

Briefing, February 2023

China permits two new coal power plants per week in 2022



Key findings

- Coal power plant permitting, construction starts and new project announcements accelerated dramatically in China in 2022, with new permits reaching the highest level since 2015. The coal power capacity starting construction in China was six times as large as that in all of the rest of the world combined.
- 50 GW of coal power capacity started construction in China in 2022, a more than 50% increase from 2021. Many of these projects had their permits fast-tracked and moved to construction in a matter of months. A total of 106 GW of new coal power projects were permitted, the equivalent of two large coal power plants per week¹. The amount of capacity permitted more than quadrupled from 23 GW in 2021. Of the projects permitted in 2022, 60 GW were not under construction in January 2023, but are likely to start construction soon, indicating even more construction starts in 2023. In total, 86 GW of new coal power projects were initiated, more than doubling from 40 GW in 2021.
- The largest amount of capacity moved ahead in Guangdong, Jiangsu, Anhui, Zhejiang and Hubei.
- New coal power capacity added to the grid kept steady from 26.2 GW in 2021 to 26.8 GW in 2022. These two years had the lowest annual additions since 2003, reflecting the lower level of construction starts around 2017–2020. Capacity additions will rebound in a few years when projects that broke ground last year begin to come online.
- China has seen a rapid increase in electric peak loads in 2021–2022, with the highest recorded momentary load increasing by 230 GW, due to an increase in the prevalence of air conditioners and exceptionally intense heat waves. This is prompting an increase in coal power plant development as a costly and sub-optimal solution, especially in major electricity demand centres and provinces neighboring them.
- Of China’s six regional grids, the South and East grid are the only ones that don’t suffer from a clear thermal power overcapacity problem. Yet, 50% of newly announced projects and 40% of construction starts took place in the grids with overcapacity.
- The provinces permitting a large amount of new coal power plants try to justify the projects as “supporting” power capacity to ensure grid stability and the integration of renewable energy. This justification doesn’t hold water, however, as the plants

¹ The size of coal-fired power generating units varies widely; the actual number of permitted units was 168 at different 82 plant sites.

are intended to run at baseload utilization, and these specific provinces are laggards in growing clean energy generation to meet their demand growth.

- Avoiding the need for more coal-fired power plants requires improvements in energy efficiency, demand response and investments in storage, as well as improving grid operation.
- Plant retirements slowed down further in 2022, with 4.1 GW of coal-fired capacity closed down in 2022, compared with 5.2 GW in 2021. Policies on closing down small and inefficient plants have been revised to keep these plants online instead as back-up or in normal operation after retrofits.

What are the implications for CO₂ emissions?

The massive additions of new coal-fired capacity don't necessarily mean that coal use or CO₂ emissions from the power sector will increase in China. Provided that growth in non-fossil power generation from wind, solar and nuclear continues to accelerate, and electricity demand growth stabilizes or slows down, power generation from coal could peak and decline. President Xi has also pledged that China would reduce coal consumption in the 2026–30 period. This would mean a declining utilization rate of China's vast coal power plant fleet, rather than continued growth in coal-fired power generation.

Even then, hundreds of brand-new coal power plants will make meeting China's climate commitments more complicated and costly. The politically influential owners of the plants have an interest in protecting their assets and avoiding a rapid build-out of clean energy and a phase-out of coal.

While China is making rapid progress in scaling up clean energy, the country's power system remains dependent on coal power capacity for meeting electricity peak loads and managing the variability of demand and clean power supply. The continued addition of new coal power capacity implies insufficient emphasis on overcoming the power system and power market constraints that perpetuate dependence on coal.

The worst-case scenario is that the pressure to make use of the newly built coal power plants and prevent a steep fall in utilization leads to a moderation in China's clean energy buildout, and/or the promotion of energy-intensive industries to consume the electricity. This could mean a major increase in China's CO₂ emissions over this decade, undermining the global climate effort, and could even put China's climate commitments in danger.

