Global Macro Research

13 May 2025

7:46 minute read

#China / #Growth / #Sustainability

China's green investment 'bubble' isn't about to burst

The green investment surge continues to support growth, more than offsetting the drag from the beleaguered property sector. This pivot is essential to meet global climate targets. But it is also adding to geopolitical tensions, and there are looming headwinds from EV consolidation and excess battery capacity.

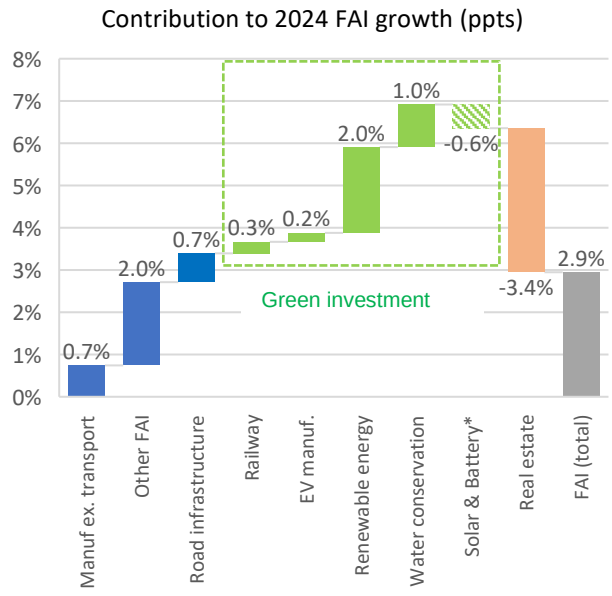
Key Takeaways

- China continues to lean hard on green investment, boosting the share of renewables in domestic power, and furthering its lead in green technology.
- China's pivot to renewable energy is essential for global climate targets. Like with electric vehicles (EVs), strong investment in solar and battery manufacturing capacity is reducing the cost of the green transition.
- But it also has the potential to add to geopolitical tensions, particularly due to the economy's sudden emergence as an EV manufacturing powerhouse.
- A green investment 'bubble' is not impossible, but there are reasons to expect it will remain a growth driver.
- Consolidation within the EV sector is likely to weigh on near-term growth, as is excess capacity within battery manufacturing, which is already dragging. The breakneck pace of solar expansion may also moderate.
- The need for additional grid capacity and ancillary infrastructure to embed renewables should maintain green investment as a driver of growth, even if investment in new generation capacity slows.
- Building up excess capacity may even be part of China's long-run strategic aims. Power could be exported to neighbouring countries, which would help tie them to China politically.
- Pushing harder on the renewables' rollout in the near-term also offers China a lever to offset the shock from US tariffs.

Green investment underpinned Chinese growth again in 2024, countering the property drag

China's carbon reduction goals, increased focus on energy security, a desire to be at the forefront of green technology and the need to counter a substantial drag from real estate, motivated another surge in green investment last year. Whether this continues will have huge ramifications for the Chinese economy, climate change and geopolitics.

Figure 1: Green investment remains a strategic priority



*Note: Solar and Battery manufacturing FAI data estimated.

Source: Aberdeen, Haver, CarbonBrief, April 2025

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We estimate that green investment once again largely offset the drag from real estate on GDP growth in 2024 (see Figure 1).

A huge investment in renewable energy – which saw a record 275 gigawatts (GW) of new solar and 80 GW of wind capacity added – was the largest major driver of fixed asset investment (FAI) for the second consecutive year. Investment in water conservation and environmental management also added a new green driver in 2024.

In contrast, investment in electric vehicle (EV) manufacturing moderated (0.2%, -0.3ppts), while the estimated contribution from solar and battery manufacturing swung sharply from a strong tailwind to a headwind (-0.6%, -2ppts), likely reflecting substantial overcapacity.

Peering through the smog

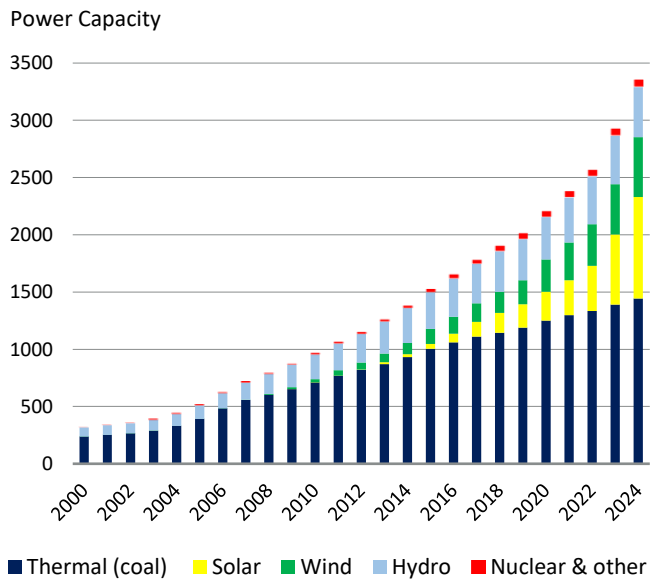
China's abrupt green pivot since 2023 partly reflects a need to counter the drag from real estate, but it is also consistent with the country's climate targets.

