

Just the FAQs

China Coal Nine Questions

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When it comes to China's power sector reform, it can often be hard to separate fact from fiction, and reality from hype. No aspect of the Chinese power sector embodies this truth better than the debate surrounding coal-fired power. Today, we're answering nine key questions on the Chinese coal power sector in 2022, assembled here in one convenient reference document.

Is China still building more coal plants right now in 2022? How much?

ANSWER: Yes, China is still building new coal plants in 2022, although far fewer than in the past. Most industrialised coastal provinces do not have any new coal capacity in their 14th Five Year Plans, (the period from 2021-2025) but some inland provinces are still building more coal over this time, with some 33GW of capacity started in 2021 and another 8GW approved in the first quarter of 2022. According to the national 14th Five Year Plan, coal additions during this period must be limited to 150GW of installed capacity by 2025.

It's important to note this doesn't mean 150GW **will all be built, but that this is the most that can be built** over the period. Before the start of the 14th FYP, the total installed coal plant capacity stood at 1080GW. After adding all 150GW of capacity allowed during the Five-Year Plan and accounting for around 50GW of plant retirements over that same period, China's installed coal capacity could reach ~1180GW by 2025. The eventual total will probably be less than that though, as **The Lantau Group (TLG) believes a significant portion of those planned 150GW of plants will be abandoned due to poor project economics**, an outlook supported by a recent trend of project cancellations.¹

Why are some provinces still building coal-fired power plants during the 14th Five Year Plan? Do they really need them?

ANSWER: During the drafting period of the 14th Five Year Plan, **power generated from renewables alone was not expected to be able to meet China's annual growth in power demand growth** from 2021-2025, even considering the aggressive renewable capacity targets, necessitating the addition of coal-fired power in some provinces.

¹ <https://www.powermag.com/at-least-15-china-backed-coal-plants-canceled-another-37-gw-in-limbo/>

Despite the huge volumes of renewable capacity currently under construction, supply challenges still exist when peak load hours aren't aligned with peak generation hours.

Furthermore, some provinces are even shutting down already-existing coal plants due to their age or inability to meet environmental standards. While some industry analysts² thought it was possible for China to maintain at just 1100 GW of coal capacity and low annual plant utilisation rates (fewer than 4200 hours), it appears that China's chosen approach will instead result in higher overall coal capacity and *even lower* annual utilisation rates (perhaps even fewer than 4000 hours). Why take such an approach?

Like in many countries, China's peak demand hours arrive in the early evening in most provinces, which misses the best solar generation hours (midday) and the best wind generation hours (later at night). Energy storage can help extend the period of time when wind and solar can be useful, but current storage technology is still only able to give the system 2-4 hours of power before some form of firm generation is needed. And of course, solar only produces when it's sunny and wind only produces when it's windy, so if there's not generation enough to charge the batteries, the storage is useless. More coal-fired power plants in more locations, all running at lower utilisation rates, could provide the firm backup power that all the new variable generation capacity needs, and in a more flexible configuration.

In some more advanced future scenario, a combination of long-duration storage and highly flexible transmission and distribution infrastructure across all of China could allow for very high penetrations of renewables with little or even no need for firm backup supply beyond nuclear and hydropower (and let's not forget that even hydropower has significant seasonal and annual variations in generation). We're definitely not at that point in 2022, however, thanks to high lithium prices and soaring large-scale battery costs, making them a shaky economic prospect for power generators and consumers, both inside and outside of China.³ This means China's solar and wind capacity additions today continue to need another source of firm backup, in this case coal.

How much coal-fired capacity will China add after 2025?

ANSWER: The expectation among industry analysts and stakeholders is **little to none**. Although this is not set in national policy, many coastal provinces have already declared a 2025 coal capacity peak, including Jiangsu, Zhejiang, Shandong, Guangdong, etc. It is possible, however, that some new coal capacity approved during the 14th Five Year Plan could be built after 2025. If this happens, we expect it would be allowed under **two special-use cases**:

1. Plants in northern China used for district heating, especially to replace older, smaller coal-fired boilers previously used for this purpose that are now retiring.
2. Plants in western China used to support massive renewable bases under construction there, especially those exporting to eastern provinces.

Since industrialised coastal provinces cannot add any more coal capacity, they will become increasingly dependent on imported power from inland and western provinces, which will be adding firm capacity to back up their renewables and ensure stable supply to the coastal provinces.