Global coal power pipeline

Changes in project status, 2022

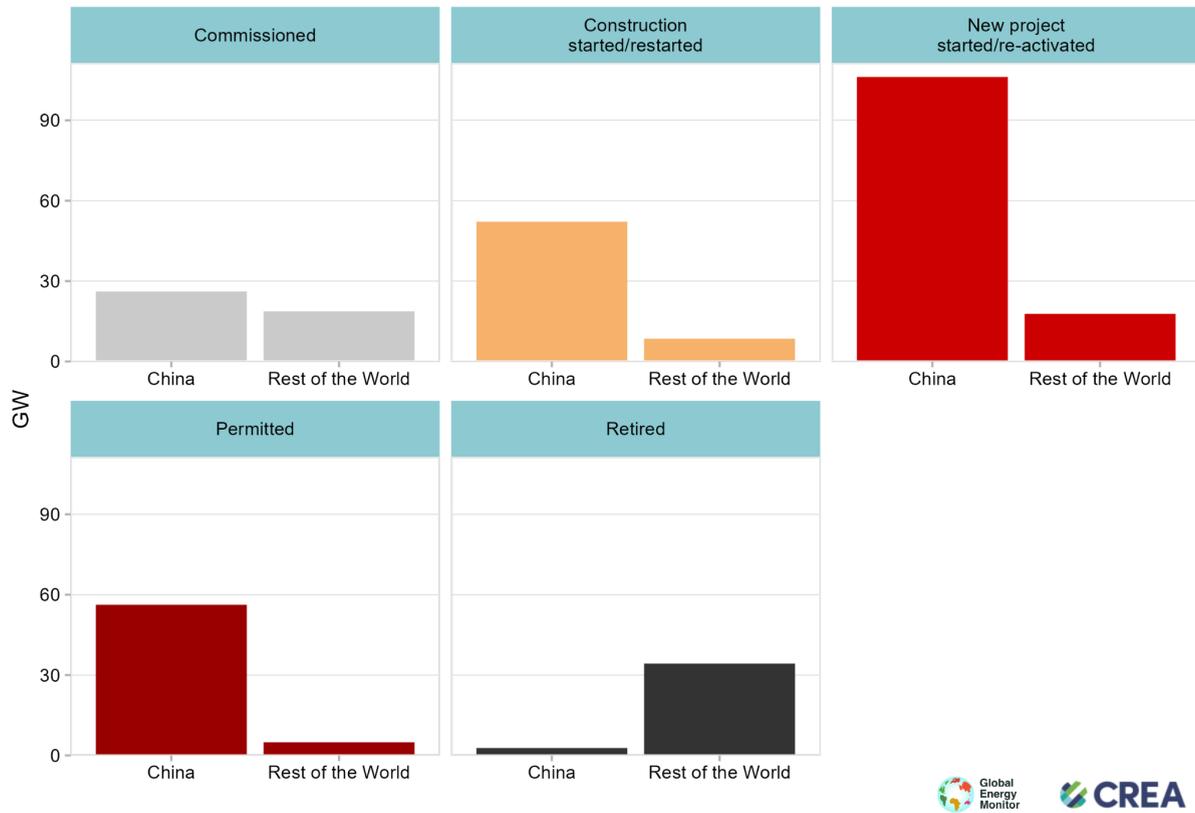


Figure 1: China dominates new coal power project activity, while retiring little existing capacity. Coal power projects in China and the rest of the world with changes in project status in 2022 (between Global Coal Plant Tracker January 2022 and January 2023 updates). Categories are mutually exclusive – e.g. plants that both obtained permits and started construction in 2022 are only included in “construction started”.

