

COAL INFORMATION UPDATES

ISSUE 2



2021

ACKNOWLEDGEMENT

This newsletter is a product of SinoCarbon and is funded by Energy Foundation China.

Many thanks to the valuable comments and suggestions of FU Sha, YANG Zhuoxiang and MEI Chengcheng from Energy Foundation China.

DISCLAIMER

-Unless otherwise specified, the views expressed in this newsletter are those of the authors and do not necessarily represent the views of Energy Foundation China. Energy Foundation China does not guarantee the accuracy of the information and data included in this newsletter and will not be responsible for any liabilities resulted from or related to using this report by any third party.

-The mention of specific companies, products and services does not imply that they are endorsed or recommended by Energy Foundation China in preference to others of a similar nature that are not mentioned.



CONTENTS

Data of Coal Market from January to June	02
Stable supply of coal	02
Growing demand for coal	04
Steady growth in electricity supply and a green low-carbon development of installed capacity	07
Electricity Demand	10
Policy Trends in Energy Sector from January to June	12
Curb on the haphazard development of energy-intensive and high-emission projects	12
A number of places released electricity consumption plans for meeting summer peak demand	12
Benchmark coal-fired power price increased by 10% in some regions	13
Historic development opportunity for energy storage	14
Reference	16

Data of Coal Market from January to June

Stable supply of coal

According to statistics in the *Briefing on the Economic Operation of Coal in the First Half of 2021*⁽¹⁾, released by the China National Coal Association, China's coal supply was generally stable in the first half of 2021. From January to June, raw coal production of China's enterprises above designated size reached 1.95 billion tons, with a year-on-year growth of 6.4%. China imported a total of 140 million tons of coal, with a year-on-year decrease of 19.7%. A total of 1.28 billion tons of coal was shipped by railway in China, with a year-on-year growth rate of 13.8%.

1. Geographic concentration of coal production

Between January and June, Shanxi, Inner Mongolia, Shaanxi, and Xinjiang continued to dominate the coal mining industry in China. The four provinces produced approximately 1.55 billion tons of coal, accounting for 79.4% of China's total coal production in the first half of 2021, with an increase of 1.6% over the same period last year, and an 11.7% increase over the same period in 2019. Compared to last year's substantial coal capacity cut, Inner Mongolia's coal production picked up steadily in the first half of 2021, with an increase of 1.4% over the same period in 2020 and a decrease of 1% over the same period in 2019. The production rate of the other three provinces - Shanxi, Shaanxi, and Xinjiang - all increased by more than 5% over the same period of last year and by more than 20% over the same period in 2019. However, a total of 13 out of the 24 regions reduced their coal production in the first half of 2021, including Chongqing, which fully withdrew from coal production at the end of June. Yet, most of the reduction of large-scale coal production reduction took place in the smaller coal-producing provinces. The bottom seven coal producers on the ranking list, except for Hubei, reduced production by more than 5% compared with the same period of last year, and by more than 15% compared with the same period in 2019. For Hubei, after a significant drop in its productive activities in 2020 due to the COVID-19 pandemic, its coal production increased by 67% over the same period in 2020 but decreased by 31.2% compared with the same period in 2019, due to the resumption of stable coal production from January to June 2021.