Regardless of how much, if any, new coal capacity is brought online after 2025, however, **a national coal consumption peak has already been declared for 2025**.⁴ This means that while new coal-fired capacity might still theoretically be built after 2025, the fleet would be operating for fewer hours and consuming less coal overall starting from 2025.

2 <http://www.nrdc.cn/Public/uploads/2021-07-15/60efa82067f7b.pdf>

3 <https://www.energy-storage.news/us-battery-storage-industry-at-crisis-point-over-supply-chain-crunch/>

4 <https://www.reuters.com/world/china/chinas-xi-says-china-will-phase-down-coal-consumption-over-2026-2030-2021-04-22/>

Nuclear power can fulfill a similar function as coal, providing low-carbon baseload and backup supply for renewables, but the aversion of energy planners to approve inland nuclear plants limits the role it can play currently.

Okay, the renewables need backup. But why not nuclear?

ANSWER: Yes, nuclear capacity could serve a similar role as coal-fired capacity in firming up supply and supporting renewables. All firm generation technologies benefit from large volumes of renewables coming onto the system, since variable generation currently requires them for backup.

However, beyond the demanding construction schedule, capital costs, and supply chain requirements, nuclear can be much harder to site than coal plants, since they have specific requirements for site geology, the surrounding natural environment, and distance from major population centres. There are also high demands for environmental impact mitigation, scale of supply chain, human resource development, and regulatory capacity that make nuclear power plant construction a much slower-paced process than coal power plant construction, even in China.

Nuclear power will surely play a larger role in China's future energy mix than it does now. Despite all those challenges, China is building nearly 20 nuclear units right now and still plans to build many more, but the current pace definitely can't keep up with the rate of renewables additions. Furthermore, China has suspended construction of its inland nuclear power plants since the Fukushima accident, which takes away the option of using them for firm supply that could support deployment of renewables in inland regions, at least for now. The exact reason for the continued suspension of the inland plants remains a point of debate in the industry, although many believe the core issue is the perceived risk of siting inland nuclear plants along rivers that cannot be stopped or blocked in the event of an accident, and the subsequent impact on all communities downstream.

Okay, so for now China will keep adding coal. How much use will these plants actually get?

ANSWER: According to China's power dispatch laws, solar, wind, and hydro should be dispatched to the grid first before coal-fired power. Thus, coal-fired power is supposed to only be used when it is needed, that is, when all cheaper and cleaner sources of generation have been exhausted or are already unavailable. Considering the record-breaking capacity additions of renewables, **it's reasonable to assume these new coal plants are going to see low usage rates once they finish**, perhaps as low as 30-40%, or even lower. Such unattractive forecasts are surely part of why many plant owners have already abandoned their construction plans. Even provinces that have historically favoured dispatching local coal over imported renewables will see increased pressure to reform these naughty habits, in view of ever-increasing renewable power consumption quotas.

Aside from the dispatch rules, it also just makes good economic sense to use renewables first, since they have no marginal fuel costs. Already in some provinces with lots of solar capacity and abundant solar resources, **almost no coal-fired power is used during the day**, and excess solar capacity has even sent midday spot power prices into negative territory in some provinces like Shandong.⁵ During that time, coal plants are running at low spinning rates, waiting to ramp back up for the evening peak demand period.

5 <https://news.bjx.com.cn/html/20200423/1065727.shtml>

Does that mean it's more important to look at coal consumption than coal-fired capacity when considering the climate impact of adding coal plants?

ANSWER: Perhaps it feels like we're leading the witness here, but **yes, exactly**. The nameplate capacity of a fleet of generation units, matters far less than how much power they actually generate. Put another way, this is the difference between GW and GWh. Gigawatts are used to measure the total capacity of a power plant, while Gigawatt hours are used to measure the power plant's actual generation. When analysts (like us) emphasise that GW \neq GWh, it means capacity deployed does not necessarily translate to power generated or consumed. China's overall coal consumption will still increase before its peak in 2025, but not nearly as much as might be implied from the 150 GW of new capacity allowed within the 14th Five Year Plan.

From an environmental and emissions reduction standpoint, actual power generation and coal consumption is much more important than nameplate capacity.