Coal-fired power capacity permitted in China by month

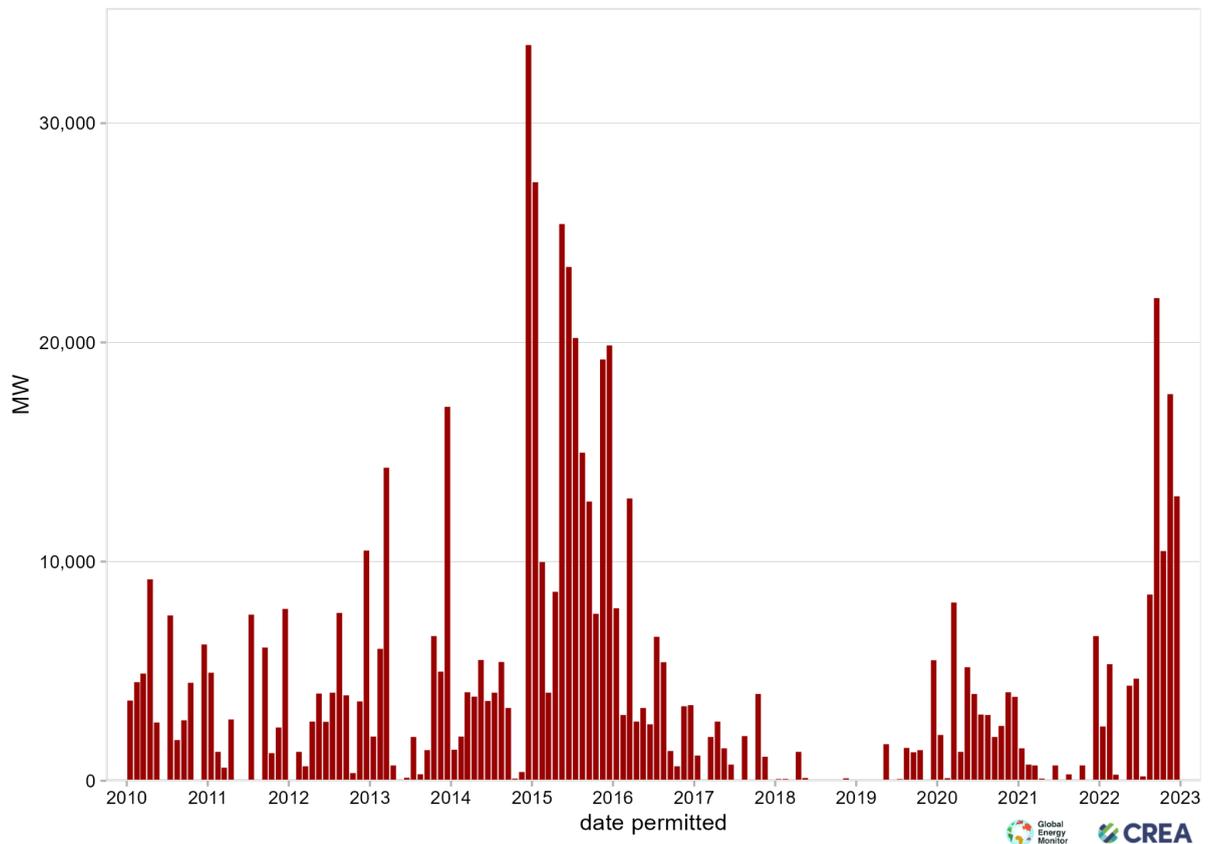


Figure 2: The second half of 2022 saw a steep acceleration in the permitting of new coal power plants, only eclipsed by the 2015 surge that happened after provincial governments gained the authority to permit new projects. The 2015 surge was followed by a clampdown on overcapacity.

Coal power projects accelerated in the second half of 2022

Coal power plant permitting, construction starts and new project announcements accelerated dramatically in China in 2022, with new permits reaching the highest level since 2015. The coal power capacity starting construction in China was six times as large as that in all of the rest of the world combined.

50 GW of coal power capacity started construction in China in 2022, a more than 50% increase from 2021, with many projects newly permitted in 2022 and fast-tracked to construction. A total of 106 GW of new coal power projects were permitted, more than quadrupling from 23 GW in 2021. Of the projects permitted in 2022, 60 GW were not under construction in January but are likely to start construction soon, indicating even more construction starts in 2023. In total, 86 GW of new coal power projects were initiated, more than doubling from 40 GW in 2021.

The speed at which projects progressed through permitting to construction in 2022 was extraordinary, with many projects not even mentioned in provincial five-year plans issued in early 2022 or otherwise announced sprouting up, gaining permits, obtaining financing and breaking ground apparently in a matter of months. A Huadian executive [boasted](#) of obtaining permits to build a 4000 MW coal power plant in a matter of 63 days after taking ownership of the project.

New coal power capacity added to the grid kept steady from 26.2 GW in 2021 to 26.8 GW in 2022. The two years had the lowest annual additions since 2003, reflecting the lower level of construction starts around 2017–2020. Capacity additions will rebound in a few years when projects that broke ground last year begin to come online.

China has not seen such a wave of new permits for new coal-fired power plants since the permitting frenzy of 2015, when provincial governments were given the authority to approve new projects. Furthermore, in that instance, a flood of new permits was not in line with central government policy, particularly the emphasis on reducing overcapacity, and a clampdown followed soon after. Currently, the central government appears to be supportive of the new projects, however, with the [energy regulator targeting](#) 165 GW of coal power construction starts in 2022–23.

Power generation companies are not keen to build new coal-fired power plants because coal-fired power generation is significantly lossmaking at current coal and power prices. However, as both the central and provincial governments are encouraging or ordering the start of new projects, and ensuring that financing is available, power companies are opting to build uneconomic plants rather than give up market share to competitors.

The acceleration stands out even more in the case of newly announced projects, where the volume of new proposals was at the highest level by far since the start of GEM’s historical dataset in 2014.

Retirements continued at low levels, with the policy calling for “outdated” coal power plants scheduled for retirement to be converted into backup plants instead, or even retrofitted to meet new standards. Inner Mongolia’s government work plan for 2023 goes even further, speaking of “converting”, or more accurately, re-branding, conventional coal power plants into “new green smart power plants”.