As electrification continues at pace, China is likely to have already reached peak emissions or to achieve it very soon, well ahead of its stated 2030 target.

China's announced "dual control" system for carbon emissions – which focuses on energy intensity and total emissions – will only have non-binding targets for absolute emissions until 2030. Details on the targets for its National Determined Contribution (NDC) related to its Paris Agreement commitments, which could also be unambitious, are expected in coming months.

Still, there is a good chance that these objectives are reached early, as has been the case thus far with China's renewable agenda.

Figure 2: Renewable capacity rose again in 2024, but China continues to build new coal-fired power plants

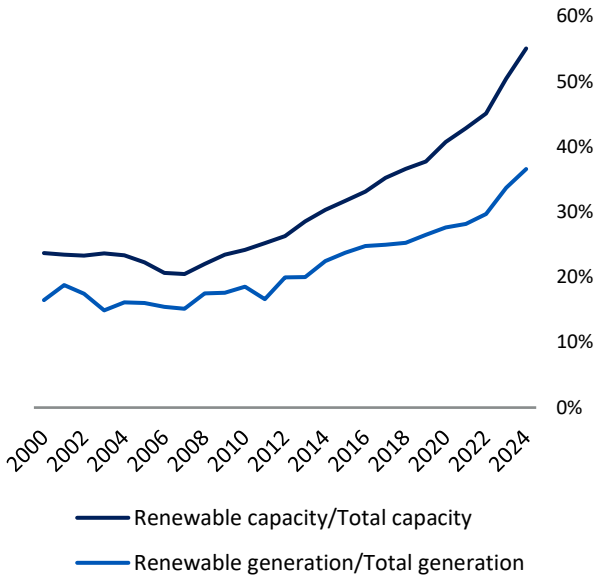


Source: Aberdeen, Haver, April 2025

That said, the pace of emissions reduction will likely remain limited this decade, not least because China continues to build coal power plants (see Figure 2).

The risk of adding "stranded assets" and the subsidisation of coal power appear to be insurance costs the authorities are willing to pay to guarantee energy security and deal with the vagaries of renewable production. But this may also reflect the fact that energy generation is more skewed towards coal (65%) than its falling share in capacity (43%) would suggest (see Figure 3).

Figure 3: Electricity generation from renewables continues to lag behind rapidly rising capacity

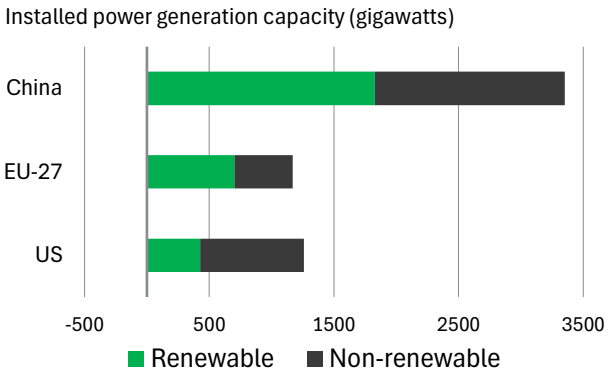


Source: Aberdeen, International Renewable Energy Agency, April 2025. Note: renewable generation figures for 2023 and 2024 are estimated.

China's industry craves power

China's electricity consumption and generation capacity pushed further above those of the US and the Eurozone combined in 2024 (see Figure 4).

Figure 4: China is not world's largest economy, but it already has the largest energy demands



Source: Aberdeen, International Renewable Energy Agency, April 2025

This reflects the large role industry plays in the economy and the energy-intensive manufacturing in which it now specialises.

Semiconductors, aluminium, nickel refining and data centres all require large amounts of electricity.

