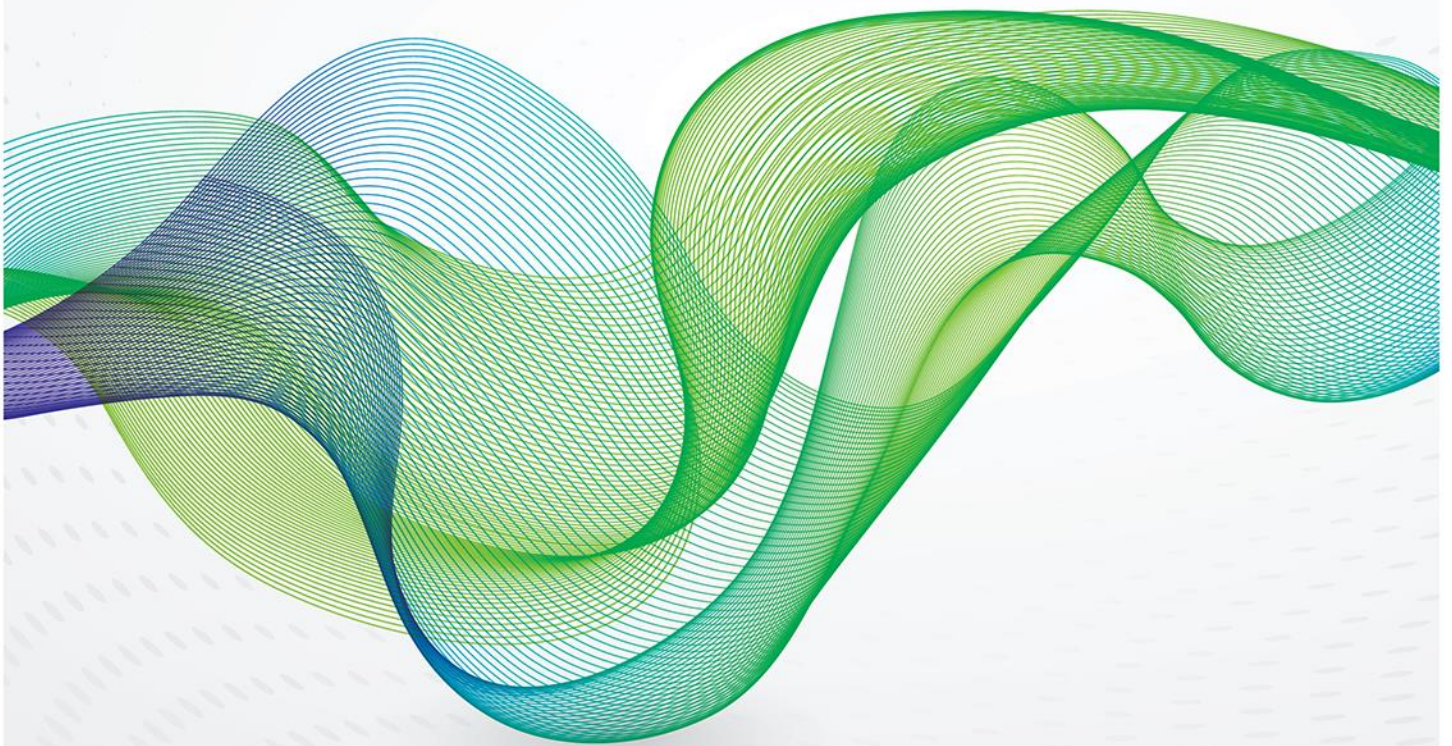




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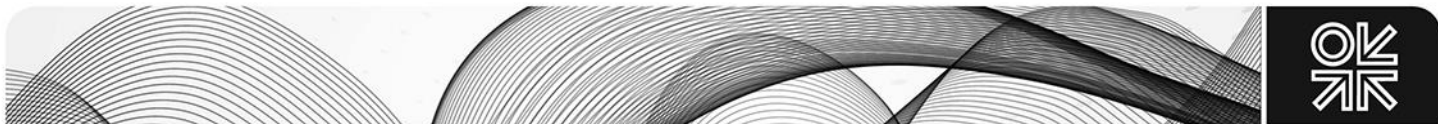
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Current direction for renewable energy in China