Furthermore, when we talk about coal consumption, it's important to consider how efficiently these new coal plants built before 2025 will consume coal versus the plants being retired at the same time. China will be building modern ultra-supercritical coal plants, while simultaneously retiring some its oldest, least-efficient subcritical plants, often small (<200MW) captive power plants that have stayed off of regulators' radars and managed to duck China's fairly strict NOx and SOx emissions standards for years. While the emissions-reduction impact of swapping out subcritical coal plants with ultra-supercritical coal plants will never be quite as impressive as a coal industry lobbyist would like you to believe,⁶ the coal plants China will add over the next few years will be held to more stringent emissions standards and consume coal much more efficiently than the antique beasts facing retirement, even if they are operated at lower load factors.

So why *would* a power plant owner choose to build a plant that won't be used most of the time, selling only a bit of power each day? Wouldn't they lose money on their investment?

ANSWER: Firstly, **yes profitability is definitely affected** - this is part of the reason for why many coal projects are being cancelled, and why we think many more will face the same fate. For the owners that are not cancelling their projects, they are likely considering how their plant will be selling its power during times of the day when solar and wind are unavailable, which reduces power supply and **drives spot power prices back up to levels at which they can be profitable**.

Beyond this, the plant could make money via other channels, for instance **selling power into the auxiliary services market** to help smooth out frequency imbalances or variable generation from wind/solar. It's also possible that they could be paid just for existing and being available if needed in an emergency. This business model is compensated via a mechanism called a **capacity market**, and although China doesn't have a capacity market yet, it is in the process of setting one up. Capacity markets are a typical tool used around the world to incentivise investment into "extra" power generation infrastructure that is used rarely but must be ready and available when needed.

Finally, some coal-fired plants in northern China will make money on the basis of their **auxiliary business: selling steam/heat** as well as power, for the purpose of district heating. Steam/heat is considered a natural-monopoly utility and its pricing remains regulated by government policy via a cost-plus method, so its profitability is guaranteed. This is also one of the few cases in which coal power may be dispatched ahead of renewables, which has historically contributed to curtailment.⁷

⁶ <https://energypost.eu/how-much-do-ultra-supercritical-coal-plants-really-reduce-air-pollution/>

⁷ http://www.lantaugroup.com/files/ppt_pgen16_lz.pdf

About The Lantau Group

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David Fishman is a senior manager at The Lantau Group with 8 years of experience in the Chinese power sector, covering nuclear, coal, solar, wind storage, and grid infrastructure. At TLG, he focuses on our transactional and commercial due diligence work for energy developers, lenders, and financiers looking to buy, sell, or invest in Mainland China energy assets. His work in China also involves supporting MNCs with their evaluation and execution of their long-term power strategies, including evaluation and procurement of low-carbon power and renewable energy certificates. David is based out of the TLG office in Shanghai, serving the needs of our customers across Mainland China.

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Doesn't China also guarantee payment to coal-fired power plants by forcing the grid to buy a certain number of hours each year like a quota?

ANSWER: In the past, yes, but **that policy has been abolished since October 2021**.⁸ Currently, coal-fired power plants are only compensated for the power they generate, since the capacity market doesn't exist yet. If the market doesn't need their power and they can't find any other channels to earn money, they will eventually be forced to exit the market.

If China continues to build coal, does that mean it's not taking its climate objectives seriously?

ANSWER: China has shown huge economic and policy commitments to its climate objectives, as evidenced by its massive wind and solar buildout, strict power consumption and power intensity limits, and increasingly green-friendly power market liberalisation, but **coal remains a "necessary evil" for now**. Chinese energy policymakers enjoy clean air and affordable power just as much as those of other countries, but from a system stability and energy security viewpoint, the continued construction of coal-fired power plants is simply unavoidable if renewable deployment targets are to be met while still keeping the lights on. Owing to still-incomplete transmission infrastructure and the constraints of currently mature storage technologies, if China started adding ONLY low-carbon power without any backup, we forecast it would be facing considerable power undersupply within several years, leading to blackouts, power rationing, and considerable economic damage.

Beyond this, its citizens would also be forced to curb their power usage, even though many millions of rural citizens still only have very basic electricity consumption habits, and China's per-capita power usage is only half that of countries like the USA, Sweden, or South Korea. Avoidance of such a scenario is of paramount importance to power sector planners and would be a grim outcome of an overenthusiastic and premature commitment to exclusively low-carbon power sources.

Past 2025, power planners will need to use other backup power supply instead of coal, which is when nuclear newbuild is likely to see an upsurge, especially for inland areas. Aside from nuclear, various storage (battery, pumped hydro) and investments into demand-response and improved dispatch technology will still be needed to supplement the continued large investments into wind and solar.

⁸ https://www.lantaugroup.com/file/brief_china_power_sector_oct21.pdf