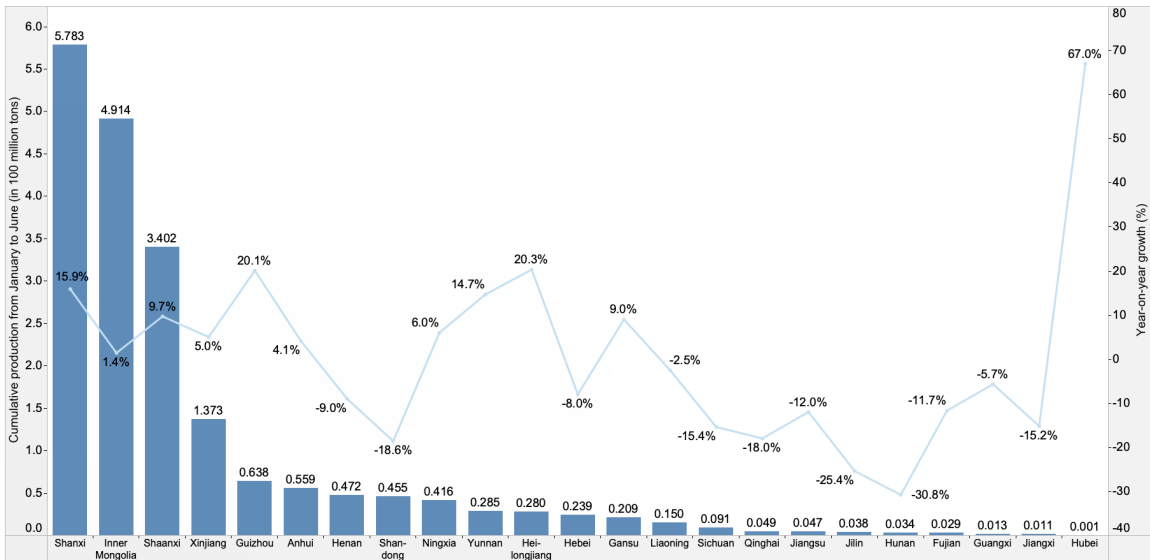


Figure 1 Cumulative raw coal production from January to June 2021 (by province)

Data source: National Bureau of Statistics

2. Record-high capacity utilization

From January to June, China achieved an annual increase production capacity of approximate 140 million tons through diversified methods such as investment in coal mine construction and the intelligent transformation of coal mines. In the first half of 2021, coal mines under construction could produce more than 90 million tons/year once in operation. Furthermore, around 30 million tons/year of additional capacity were approved for production, and 18 million tons/year of temporary open-pit coal mines were approved for restoration in Ordos, Inner Mongolia. In addition, about 40 million tons of coal mine capacity will be approved, and 70 million tons of coal mine capacity will be built and put into operation. It is expected to add about 110 million tons of capacity in the second half of the year^[2]. Capacity utilization in the coal mining and washing industry increased to 72.8%, realizing a year-on-year growth of 5.4%, which is a record high over the past three years. Meanwhile, a total of 961 million tons of coal was shipped by train in the first half, presenting a year-on-year growth of 12.4% (Figure 3). The national railway loaded an average of 76,000 carloads of coal and 49,000 carloads of thermal coal per day with a year-on-year growth of 12.9% and 19.4%, respectively^[3].

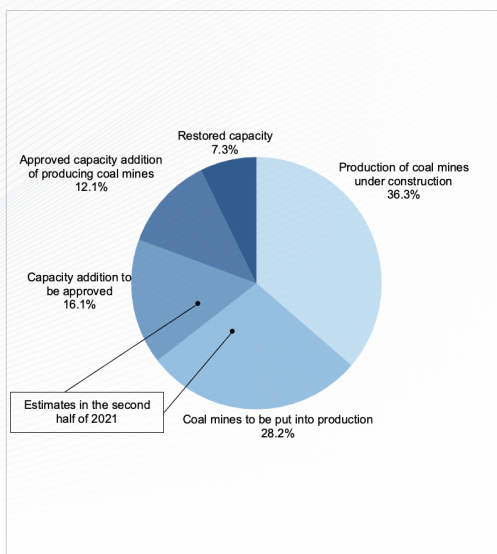


Figure 2 Share of coal production capacity addition in the first half 2021 and estimates in the second half

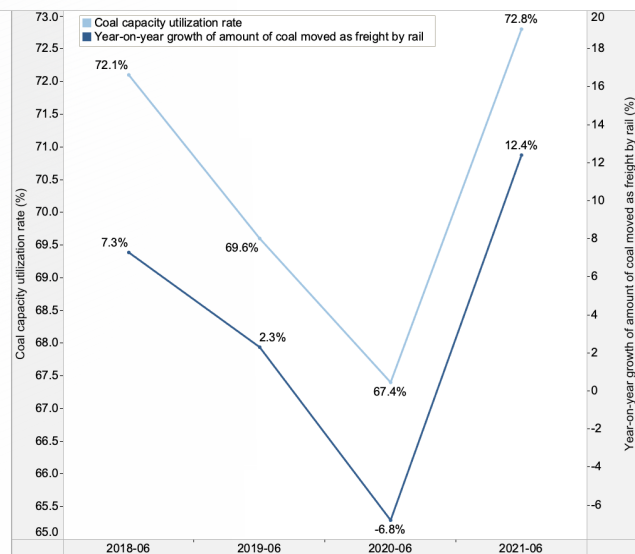


Figure 3 Coal capacity utilization rate and growth rate of amount of coal moved as freight by rail from 2018 to 2021