Coal power pipeline in China

Changes in project status, annual

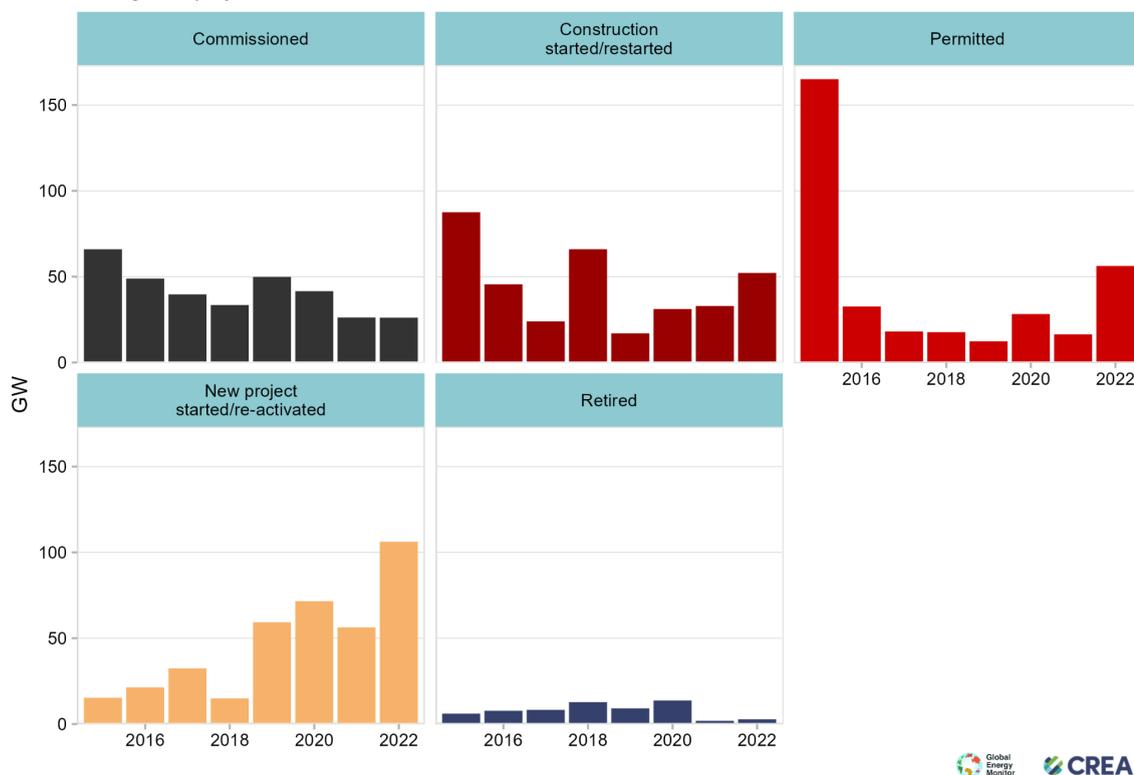


Figure 3: New project activity accelerated dramatically in 2022. Changes in coal power project status by year (between the Global Coal Plant Tracker January updates). Categories are mutually exclusive — e.g. plants that both obtained permits and started construction in 2022 are only included in “construction started”.

Record clean energy additions, but more needed to cover demand growth

In terms of absolute increases in non-fossil power generation, China made new records in 2021–22. The acceleration was particularly impressive looking at non-fossil energy excluding hydropower, which had unfavorable operating conditions during most years, meaning no increase in generation despite capacity additions.

A record 125 GW solar and wind capacity [was added](#) in China in 2022, breaking the previous record from 2020. Of the added capacity, 87 GW was solar and 38 GW wind. The added generation equals 2% of China's electricity demand, meaning that added wind and solar power covered half of the demand growth of 3.6%. The amount of wind capacity connected to the grid in fact came in significantly under the [forecasts](#) of 55–70 GW for the year, as the Covid-19 epidemic and control policies [affected](#) grid connections.

Clean energy growth is bound to accelerate, with 165 GW of new wind and solar capacity [targeted](#) for 2023, and [bidding](#) for new wind turbine supply contracts alone reaching 100 GW in 2022. As electricity demand growth is likely to accelerate, even this increase won't be sufficient to supply all of the demand growth without increasing power generation from fossil fuels.

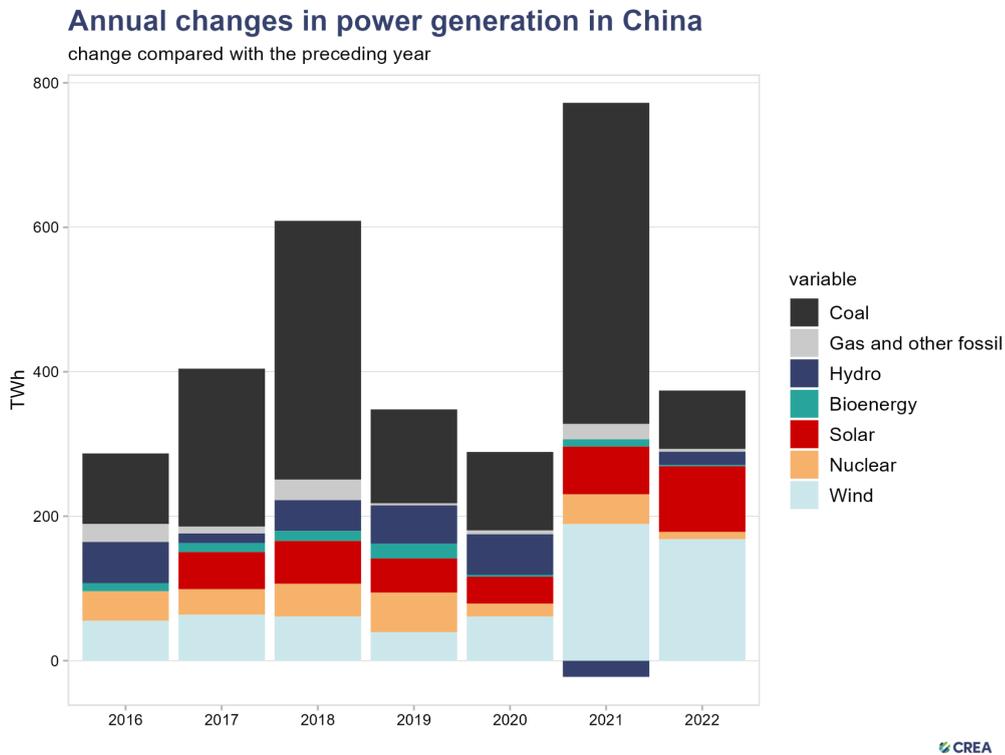


Figure 4: Clean energy is catching up to power demand growth. Source: CREA analysis of Ember [Monthly electricity data](#).