OXFORD ENERGY COMMENT

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For many years running, China has led the world in construction of new wind and solar facilities, yet China also continues to build new coal plants. Notwithstanding market reforms that have addressed some of the problems China previously experienced in integrating renewable energy, the trend for clean energy in China defies easy analysis. Indeed, several contradictions continue to exist: national guidance versus local implementation, support for coal co-existing with promotion of renewables, and slow roll-out of spot electricity markets. Based on the policies and government guidance released so far in 2020, China is likely to focus on keeping markets for wind and solar stable, while attempting to tackle structural issues on a step-by-step basis. While this could disappoint analysts who note the risk to public health and finances of further investments in fossil energy, the ultimate result could nevertheless favour a clean energy transition driven by a combination of both markets and policy.

The trend leading into 2020

China continues to lead the world in additions of new wind and PV capacity, even though in the past 18 months these installations have slowed. In 2018, China added a combined 66 GW of wind and solar (20 GW of wind and a record 44 GW of solar PV), and this declined to 56 GW in 2019 (26 GW of wind and 30 GW of solar PV – see figures 1 and 2).

Figure 1: Annual additions of wind capacity

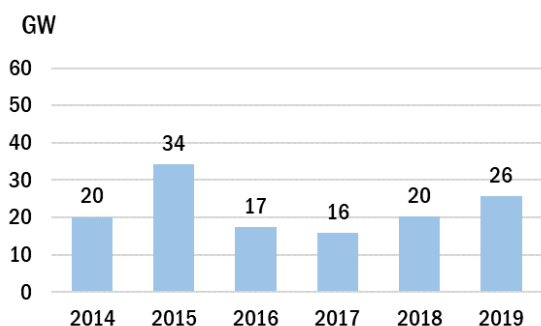
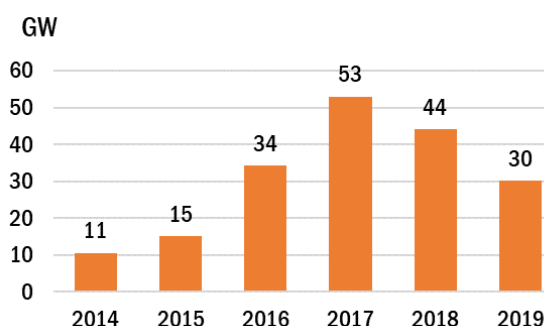


Figure 2: Annual additions of solar PV



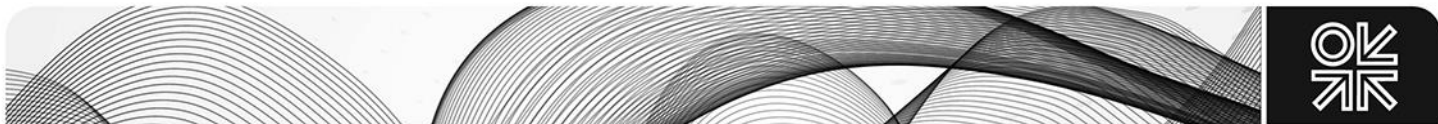
Source: CEC, NEA

There are several reasons for the decline in installations.

The winding-down of renewable energy feed-in tariffs (FITs) is the main factor. Rapid cost declines in wind and solar PV had led to cycles of boom and bust in the sector, as policy-makers struggled to adjust feed-in tariffs quickly enough to prevent overheating the market. Starting in 2018, the National Development and Reform Commission (NDRC), which sets prices, had signalled that wind and solar feed-in tariffs would be phased out completely, in part to address growing deficits in the funds used to pay for the subsidies. Such funds are derived from electricity surcharges, which the government is unwilling to increase. In mid-2018, a sudden announcement that there would be no further quota for solar FITs led to a sharp drop in solar installations, and that market has only partially recovered. For 2020, project approvals for any facilities that benefit from feed-in tariffs must be strictly controlled and limited to the anticipated increase in surcharge funds, which rise in proportion to electricity demand growth.¹