Data source: National Development and Reform Commission and China National Coal Association

Growing demand for coal

According to the *Briefing on the Economic Operation of Coal in the First Half of 2021* released by the China National Coal Association, China's coal demand has kept a strong momentum and coal prices have run high in the first half of 2021. From January to June, China's coal consumption was about 2.1 billion tons equal to a year-on-year growth of 10.7%. At the end of June, the comprehensive trading price of 5,500 Kcal thermal coal at Qinhuangdao port was 819 yuan/ton, increased by 274 yuan/ton from last year's level. The comprehensive price of cleaned coking coal and rich coal of Shanxi on CCTD was 2,125 yuan/ton, with a year-on-year growth of 890 yuan/ton^[1].

1. Significant growth of coal consumption in electricity generation and building materials

In Q1 2021, coal consumption increased by 15.8% over the same period in 2020 and 8.4% over the same period in 2019. Among coal consumption in Q1 2021, thermal coal consumption increased by 20.6% yearly over the previous year, contributing to 72.6% of total coal consumption growth; coal used in building materials industry increased by 39.7% year on year over the last year, contributing to 17.0% of coal consumption growth. Cumulatively, coal consumption increased by 10.7% year on year in the first half of 2021 and by 8.1% over the same period in 2019. Coal consumption for electricity generation and building materials continued to grow rapidly, with a year-on-year growth rates of 15.7% and 12.0%, respectively. Thermal coal once again broke its record in its contribution to the growth of coal consumption, reaching 76.7%^[4].

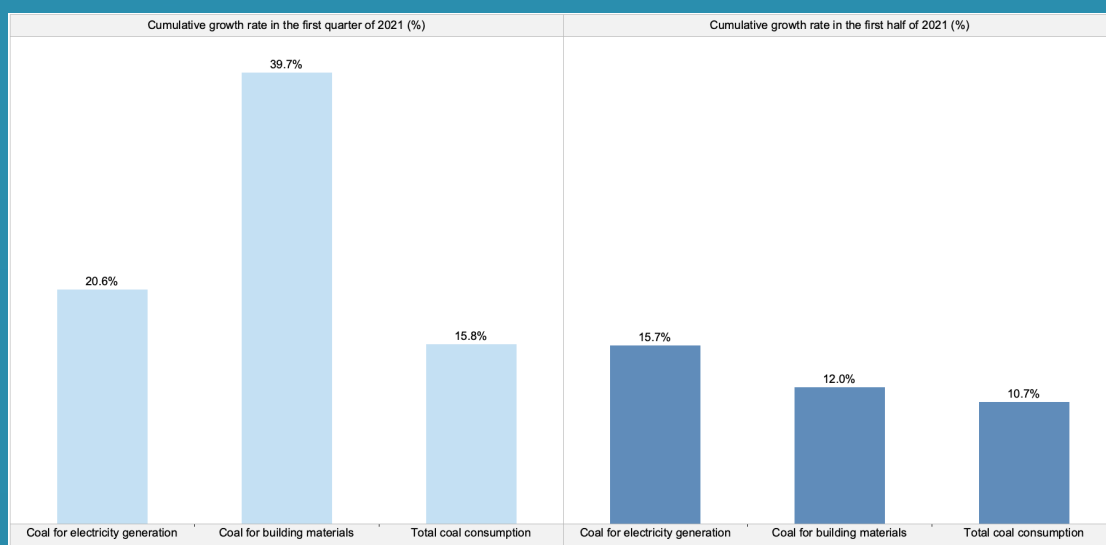


Figure 4 Year-on-year coal consumption growth from January to June 2021

Data source: National Energy Administration

2. Significant decrease in import volume

From January to June 2021, China imported 139.56 million tons of coal, with a year-on-year decrease of 19.7%. Compared with 2020, the first half of 2021 showed a stable domestic coal supply and a significant shrinking of coal imports. From January to May, coal imports showed a continuous downward trend but stabilized slightly in June. Imports decreased by 39.5% year on year from January to February 2021 due to a surge in coal imports caused by customs clearance in early 2020. In April, Australian coal imports were restricted by policies and Mongolia only exported 710,600 tons of coal to China due to the impact of the COVID-19, together leading to a huge year-on-year decrease in China's total coal imports by 29.8%. Activities in the imported coal market picked up in June as end-user demand rose significantly and coal import restrictions were relaxed in some areas, bringing about a year-on-year coal imports growth of 12.3%^[1].