Rapid increase in peak loads challenges the power system paradigm

China has seen a rapid increase in electric peak loads in 2021–2022, with the highest recorded momentary load reaching 1290 GW in 2022, an increase of 230 GW from 2020. This was due to an increase in the prevalence of air conditioners and exceptionally intense heat waves. The increase in peak loads is prompting an increase in coal power plant development as a costly and sub-optimal solution, especially in major electricity demand centres and provinces neighboring them.

The increase in electricity demand for cooling in summer 2022 was extreme, not only because of the record-high temperatures but also because summertime highs in temperatures had been below trend in the previous two years. Air conditioning had become much more prevalent since 2019 which was the previous year that saw a week with above-average temperatures. A trend towards hotter maximum temperatures during the summer is apparent in the data spanning 2010–22, but the increase from 2020–21 represented fluctuation around this much more gradual trend.

The challenge of meeting demand peaks is exacerbated by China's rigid grid operation paradigm. Most provinces are building thermal power capacity to match their local peak loads, without making use of the electricity transmission network. For example, during the drought in 2022, Sichuan continued to export large amounts of electricity to the east, while rationing consumption within the province. The lack of flexible grid management perpetuates reliance on coal power and creates a perceived need to build more of it.

However, as the growth in electricity demand continues, avoiding the need for more coal-fired power plants will require improvements in energy efficiency, demand response and investments in storage, as well as improving grid operation.

Building coal-fired power plants to cover peak loads means low utilization of capital-intensive assets, making it an expensive way to solve the problem even in the absence of climate targets. In addition, China's carbon neutrality commitment means that the lifetime of new coal power plants will be very limited, further driving up the costs.

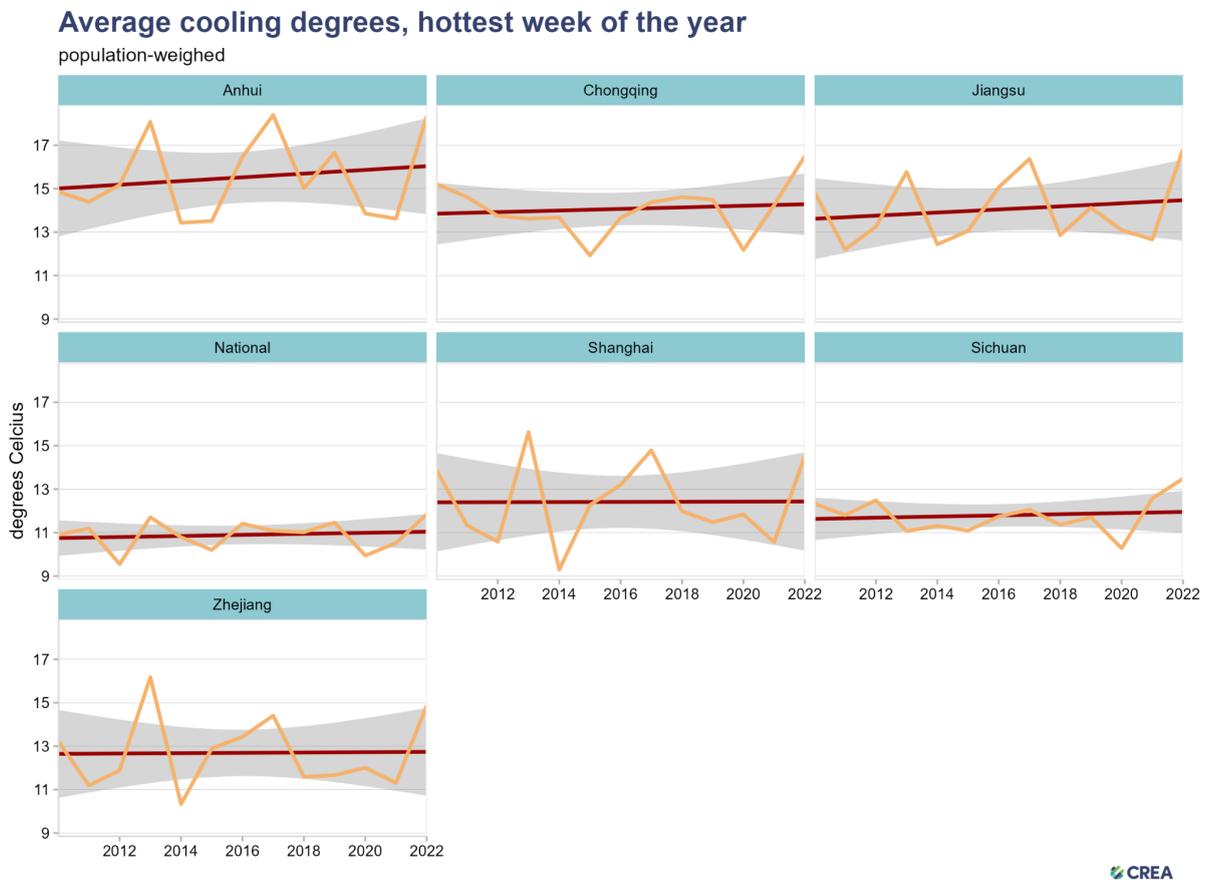


Figure 5: The 2022 heatwave caused record-high cooling needs in many affected provinces. Cooling-degrees are degrees above 24°C. Source: CREA analysis; gridded daily average temperatures are taken from the NCEP [Climate Forecast System](#) and population-weighted averages are calculated using the [Gridded Population of the World](#) from CIESIN.