Continuing additions of coal-fired power capacity has also played a role. Although utilization rates at China's coal plants are low, and most lose money, planners and provincial officials continue to be concerned about the potential for power shortages, and see coal as essential for reliability. China's National Energy Administration (NEA) established a red-yellow-green provincial risk alert mechanism

¹ *Opinions on Promoting the Healthy Development of Non-hydro Renewable Energy Power Generation*, Ministry of Finance, 3 February 2020



that marked most provinces as red for coal investment back in 2016,² effectively halting most coal plants construction due to overcapacity and renewable curtailment. Each of the five subsequent annual lists has green-lighted more provinces, and the latest map is mostly green.³ The methodology for the system is not public, and the alert mechanism does not appear to account for slowing demand due to the present economic crisis.

A third factor in the slowdown is the shift to new regions and technologies. Because onshore wind and utility-scale solar are more cost-competitive, policy makers have focused subsidies and supportive policies on distributed and rooftop solar, and offshore wind. In 2019 distributed solar accounted for 30.6 per cent of new solar additions. Offshore wind grew by 37.8 per cent from the prior year.⁴

Policy support for clean energy shifts to consumption

China's energy market constitutes a hybrid of market and administrative measures, including administrative planning targets. Under the 12th Five-Year Plan, NEA set ambitious targets for wind and solar, supported by subsidized feed-in tariffs, and the market often overshot these targets, which policy makers often then revised upward. Wind and solar market observers came to regard capacity targets as a leading indicator of policy ambition on clean energy. However, with the 13th Five-Year Plan, NEA set 2020 targets for wind and solar that implied steadier growth, and declined to update the targets as the market outpaced them.

Instead, NEA focused more on consumption of renewable energy—which had emerged as a major problem. Wind curtailment reached a high of 17 per cent for the full year of 2016 and some provinces such as Gansu experienced full-year curtailment rates as high as 40 per cent.⁵ A policy introduced in 2016, *Document 625*, mandated full purchase of renewable energy, setting a minimum operating hours purchase rule for provinces.⁶ Document 625 included requirements for compensation for curtailment of renewable energy, and this was re-emphasized in late 2019. The government in 2018 also introduced a target for provinces and grid companies to steadily reduce wind and solar curtailment, with 2020 set as the date to “basically resolve” renewable energy integration issues, setting a goal of curtailment below 5 per cent in all provinces for both wind and solar.⁷ New market trading rules, such as generation rights trading between provinces and bidding of curtailed renewable energy into neighboring provinces' power markets, as well as new transmission lines also helped. By 2019, annual wind curtailment had fallen to 4 per cent and solar curtailment to 2 per cent.⁸

China has also introduced green certificates and a renewable obligation to support renewable uptake. While these appear analogous to markets that exist in the U.S. and U.K., their purpose and function differ dramatically—a point often missed in reporting outside of China. The green certificate market was launched mainly to reduce the government's subsidy payment obligation by persuading corporates or individuals to purchase the certificates, thereby transferring the subsidy obligation for existing projects, rather than creating a market for projects that would provide additional renewable energy beyond that already existing. For this reason, the green certificate market never took off.

The renewable obligation (RO), which went through three drafts in 2018 before adoption, also differs from similar mandates in the U.S. and Europe. China's RO specifies consumption targets for just three years (including the current year), rather than setting targets for the provinces or market to aim for over

² *Notice on Establishing and Issuing Risk Early Warning Mechanism of Coal Power Planning and Construction in 2019*, National Energy Administration, 9 May 2016

³ *Notice on 2023 Coal Planning and Construction Risk Warning*, National Energy Administration, 26 February 2020

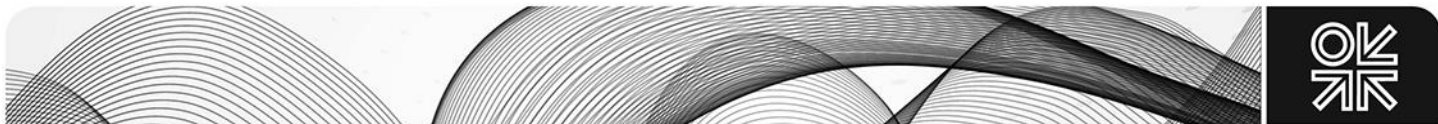
⁴ *Photovoltaic Power Grid Operation Status 2019*, National Energy Administration, 28 February 2020, http://www.nea.gov.cn/2020-02/28/c_138827910.htm