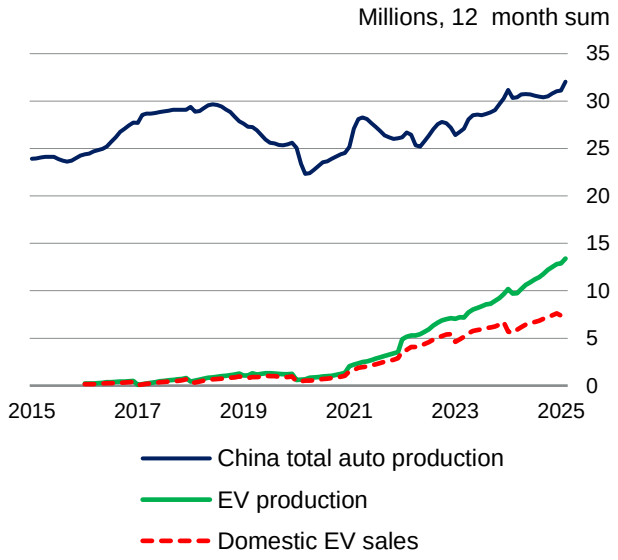
Pushing power capacity into renewables also requires inputs that themselves need a lot of electricity to produce. Polysilicon – the key raw material for solar panels – needs four times as much energy per ton as aluminium and 150 times more than a ton of steel, for example.

Indeed, the International Energy Agency (IEA) estimates that the manufacturing of green products alone represents 16% of total electricity growth.

More broadly, China is witnessing dramatic electrification.

China's domestic EV adoption has slowed down recently (see Figure 5), but, in the long run, the electrification of transport will require greater grid capacity. The Chinese Academy of Sciences predicts that EVs could account for 7% of national power consumption by 2035.

Figure 5: China's rapid emergence as a major EV exporter remains a source of geopolitical tensions



Source: Aberdeen, Haver, April 2025

Rising living standards and temperatures are leading to an increase in electricity consumption by households, for example via air conditioning. But households also continue to pivot from fossil fuel to electric heating.

All of this suggests that the grid rollout has solid fundamentals. Should excess generation capacity emerge, it could even be exported to neighbouring countries, which would help tie them to China politically.

Green light, red light

A key question is whether China's green drive can continue to support growth or whether it will turn into a headwind.

The contribution to investment from EV manufacturing moderated in 2024, and we continue to expect significant consolidation in this space. This could weigh on investment in the automotive sector over the next couple of years, even if the long-run drive to electrify China's transport network will ultimately generate more green investment.

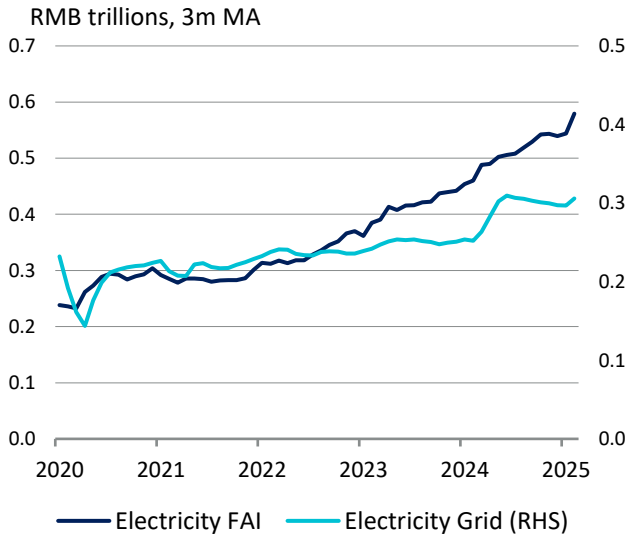
Excess capacity within battery manufacturing, which turned into a drag on whole-economy FAI in 2024, may also be worsened by developed markets attempting to reduce reliance on China.

Bloomberg NEF is tracking 6.8 TWh of annual battery manufacturing capacity for the end of 2025, with China alone making up nearly 5 TWh. Industry reports suggest CATL – the largest Chinese manufacturer – is only operating at 60% capacity, with smaller firms running as low as 20-30%. Industry standards aimed at culling low-quality capacity will likely amplify consolidation pressures.

It is also difficult to know whether the renewable energy rollout can continue to gather pace and therefore support GDP growth in 2025 and beyond. To do so, it is not enough to add new power capacity at the exceptionally high pace seen over 2024 – it must rise further.

Data to February at least show little sign of slowing down (see Figure 6). And it is plausible that China leans more heavily on green investment as a means to counter the trade war with the US.

Figure 6: Can a rotation towards grid capacity and storage drive further growth?



Source: Aberdeen, Haver, April 2025

That said, China is changing the pricing system for new wind and solar projects from June. While current projects receive a fixed price benchmarked on coal power prices, future power price will be determined by competitive auctions, which could slow the renewable rollout.