“Coal power by any other name”: province energy policies

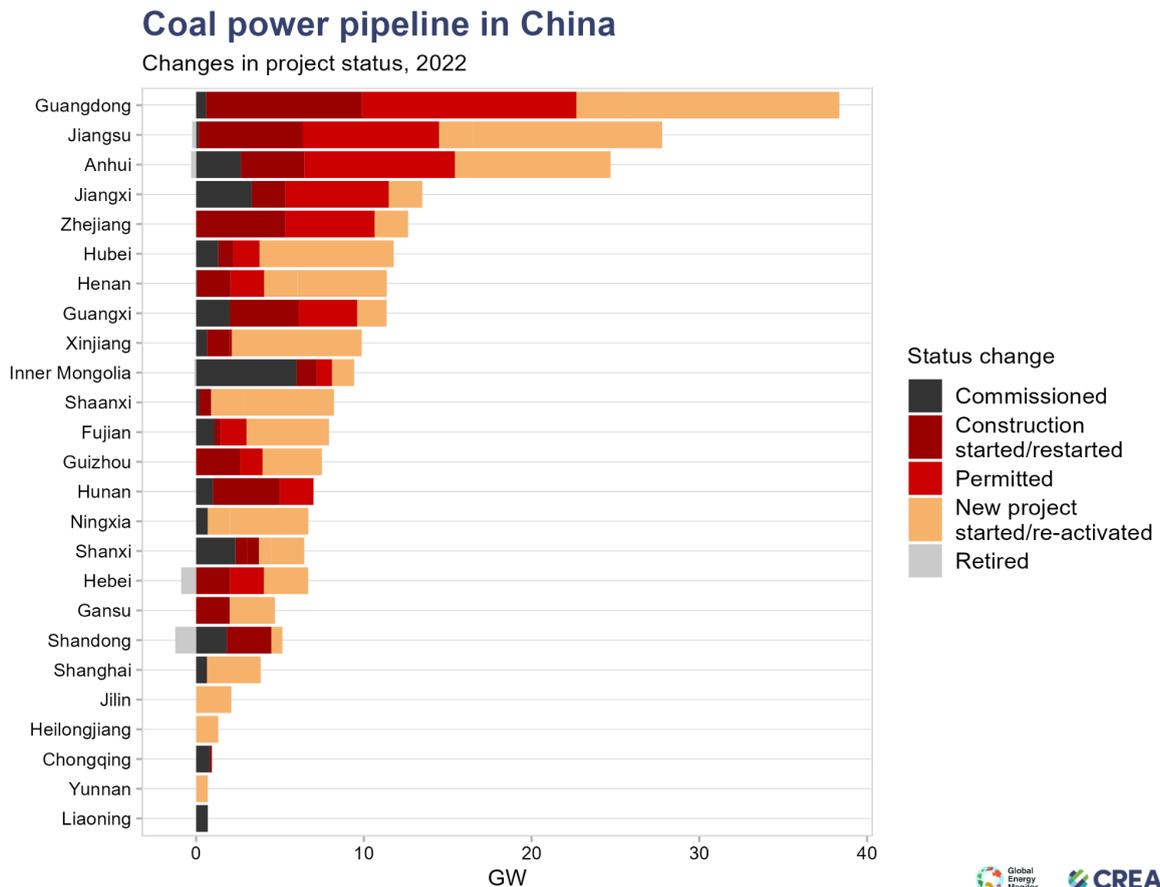


Figure 6: Changes in status of coal power plants and projects in 2022.

The largest amount of capacity moved ahead in Guangdong, Jiangsu, Anhui, Zhejiang and Hubei. Guangdong, Jiangsu and Zhejiang had the largest number of construction starts. Most permits were handed out in Guangdong, Anhui and Jiangsu.

Project activity slowed down in Inner Mongolia and didn't see much acceleration in the other western provinces, showing that the current surge is driven predominantly by concern about capacity adequacy in the major demand centres.

The new coal power spree in Guangdong happened incredibly fast. None of the 10 new megaprojects approved in Guangdong in the second half of 2022 were included in the

province's five-year plan on energy, issued in March 2022. The likely triggers for the scramble for new coal were the drought in the hydropower region of southwestern China in summer 2022, which affected power supply to Guangdong, as well as the record-high LNG prices. Guangdong [has the most](#) gas-fired power capacity among Chinese provinces and was therefore more vulnerable to the gas price shock.