⁵ *Wind Power Grid Operation Status 2016*, National Energy Administration, 26 January 2017

⁶ *Management Measures for the Full Guaranteed Acquisition of Renewable Energy Generation*, National Development and Reform Commission, 31 March 2016

⁷ *Clean energy consumption action plan [2018-2020]*, National Energy Administration, 4 December 2018

⁸ *Photovoltaic Power Grid Operation Status 2019 & Wind Power Grid Operation Status 2019*, National Energy Administration, 28 February 2020, http://www.nea.gov.cn/2020-02/28/c_138827910.htm;



the long-term. Indeed, the provincial obligation for 2020 was adjusted in June of this year to more closely reflect output.⁹ This means that the obligation resembles an administrative planning quota, and does little to promote market-based investments in clean energy over the long-term.

Lastly, for many years international experts have advocated that China shift to electricity markets that would include spot markets and ancillary services markets where the low marginal cost of renewable energy and energy storage could help reduce curtailment and encourage greater trading of electricity between provinces. Though China initially focused on monthly and annual bilateral contracts, which generally left out variable wind and solar, spot markets have become a top priority over the past two years, especially since the launch of seven spot market pilots, which are currently mainly undergoing simulated trading. These provincial pilots have pursued various designs for their spot market pilots. For example, Guangdong has adopted locational-marginal-pricing, whereas Zhejiang has proposed a power pool arrangement. National authorities have set loose guidelines, and anticipate that provincial pilots could evolve gradually into a unified national market.

Although many short-term measures to date have focused on administrative planning, in the medium-term the government sees spot markets and supporting market measures as critical for rationalizing power sector investment, driving down electricity costs and prices, and improving clean energy uptake. New wind and solar investments are mainly funnelled through competitive tenders for either “grid parity” project contracts—long-term contracts at the local coal grid tariff—or through competitive auctions for remaining feed-in tariff funds.

Covid-19 and clean energy trends

Covid-19 has three main impacts on clean energy trends. First, lower electricity demand growth means lower renewable energy surcharge collections, which in turn reduces the space for renewable subsidies, which were already scaling off. The NEA has already reduced the total subsidy available for new PV plants in 2020 from RMB 2.6 billion announced in November last year to RMB 1.5 billion in February.¹⁰

Second, lower electricity demand growth also means less demand for coal. In the first three months of 2020, electricity from thermal sources (mainly coal) declined 8.4 per cent from the prior year, while total wind and solar output rose 7.6 per cent from the prior year.¹¹ Although to date we have not seen major changes or cancellations in coal plants resulting from lower output, nor has NEA revised its risk alert levels for new coal plant approvals, lower utilization of coal plants for a full year could ultimately lead to fewer approvals. But paradoxically, lower electricity demand may also mean that provinces further restrict new renewable additions, as provincial energy systems remain tied to inflexible coal power plants and have lower consumption capacity, at least under the present calculation methodology.

A third factor to consider is the economic stimulus, which may take green or brown forms. Prior to the Covid-19 crisis, the government had already launched a New Infrastructure plan, which included high-voltage transmission and electric vehicle charging among its categories.¹² While there have been calls for additional stimulus, including green stimulus focused on clean energy, the present course of the government appears to focus on more modest pro-growth measures that reinforce trends and policies already underway. The annual Two Sessions of the National People’s Congress included measures to boost local lending, as well as efforts to increase employment and consumption. But thus far, major changes to traditional infrastructure spending (real estate, steel, cement) or clean energy appear unlikely.

