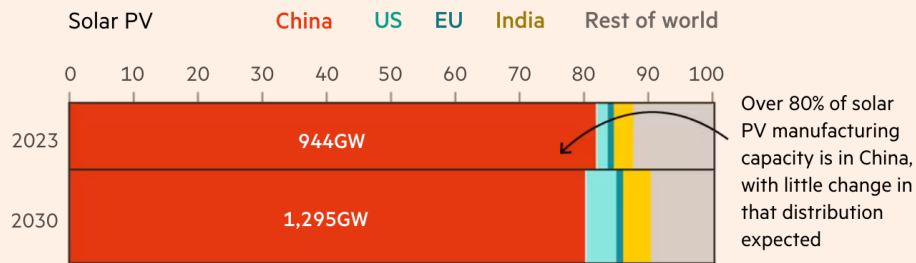
Source: Wood Mackenzie • LCOE is a standard power industry metric used to evaluate the total cost of power generation over a project's lifetime

Yet following Xi's dual pledges that China's carbon emissions would peak before 2030 and the country would achieve carbon neutrality by 2060, the fuel is expected to over time be used more and more as a back up for a renewables-dominated electricity system.

China dominates cleantech production

Global manufacturing capacity by country for select clean energy technologies

↓ Height of bars indicates relative size of capacity for each technology, 2023 vs 2030



Source: IEA • Capacity at year-end. 2030 manufacturing capacity includes existing and planned capacity based on project announcements.

“The world has underestimated how much the cost of renewable energy has come down in China,” says Yanmei Xie, an independent expert on Chinese industrial policy. “They actually opened renewable energy to market pricing, confident that it was cost-competitive with traditional energy.”

According to **RMI**’s research, low electricity prices are also essential to electrification, as has been the case in China where low prices have increased usage. Its analysis shows that countries that fail to reduce prices struggle to electrify. “It’s very simple economics 101. If the price of something is high, you are going to use less of it,” says Daan Walter, one of the authors of the RMI report, now with **Ember** climate think-tank.

While China’s industrial policy is boosting energy and resource security, it has also led to overcapacity, hammered countless foreign rivals and contributed to an overwhelming trade imbalance.

The country’s cleantech manufacturing capacity massively outstrips domestic demand, according to data from Wood Mackenzie. This has led to stunning price falls but also sparked allegations from Washington and Brussels that Beijing has violated international trade rules through years of unfair state support.

Immense supply gluts in solar, for example, have led to warehouses overflowing and low-grade Chinese-made panels being used for fencing in Europe.

The dichotomy — that industrial policy can be immensely wasteful and lead to successful strategic outcomes — is not lost on policymakers in Beijing.

Elisa Hoerhager, the Beijing-based chief representative in China for the **Federation of German Industries**, known as BDI, expects the Chinese state’s economic planners to intensify efforts to tackle “this disconnect” between innovation and efficiency of industry in their next five-year plan, which is expected to be unveiled in early 2026. “This is going to be one of the major challenges that they’re going to try to address: to connect ‘fostering innovation’ and ‘raising productivity’ with each other,” she says.

Among western policymakers, there is a dawning realisation that matching China’s cleantech supply chains may be impossible.

China spent decades securing access to the world’s critical resources, building out the processing and refining infrastructure, and subsidising local manufacturing and consumption. It now dominates all stages of the supply chain, from mines to factories.

According to research published this year by AidData, at the College of William & Mary in the US, Chinese entities issued loans worth nearly \$57bn from 2000 to 2021 to secure access to critical minerals such as copper, cobalt, nickel, lithium and rare earths across the developing world.

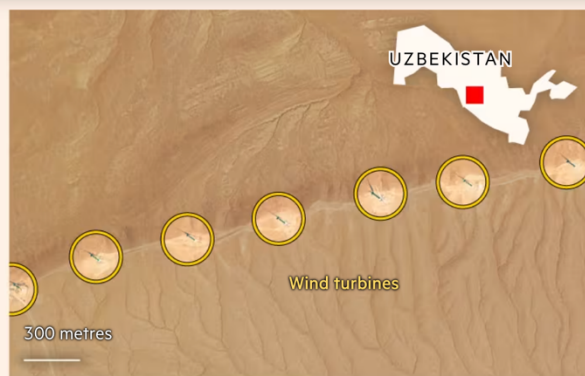
Now, the country is leveraging that dominance. China is increasingly exporting its clean technology, engineering, supply chain and financing capacities.