The good news is that investment in grid and ancillary infrastructure could still support growth, even if the installation of new renewable energy capacity stabilises or eases.

Indeed, China likely needs to install more ultra-high voltage (+800 kV) power lines to move renewable power from where it is generated in the West, to where industrial and household demand resides in the East.

Investments in energy storage will need to be made to keep the electricity system operating smoothly through the day and night. Since solar and battery costs are now often cheaper than coal – and are expected to fall further – this should accelerate this trend.

Other storage mechanisms, such as pumped hydro, are another example of an ancillary investment that could keep green infrastructure spending high. CarbonBrief note that storage infrastructure under construction rose to 189 GW (+13%) in 2024, while energy storage was included as an aim for the first time in the government work report presented at the "two sessions".

An unsustainable surge in sustainable investment?

China's push into green investment in 2023 and 2024 was remarkable; the number of EVs manufactured has almost doubled since 2022, to over 13 million, while surging investment in renewables means that more than half of China's electricity generation capacity is green.

That said, the pivot away from real estate and into green investment raises the question of whether China is swapping one unsustainable form of investment for another.

Assessing the time horizons over which different aspects of green investment could support or weigh on growth is complicated.

As noted above, some aspects of green investment are already dragging on the economy, while others may curtail investment soon.

But considering a longer time horizon, the potential for EVs to rise from their current 20% share to a much larger proportion of China's auto fleet suggests green investment in transportation could still be a significant driver of growth.

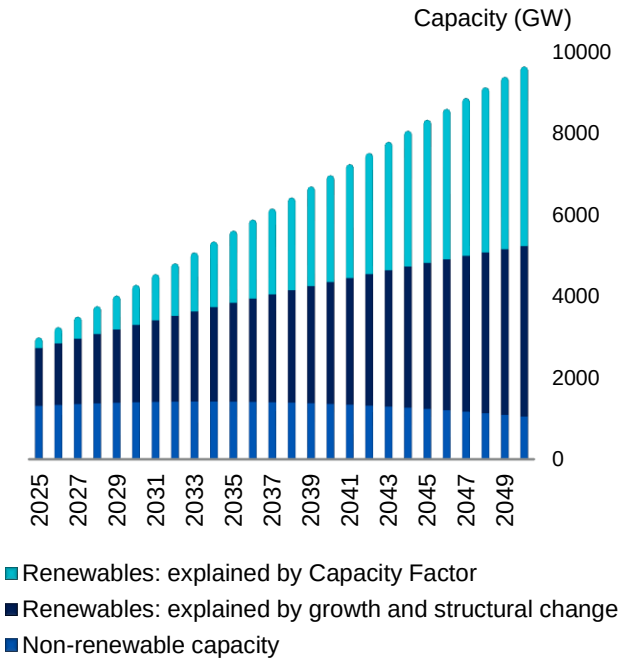
We have little visibility on the Chinese Communist Party's (CCP's) plans for investment in renewable power over the long run. China smashed through its 2030 target of 1,200 GW of solar and wind capacity, reaching 1,400 GW in 2024.

The latest International Energy Agency (IEA) Renewables 2024 report forecasts 4,800GW of renewable energy capacity by 2030, more than tripling from its 2023 level. If correct, that would imply the renewable rollout would provide a strong near-term growth boost as the installation of new capacity could still accelerate.

Our latest modelling work is more cautious, suggesting that such a fast pace of renewable capacity expansion would exceed fundamental demand.

Regardless of the timescale and ambitions, the pivot towards renewable energy – which requires a greater amount of capacity to be installed relative to thermal power (due to a lower 'Capacity Factor') – suggests substantial expansion is the new norm. Indeed, our modelling shows that the pivot to renewables almost doubles the amount of capacity that needs to be installed (see Figure 7).

Figure 7: How much power does China need?



Source: Aberdeen, Haver, April 2025. *Note: models account for growth and structural change (urbanisation, share of manufacturing etc), and assume a Capacity Factor replacement ratio between thermal and renewables of 2.5.

This modelling also assumes that coal-fired power capacity may continue to expand modestly over the next five to 10 years. This partly reflects the need for thermal power to help smooth through the ups and downs of renewable energy production but is also due to the substantial power needs associated with China's growth trajectory, which will make retiring non-renewable capacity challenging.

At some stage, the renewables' rollout will need to slow, but grid capacity and ancillary infrastructure needs will still have to catch up, which should provide a more long-lasting support to growth. The IEA World Energy Investment report expects investment into grid and storage to almost triple. If correct, green investment should continue to support growth over the coming years.

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