⁹ *Renewable Energy Electricity Consumption Obligation in 2020 for Each Provincial Administrative Region*, National Energy Administration, 1 June 2020, https://www.ndrc.gov.cn/xxgk/zcfb/tz/202006/t20200601_1229674.html

¹⁰ *Opinions on Promoting the Healthy Development of Non-hydro Renewable Energy Power Generation*, Ministry of Finance, 3 February 2020

¹¹ <http://data.stats.gov.cn/easyquery.htm?cn=A01&zb=A03010G&sj=202005>;

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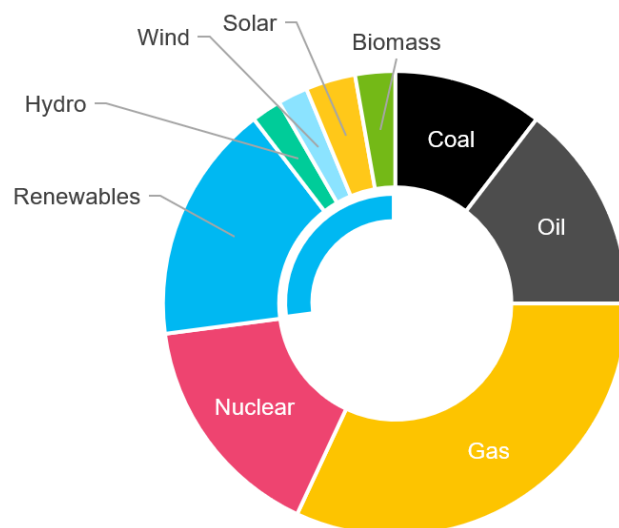
¹² “2020: New infrastructure, new future, big opportunities” (Chinese), 3 May 2020, https://www.sohu.com/a/378000727_772337

Overall policy theme is clear: stable growth of clean energy

The current government work plan calls for “stable growth” of renewable energy, and the policies released so far in 2020 all support this paradigm.

The draft Energy Law¹³ clearly states that renewable energy will have priority for development. The draft contains more mention of renewable energy in all its forms than any other fuel, and coal receives little attention in the draft, both in terms of mentions (figure 3) and in terms of specific policy measures (however, the law does mention that advanced coal technology should be developed). Many of the provisions of the Energy Law draft relating to renewable energy represent codifications of policies—such as on the renewable obligation—that already existed in policy form.

Figure 3: Mentions of fuel sources in 2020 draft Energy Law



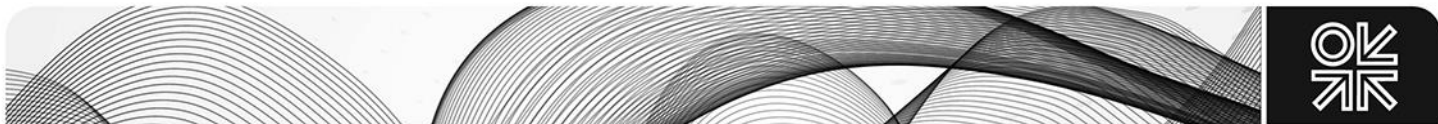
Other policies are aimed at increasing demand for clean energy from industry. In March 2020, the National Development and Reform Commission (NDRC) issued the Opinion on Accelerating the Regulatory and Policy System of Green Production and Consumption, emphasizing promotion of various green industries, technologies, goods, and services.¹⁴ Item 5 on Advanced Clean Energy Development emphasizes “Increasing policy support for distributed energy, smart grid, energy storage technology, and multi-energy complementarity.” Multi-energy complementarity refers to using multiple sources of energy, energy storage, and flexible consumption to reduce the overall cost and increase the reliability of clean energy.

Renewable energy consumption as well as innovation were also emphasized in a draft guidance on Establishing a Sound, Long-term Mechanism for Clean Energy Consumption issued in May 2019¹⁵. The measure begins with the statement that renewable energy development has “consumption at its core”—rather than new capacity. The measure begins with primarily administrative content, promoting “scientific targets” for renewable consumption and “strengthened analysis of renewable consumption capacity,” and states that renewable energy developers should strictly bear in mind local capacity to absorb renewable energy—which is based on administrative planning. The measures also vaguely mention the need to coordinate renewable obligations and green certificates, and encourages participation of renewables in spot markets and ancillary services markets. Finally, the document

¹³ *Energy Law of the People's Republic of China [Draft for Comments]*, National Energy Administration, 10 April 2020

¹⁴ *Opinions on Accelerating the Green Production and Consumption Regulatory Policy System*, National Development and Reform Commission, 11 March 2020

¹⁵ *Draft Guidance on Establishing a Sound, Long-term Mechanism for Clean Energy Consumption*, National Energy Administration, 19 May 2019



contains a list of innovative fields for policy promotion, including especially energy storage, multi-energy complementarity, and uptake of renewable electricity through port electrification, electric vehicle charging, hydrogen production, and heating and cooling.