Beijing is also increasingly using its green energy success to claim a moral high ground over western rivals. “Since I announced China’s goals for carbon peaking and carbon neutrality five years ago, we have built the world’s largest and fastest-growing renewable energy system as well as the largest and most complete new energy industrial chain,” Xi told a UN-convened virtual meeting of world leaders in late April.

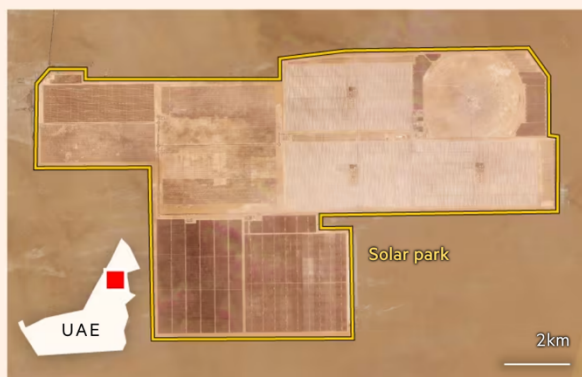
China is investing billions in clean energy projects abroad



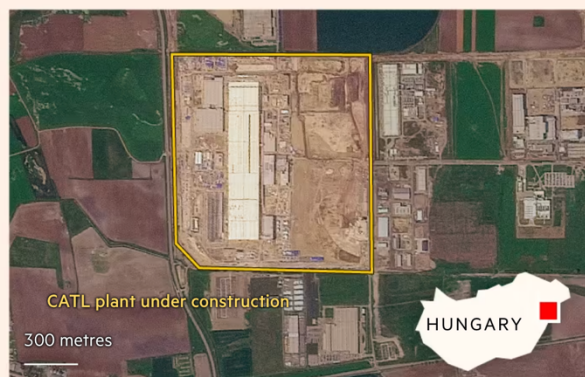
Companies from China supplied the equipment and installed most of the units at the 2.1 gigawatt (GW) **Julius Nyerere hydroelectric power plant** in eastern Tanzania. The facility will double the African country's power generation capacity.



Beijing is investing in several renewable energy projects in central Asia, such as China Southern Power Grid's stake in Uzbekistan's **Bash and Dzhankeldy wind farms**. The 1GW project, located in the Kyzylkum desert, is the largest wind power facility in the region.



Chinese companies are playing a growing role in clean energy developments in the Gulf region, including at the **Mohammed Bin Rashid Al Maktoum solar park** in Dubai. The megaproject is one of the largest solar farms in the world, with a planned capacity of 7.2GW by 2030.



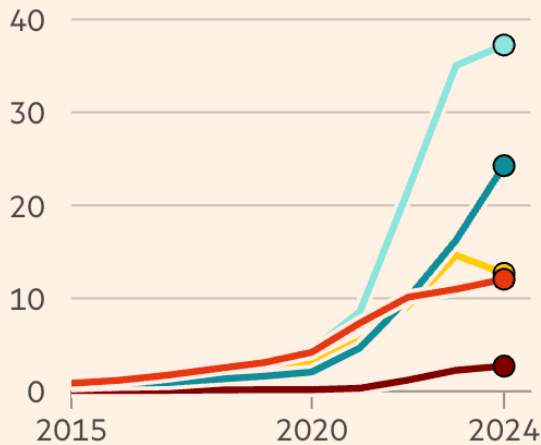
Battery giant CATL expects to start production at its €7.3bn plant in Debrecen, Hungary, this year. The project is the largest-ever greenfield foreign direct investment in the country and is set to become the biggest battery 'gigafactory' in Europe.

According to corporate announcements and financial statements compiled by **Climate Energy Finance**, a Sydney-based research group, Chinese companies have, since the start of 2023, committed \$156bn in outbound foreign direct investment across more than 200 clean technology transactions. This effort is expanding Beijing's political and economic influence globally just as the Trump administration pursues a hard decoupling from Chinese supply chains and roils global trade. "This trade war has really emphasised the whole point of energy security and electrification because one of the most-traded commodities in the world is fossil fuels," says Tim Buckley, director of CEF. "Countries around the world are going to be thinking very much the same way [as China]," Buckley adds. "Obviously China is very well positioned to aid them in that, and come out of this geopolitical shitshow with a strategic trade weapon: collaborating with anyone that wants to work on energy security and decarbonisation."