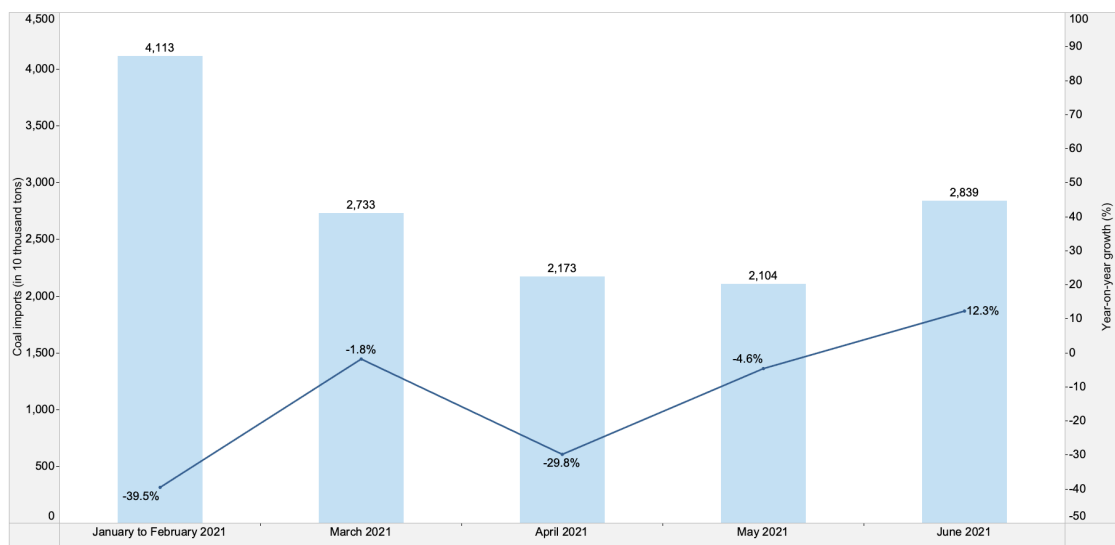


Figure 5 Coal import from January to June 2021

Data source: China Coal Transportation and Distribution Association (CCTD)

3. Revenue growth outpaced that of overall industry for the first time

In the first half of 2021, coal prices continued to run at a high level, driving an overall improvement in the revenue of the coal industry. There were 4,284 coal industry enterprises above designated size, with a year-on-year growth of 79%. The total assets of these enterprises amounted to 5,882.08 billion yuan, with a year-on-year growth of 6.3%. Meanwhile, the total losses of loss-making enterprises fell to 26.21 billion yuan, with a year-on-year decrease of 18.4%. From January to June, the mining industry achieved an operating income of 2,318.15 billion yuan, with a year-on-year growth of 29.5%. The revenue growth of coal industry outstripped that of the national industrial sector by 1.6%. From January to June, the coal mining and washing industry achieved a revenue of 1,215.95 billion yuan, with a year-on-year growth of 30.9%, which was 3% ahead of the revenue growth of national industrial sector. The mining industry achieved a total profit of 382.11 billion yuan with a year-on-year growth of 133%, which was 66.1% higher than that of national industrial sector. The coal mining and washing industry achieved a total profit of 206.88 billion yuan, realizing a year-on-year growth of 113.8%, which was 46.9% higher than the profit growth of national industrial sector. The overall revenue growth rate of the coal industry exceeded that of national industrial sector for the first time^[5].