Overall, the central theme of these measures is stable and sustainable growth in renewables. As Li Junfeng, the director of the China Renewable Energy Industry Association and one of the original designers of China's renewable energy feed-in tariffs, noted in an April 2020 WeChat post, "Priority development of renewable energy does not mean that there will be explosive growth. Renewables should gradually replace fossil energy based on demand".¹⁶ As recently as 1 June 2020, a guidance from the National Development and Reform Commission (NDRC) stated that even if renewable quotas for 2020 are adjusted upward, "we shouldn't blindly ratchet up expectations".¹⁷ And while premier Li Keqiang's speech at the National People's Congress mentions that carbon-free energy should supply the largest share of incremental energy production output, this is already the case in 2018–2019 for electricity.¹⁸

What are the obstacles to clean energy in China today?

The main obstacle to clean energy is that the contradiction between coal and renewables remains unresolved. Coal is still perceived as a reliable, baseload fuel, and discussions of energy security in China generally fail to mention the role of renewable energy. Renewables are also portrayed as expensive, even as academic studies show wind and solar are now competitive with coal in much of China and coal plants lose money.

The contradiction is not merely an ideological debate, but is reflected in administrative planning at all levels. More provinces now have the green light for coal investment than for wind and solar. Recently, the provinces of Henan, Hunan, and Shanxi released renewable consumption capacity plans that bar new utility-scale solar additions—even though new coal plants are approved for these areas and wind and solar made up less than 15 per cent of their electricity production in 2018. The provinces each consume roughly the same amount of electricity as the U.K. or other large European countries—yet in comparison to these, their wind and solar share is much smaller (figure 4). The limited flexibility of local power plants is unlikely to fully explain the relatively small space for renewables calculated by planners.

The slow adoption of spot markets also presents a challenge. Yet, it remains unclear what market model China will adopt, and whether it can fully enable full price competition and economic dispatch of electricity sector assets at the provincial and regional levels. The design of power markets also highlights contradictions between central and provincial authorities—with central officials placing a higher priority on renewable energy and competition, whereas local officials often seek mechanisms such as capacity markets that might provide a safety net for local coal assets.

¹⁶ "Li Junfeng discusses the draft Energy Law: Renewables unlikely to see explosive growth" (Chinese), https://mp.weixin.qq.com/s/M9FDAzd0FqKyA_crwldtMA

¹⁷ *Renewable Energy Electricity Consumption Obligation in 2020 for Each Provincial Administrative Region*, National Energy Administration, 1 June 2020, https://www.ndrc.gov.cn/xxgk/zcfb/tz/202006/t20200601_1229674.html

¹⁸ *Analysis and Forecast Report of National Electricity Supply and Demand Situation*, China Electricity Council, 21 January 2020

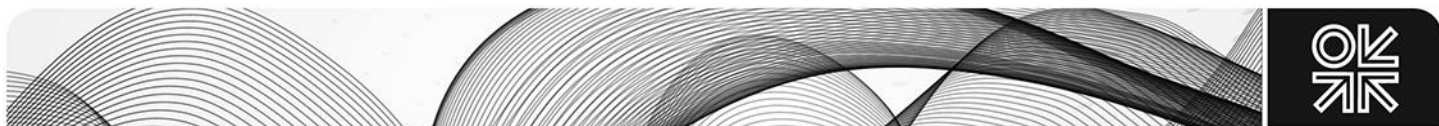


Figure 4: Electricity generation and consumption figures in 2018

	Total Generation (TWh)	Total Consumption (TWh)	Generation from wind (TWh)	Generation from solar (TWh)	Generation from hydro (TWh)	Current share of RE	Renewable Obligation in 2020	Non-hydro Renewable Obligation in 2020
Henan Province	292	342	8.8 (3%)	12.8 (4.4%)	14.1 (4.8%)	12.2%	17.5%	12.5%
Hunan Province	142	175	7.5 (5.3%)	2.6 (1.8%)	52.8 (37.2%)	44.3%	40%	9%
Shanxi Province	304	216	22.4 (7.4%)	10.2 (3.4%)	5.6 (1.8%)	23.2%	17%	16%
U.K.	281	300	57.1 (20.3%)	12.9 (4.6%)	5.5 (2.0%)	39.5%	-	
Germany	545	574	111.5 (20.4%)	45.8 (8.4%)	19.4 (3.6%)	40.6%		
U.S. - California	195	268	14.1 (7.2%)	27.3 (14%)	26.1 (13.5%)	40.24%		