Both the hurried process and the round number of exactly 10 new projects indicate that there was little consideration of the precise need or the alternatives for new coal. Paradoxically, the Guangdong provincial government's [2023 work plan](#) rationalizes the province's coal power plant building spree with the headwinds faced by the economy, including weakening demand outlook and expectations. This reflects the logic of using large investment projects to stimulate the economy rather than an assessment based on supply and demand of power. The government work plan indicates that the province is seeking Beijing approval for a total of 23 GW of new “supporting” power capacity, meaning coal- and possibly gas-fired power.

The new wave of coal power projects in Jiangsu and Anhui appears to have been triggered by the drought and heatwave in summer 2022. During the drought, hydropower-rich Sichuan was experiencing an electricity shortage, but continued exporting its hydropower to the East China grid, the regional grid that covers both Jiangsu and Anhui. This triggered a scramble for additional generating capacity both at the receiving end, perhaps due to concerns that electricity imports from Sichuan might not be available during future droughts. In both Jiangsu and Anhui, new projects started moving ahead very fast after the summer.

[Jiangsu's](#) energy policy for 2023 is framed around the slogan “build first and reform later”, [used](#) by the central-level NDRC in September 2022. This evolved from “build first and dismantle later”, a slogan used by the State Council in summer 2021 in response to emission reduction plans proposed by provinces and industrial sectors that were deemed overly ambitious. Replacing “dismantling” with “reform” further emphasizes the gradual pace of targeted progress also in the longer term. In practice the slogan means accelerating the construction of new, large coal power plants.

Jiangsu's provincial government proposed a [batch](#) of three “supporting” coal power projects in September 2022, each with a capacity of 2x1,000MW. An even larger batch of 13 plant units with a total capacity of 11.3 GW was [introduced](#) in January 2023.

The new wave of coal power projects in [Anhui](#) followed the same pattern as in Jiangsu. Of the 10 coal power projects permitted in 2022, 9 were permitted or opened to public review

before the permit in the second half of the year. Anhui, like Guangdong, chose the round number of ten large coal power projects to pursue, conveying more political symbolism than careful planning.

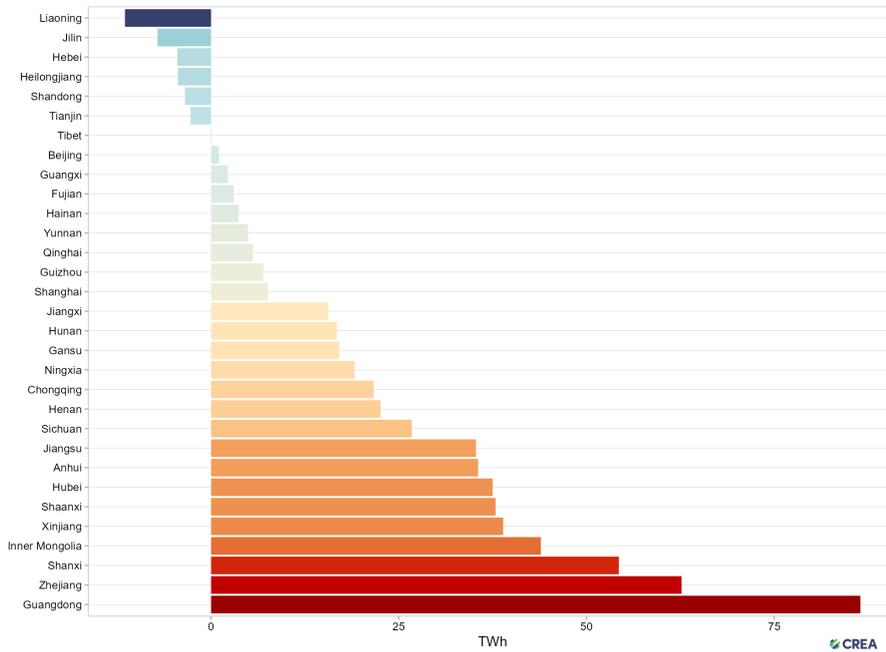
After the summer’s power shortage, Sichuan, China’s main gas-producing province, [permitted](#) seven gas-fired power projects with a total capacity of 8750 MW. The province is now also considering new coal-fired power projects as a part of its [power grid and generation plan](#) for 2022–25.

The new coal power plants in Guangdong, Jiangsu and Anhui are branded “supporting” generation sources, which is a reference to either “supporting grid stability” or “supporting intermittent renewables”, as opposed to bulk power generation. This is because the National Energy Administration [released](#) a policy in February 2022 that said no new coal power plants would be approved for the purpose of bulk power generation. Designation as “supporting power sources” should imply low operating rates, as supporting sources should only run when there is a shortfall of capacity. However, the Environmental Impact Assessments of these projects foresee them operating for 4500–5500 hours per year², which is above the average for baseload coal power plants in China and in direct contradiction with labeling the plants as “supporting power sources”.

The growth in non-fossil power generation in the provinces with the largest coal power investments don’t justify the claim that coal power plants are acting as “supporting” sources. Guangdong and Zhejiang were the top two provinces increasing power generation from thermal power (mainly coal) in the past two years. In both provinces, as well as in Anhui and Hubei, over 75% of growth in total power generation came from thermal power. Jiangsu did somewhat better, getting more than half of total power generation growth from non-fossil sources, mainly wind and nuclear, but still had a major increase in thermal power generation. This shows that all of these provinces are still rapidly increasing bulk power generation from coal.