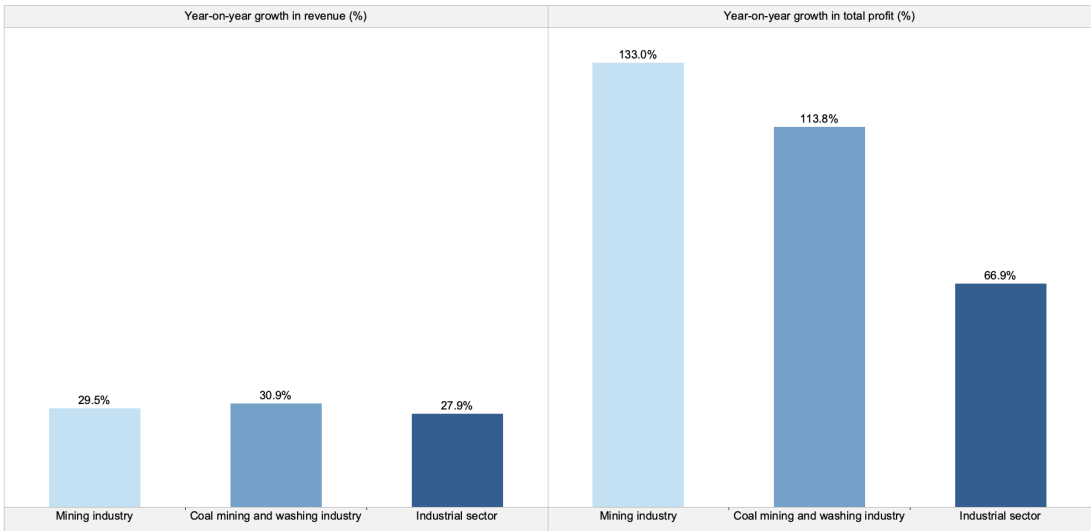


Figure 6 Comparison of revenue and total profit growth in coal-related industries from January to June 2021

Data source: National Bureau of Statistics

4. Continuing high level of thermal coal prices

According to the statistics from China Electricity Council, the market price of thermal coal has climbed rapidly, reaching a historical high since the beginning of 2021. In January, the coastal index of 5,500 Kcal thermal coal once exceeded the price of imported coal, reaching the highest trading price of 760 yuan/ton. With the peak of winter coal demand fading away in February, China's coal prices temporarily fell, and the tight coal-fired power supply was eased. Coal prices continued to rise steadily since March. The 5,000 Kcal thermal coal was priced at 598 yuan/ton and 5,500 Kcal thermal coal at 770 yuan/ton as the summer electricity peak approaches, realizing year-on-year growth of 31.4% and 48.4% respectively. In addition, imported coal continued to remain "high in price and low in volume" due to COVID-19 and policy restrictions. At the end of May, the purchase price index for thermal coal imports reached 929 yuan/ton, with a year-on-year growth of more than 80%^[6].

The difficulty in procuring thermal coal and securing thermal coal supply mounted. The fuel cost for coal-fired power companies rose significantly, with the unit price of standard coal arriving at some large power generation groups rising by 50.5% year on year in June. The loss of coal-fired power companies significantly expanded. Specifically, more than 70% of coal-fired power plants in major large power generation groups experienced economic losses, and the coal-fired power sector showed an overall loss in June^[2]. Due to the increase in thermal coal price, the growth in electricity generation brought about by economic recovery did not bring more profits to thermal power companies, and the net profit of a number of listed thermal power companies fell sharply and even implied losses during the first half of 2021^[7].