Source: various sources¹⁹

The desire to prevent a collapse in the state-owned energy sector is also a concern for central officials. In 2019, China announced that coal plants in Xinjiang would consolidate under one power company to address losses and reduce overcapacity.²⁰ In May 2020, this policy was expanded to more provinces.²¹ Coal still accounts for most electricity production in China, so consolidation of coal plants under a single owner within each province could hurt the ability of nascent provincial spot markets and long-term contract markets to function competitively and set prices efficiently. On the flip side, consolidation could also facilitate closure of unneeded coal capacity.

Conclusion

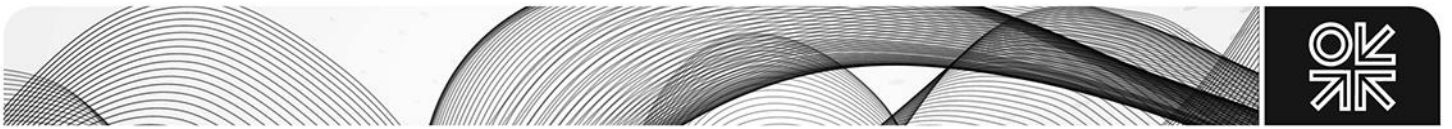
The 14th Five-Year Plan is likely to anticipate stable growth for renewables, include mentions of priority development of clean energy, and focus on pilot projects in innovative areas such as multi-energy complementarity and consumption of renewables in certain emerging industries. Development of new coal technology will almost certainly be mentioned, too. Given the present focus on energy security and economic stability, however, the plan may not include any revision of existing targets for non-fossil energy for 2030.

Two factors could change this situation. First, China's slow-but-steady development of electricity markets is likely to improve the market position of renewables over time, especially if prices for wind and solar tumble in 2020–2021. Given China's focus on renewable consumption, once industrial and commercial consumers begin to see clean energy as an economical alternative to grid power—especially if storage and electric vehicles also take off—demand for new wind, solar, and storage could exceed expectations.

¹⁹ "UK Energy Statistics, 2018 & Q4 2018," Department for Business, Energy and Industrial Strategy – UK Government, 28 March 2019, at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791297/Press_Note_March_2019.pdf; "UK Historical electricity data," Department for Business, Energy and Industrial Strategy – UK Government, 25 July 2019, at <https://www.gov.uk/government/statistical-data-sets/historical-electricity-data>; "Net public electricity generation in Germany in 2018," Fraunhofer, 13 March 2019, at https://www.energy-charts.de/energy_pie.htm?year=2018; "State Electricity Profiles," U.S. Energy Information Administration, 23 March 2020, at <https://www.eia.gov/electricity/state/>; "Total System Electric Generation," California Energy Commission, 24 June 2019, at https://www2.energy.ca.gov/almanac/electricity_data/total_system_power.html;

²⁰ *Pilot Scheme for Regional Integration of Coal and Power Resources in Central Enterprises*, State-owned Assets Supervision and Administration Commission, 3 December 2019

²¹ *Pilot Scheme for Regional Integration of Coal and Power Resources in Central Enterprises*, State-owned Assets Supervision and Administration Commission 22 May 2020



Second, the improving market position of wind and solar in the rest of the developing world, and the decision to remove coal from the taxonomy of green bonds, could make state support for the country's coal sector seem even more disconnected from global market trends. We are already seeing economics-driven coal project cancellations in Africa and South Asia, as large solar and wind projects in these regions begin to take off. China's energy and infrastructure investors could well begin to shift their focus to these fields, which would in turn affect the domestic debate around coal.