² See e.g. the EIAs for [Huaneng Taicang](#) 2x1000MW project (5000 hours/year) and [Guoxin Shazhou](#) 2x1000MW project (5000 hours/year) in Jiangsu; as well as [Huaneng Haimen](#) 2x1000MW project (4500 hours/year), [Guangdong Yudean Huilai](#) 2x1000MW project (5000 hours/year), [Guangdong Yudean Bohe](#) 2x1000MW project (5500 hours/year), and [Guangdong Lufeng Jiahuwan](#) 2x1000MW project (5500 hours/year) projects in Guangdong.

Changes in thermal power generation by province from 2020 to 2022



Shares of power generation sources in growth from 2020 to 2022

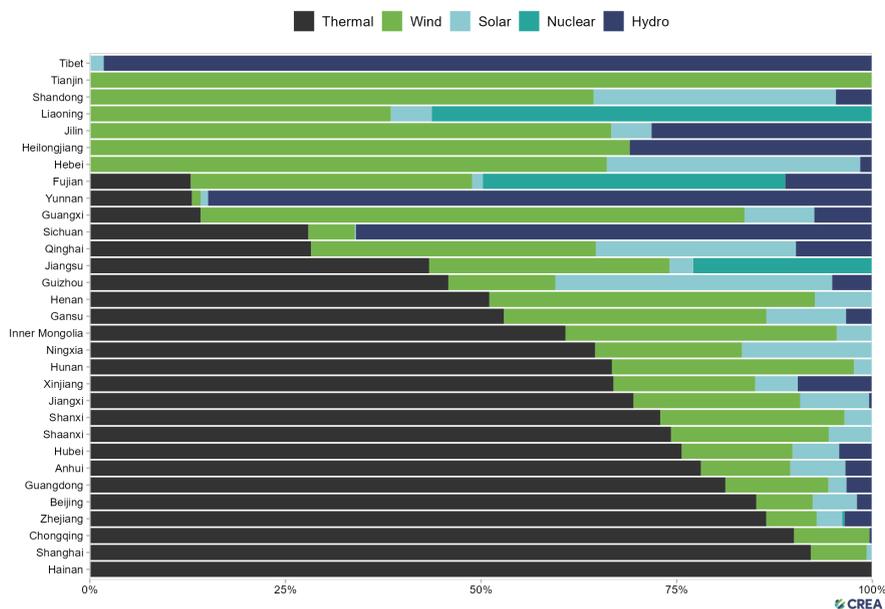


Figure 7. Sources of growth in power generation from 2020 to 2022 by province. Out of the five provinces adding most new coal power capacity, only Jiangsu has significant growth in clean power generation, but even there, almost half of the growth in power generation came from thermal power. In Guangdong, Zhejiang, Anhui and Hubei, the share was 75% or more. This implies that the provinces are still increasing bulk power generation from coal, and making little to no progress in moving coal to a “supporting” role despite their claims to the contrary.

Among the provinces that have not seen an increase in thermal power generation, and relatively little new coal project activity, Shandong [plans](#) to begin construction of 6 ultra-supercritical coal power projects in 2023, roughly 4 to 6 GW. However, GEM's data only includes one 2 GW permitted project for the province which hasn't entered construction, and 1.55 GW of additional proposed capacity. If this plan is implemented, there might be 5 more projects being permitted and entering construction in 2023.

Policy recommendations

- Strictly control new coal power capacity and reject or revoke permits to projects that are not necessary for “supporting grid stability” or “supporting the integration of variable renewable energy”.
- Accelerate investment in clean power generation to fully meet growth in electricity demand and stop increasing bulk power generation from coal. Decarbonisation requires substantial changes in network infrastructure, market mechanisms, regulatory framework, and planning processes, which require central government facilitation.
- Increase investment in electricity storage, flexibility and transmission within grid regions. Create a level playing field for different storage, demand response and generation technologies for meeting peak demand, and enable clean flexibility technologies to scale up. While many technologies, such as pumped hydro, lithium-ion battery and demand-side technologies, are as mature as coal power and ready for wider adoption, current power systems and policy frameworks still lead developers to default to coal.
- Strengthen energy efficiency requirements for A/C units and for new buildings, and introduce a program of large-scale energy efficiency improvements for existing buildings.

About the data

The changes in coal power project status analyzed for this briefing are based on the latest January 2023 update of Global Energy Monitor's [Global Coal Plant Tracker](#) (GCPT), with complementary data on retirements, including for units below 30 MW, compiled from the provincial Development and Reform Commission and National Development and Reform Commission in China. The GCPT is an online database that identifies and maps every known coal-fired generating unit and every new unit proposed since January 1, 2010 (30 MW and larger). The tracker uses footnoted wiki pages to document each plant and is updated biannually. GCPT is the most detailed dataset available on the global coal power fleet, and has provided biannual updates on coal-fired generating capacity since 2015.

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Global Energy Monitor (GEM) develops and shares information on energy projects 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.

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