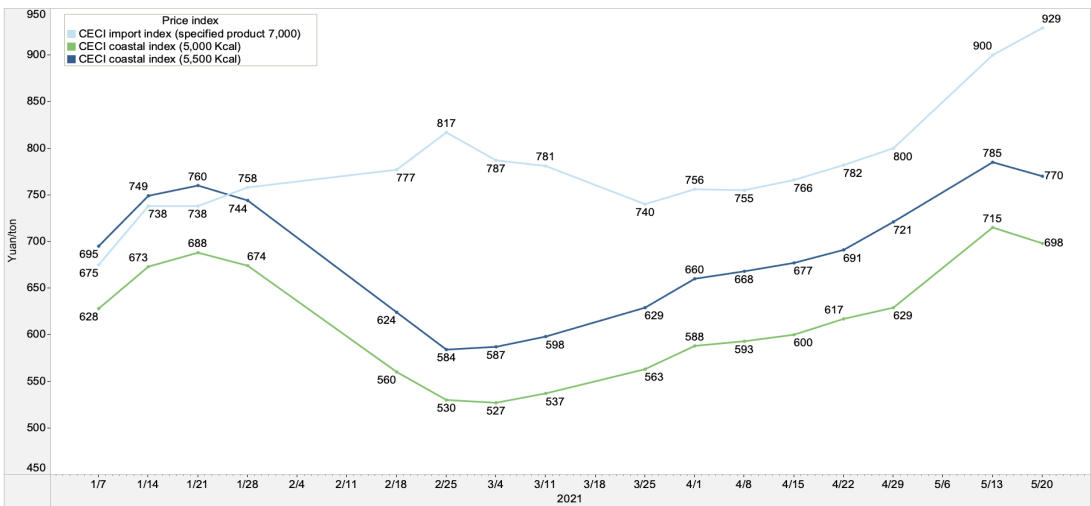


Figure 7 China electricity coal index from January to June 2021

Data source: China Electricity Council

Steady growth in electricity supply and a green low-carbon development of installed capacity

1. Steady growth in power generation by 13.7%

By the end of June 2021, China's installed power generation capacity reached 2.26 billion kW, with a year-on-year growth of 9.5%. This included 380 million kW of hydropower, 52.16 million kW of nuclear power, 290 million kW of wind power, 270 million kW of solar power, and 1.27 billion kW of thermal power (1.09 billion kW of coal-fired power and 106 million kW of gas-fired power)^[8].

In the first half of 2021, power plants above designated size generated a total of 3,871.7 billion kWh of electricity generation, realizing a cumulative year-on-year growth of 13.7%. The growth rate was 15.1% higher than that in the same period last year. In terms of power supply structure, thermal power generation amounted to 2,826.2 billion kWh, accounting for 73% of total power generation; hydroelectric power generation amounted to 482.67 billion kWh, accounting for 12.47% of total power generation; wind power generation amounted to 281.92 billion kWh, accounting for 7.28% of total power generation; and solar power generation amounted to 85.82 billion kWh, accounting for 2.22% of total power generation. By province, the top ten provinces in terms of cumulative power generation in the first half of 2021 were: Guangdong (292.95 billion kWh), Inner Mongolia (285.77 billion kWh), Shandong (284.07 billion kWh), Jiangsu (278.95 billion kWh), Xinjiang (224.93 billion kWh), Zhejiang (186.98 billion kWh), Shanxi (178.29 billion kWh), Hebei (168.3 billion kWh), Sichuan (164.77 billion kWh), and Yunnan (150.7 billion kWh).

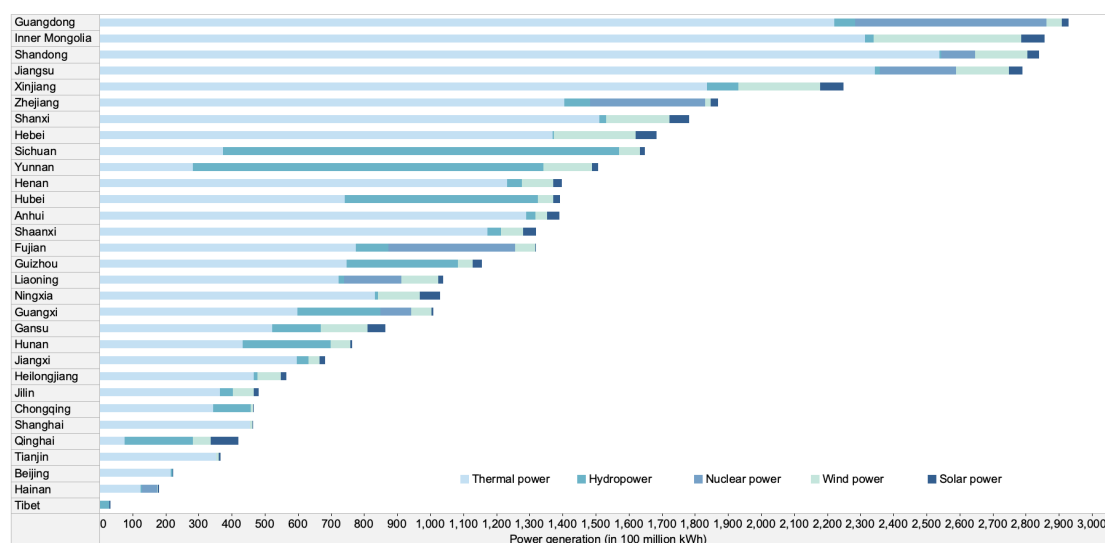


Figure 8 Cumulative power generation of different sources from January to June 2021 (by province)