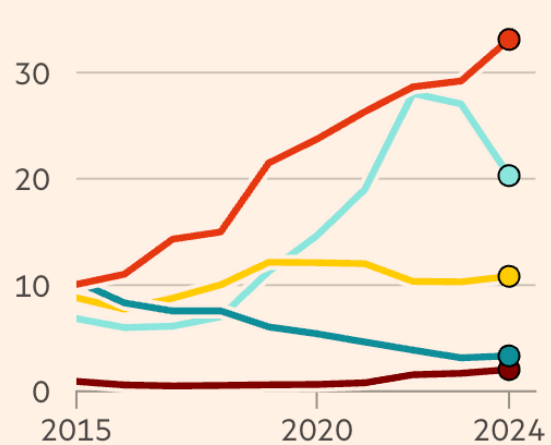
Value of green tech exports from China, in \$bn

— Developing countries — US — EU — UK — Other developed countries

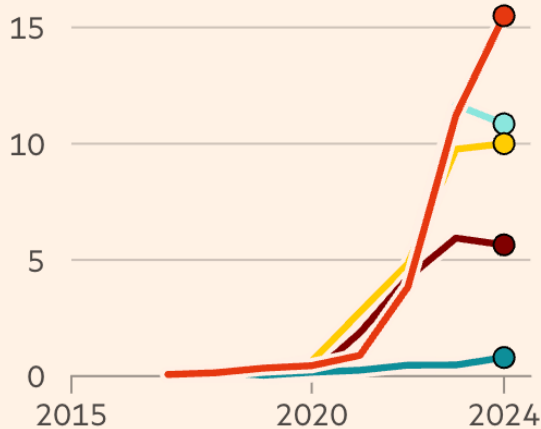
Battery



Solar



Vehicle



Source: Centre for Research on Energy and Clean Air analysis of Comtrade data • Value of imports shown at constant 2022 prices, based on averaged unit costs

While Beijing is betting on clean technologies to boost its exports, Washington is pursuing a very different approach. The White House is insisting countries increase imports of American gas to reduce their trade surpluses with the US and secure favourable trade terms.

For many countries weighing up the costs of Trump's trade war, the choice between American LNG and Chinese clean power technologies could be a defining one both financially and for decarbonisation, according to Kingsmill Bond, an energy strategist at

Ember. “Building on Chinese electrification technologies is going to be cheaper than trying to sustain the old fossil fuel system,” Bond says. “Solar beats LNG on cost and that is a boon for the climate. Basically \$1 spent on importing solar panels would save \$1 annually in gas imports while generating the same amount of electricity.”

But western analysts and officials have also identified an emerging national security risk in China’s rising dominance over green energy supply chains and technology, citing potential risks from economic dependence as well as espionage and military threats.

Ultimately, experts say that China’s success in electrification leaves Xi and his administration far more able to handle the sort of supply chain and trade shocks that now loom large in Trump’s second term.

Ironically, the tariffs may provide the “unintentional incentive” of strengthening China’s energy transition, says Yao Yi, Beijing-based project lead at Greenpeace.

As of last year China’s energy storage systems capacity was above 73GW, more than 20x higher than four years ago but still far short of the more than 500GW of storage the country is expected to need to fully support its renewable roll out.

Switching focus from exports to the US back to the domestic market may help “local governments and industries achieve goals around energy security”, says Yao.

And while both sides have weaknesses and choke points across their industrial supply chains, many experts believe that Trump and his cast of close advisers have miscalculated the extent of Beijing’s preparation for this crisis.

“To the extent any country can minimise its exposure relative to where they were years ago, China is in a much stronger position,” says Gilholm of **Control Risks**. “Nobody calls it neo-Maoist or autarkic now; China was just way ahead on de-risking and resilience.”

<https://www.ft.com/content/f86782fa-9f2e-448a-b710-29e787dc9831>