Data source: China Electricity Council and National Bureau of Statistics

2. Renewable energy maintaining rapid development

By the end of June 2021, China's installed capacity of renewable energy power reached 971 million kW, accounting for 43.0% of the total installed capacity^[4]. From January to June, China's renewable energy power generation reached 1.06 trillion kWh from January to June, accounting for 27.4% of total power generation. Renewable energy sources maintained a high utilization rate. From January to June, the average utilization rates of hydro, wind, and solar energy reached 98.4%, 96.4%, and 97.9%, respectively.

From January to June, the new grid-connected capacity of hydropower was 7.69 million kW; the new installed capacity of biomass power was 3.674 million kW; and the new grid-connected capacity of wind power was 10.84 million kW, including 8.694 million kW of onshore wind power

and 2.416 million kW of offshore wind power. In terms of the distribution of the new installed capacity, the central, eastern, and southern regions in China accounted for about 59%, and the northeast China, northern China, and northwest China accounted for 41%, further optimizing the layout of wind power development. The top ten provinces in terms of the newly-installed capacity of wind power in the first half of 2021 were: Hubei (1.45 million kW), Inner Mongolia (1.17 million kW), Guangdong (1.11 million kW), Jiangsu (1.01 million kW), Shanxi (910,000 kW), Hunan (870,000 kW), Shandong (850,000 kW), Gansu (700,000 kW), Anhui (550,000 kW), and Fujian (540,000 kW). China's new installed capacity of photovoltaic capacity reached 13.01 million kW, including 5.36 million kW from photovoltaic power plants and 7.65 million kW from distributed photovoltaics. In terms of the layout of new installed capacity, the regions with a high share of installed capacity were North China, East China, and Central China, accounting for 44%, 22%, and 14% of new installed capacity nationwide, respectively. The top ten provinces with new solar power installed capacity in the first half of 2021 were: Shandong (3.257 million kW), Hebei (1.556 million kW), Henan (964,000 kW), Anhui (903,000 kW), Zhejiang (794,000 kW), Jiangsu (774,000 kW), Shaanxi (623,000 kW), Inner Mongolia (580,000 kW), Guangxi (443,000 kW), and Jiangxi (440,000 kW)^[9].

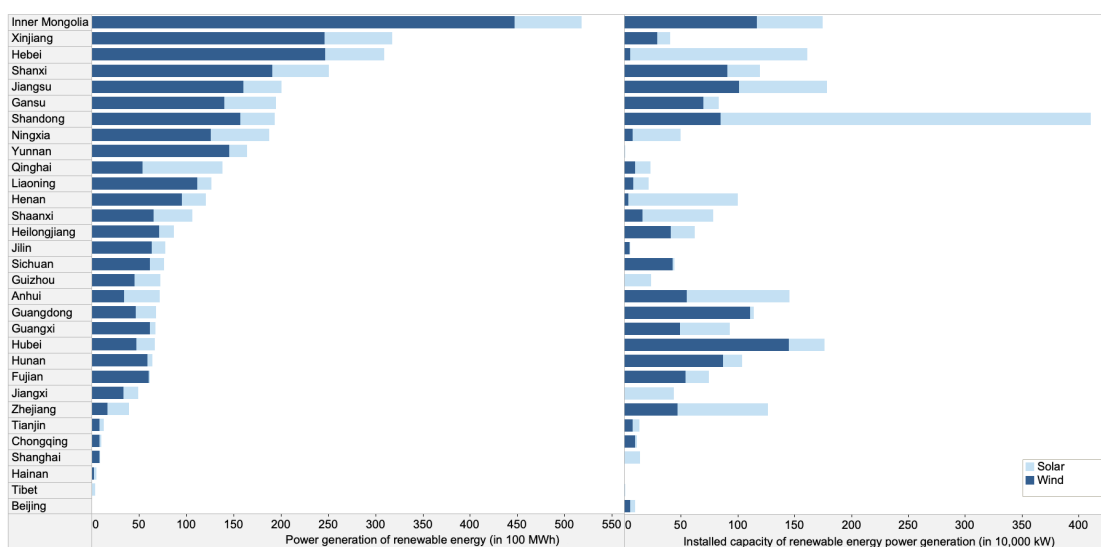


Figure 9 Power generation and new installed capacity of renewable energy from January to June 2021 (by province)

Data source: China Electricity Council, and National New Energy Consumption Monitoring and Early Warning Center

3. Slowed addition pace of new coal-fired electric generating units

According to statistics from SinoCarbon Innovation & Investment Co., Ltd., in the first half of 2021, new coal-fired electric generating projects involving 51,605 MW were added in 14 provinces. The total installed capacity of coal-fired electric generating units under planning is 8,020 MW, and the total installed capacity approved and under construction is 33,155 MW and 10,430 MW, respectively. In terms of installed capacity levels, units with the total installed capacity of 1,000 MW and above took up the largest proportion, accounting for 58% of the new coal-fired electric generating installed capacity in the first half of 2021. Units with a total installed capacity between 600 MW and 1,000 MW accounted for 32% of the total installed capacity. Installed capacity of units with a total installed capacity between 300 MW and 600 MW and those below 300 MW was 4,770 MW and 415 MW, respectively, only accounting for 10% approximately of the new coal-fired electric generating installed capacity in the first half of 2021 in China^[10].

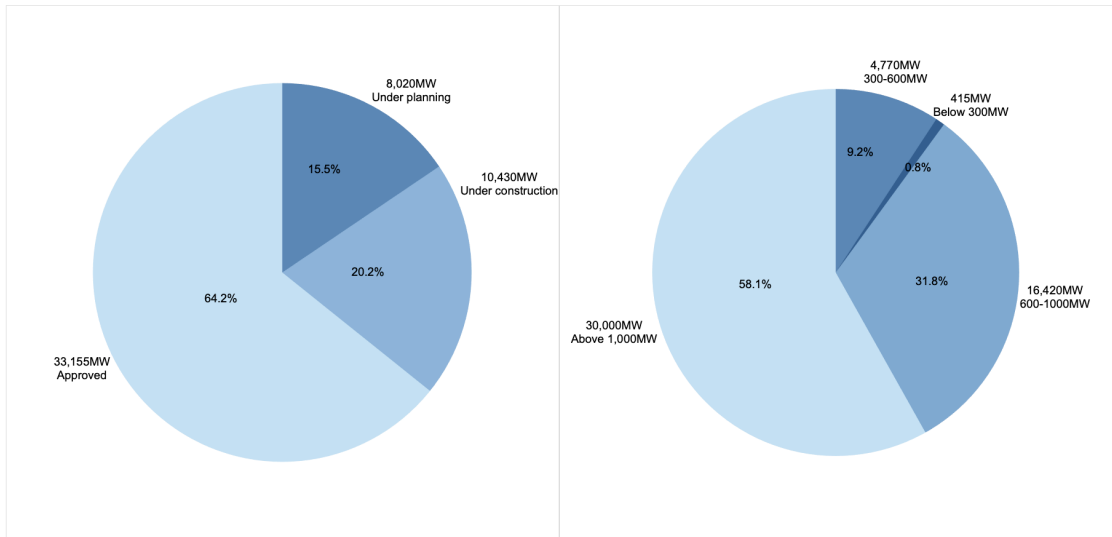


Figure 10 Status of additional coal-fired electric generating unit projects from January to June 2021

Figure 11 Type of additional coal-fired electric generating unit projects from January to June 2021

Data source: www.bjx.com

Geographically, the new coal-fired electric generating units in the first half of 2021 were mainly located in south and northeast China, and the northwest China did not see many new units added. The top 10 provinces in terms of new coal-fired electric generating installed capacity were: Anhui (5,705 MW), Hubei (5,690 MW), Inner Mongolia (4,400 MW), Guangdong (4,120 MW), Guizhou (4,020 MW), Shanxi (4,000 MW), Shaanxi (3,960 MW), Hunan (3,320 MW), Fujian (2,320 MW), and Jiangxi (2,000 MW). On April 22, President Xi Jinping proposed a "commitment to strictly control coal-fired electric generating projects" at the 2021 Leaders' Summit on Climate, emphasizing the need for strict control of increment. A total of 22,555 MW of newly installed capacity of coal-fired electric generation was added in the second quarter, realizing a quarter-on-quarter decrease of 22% compared with the first quarter^[10].

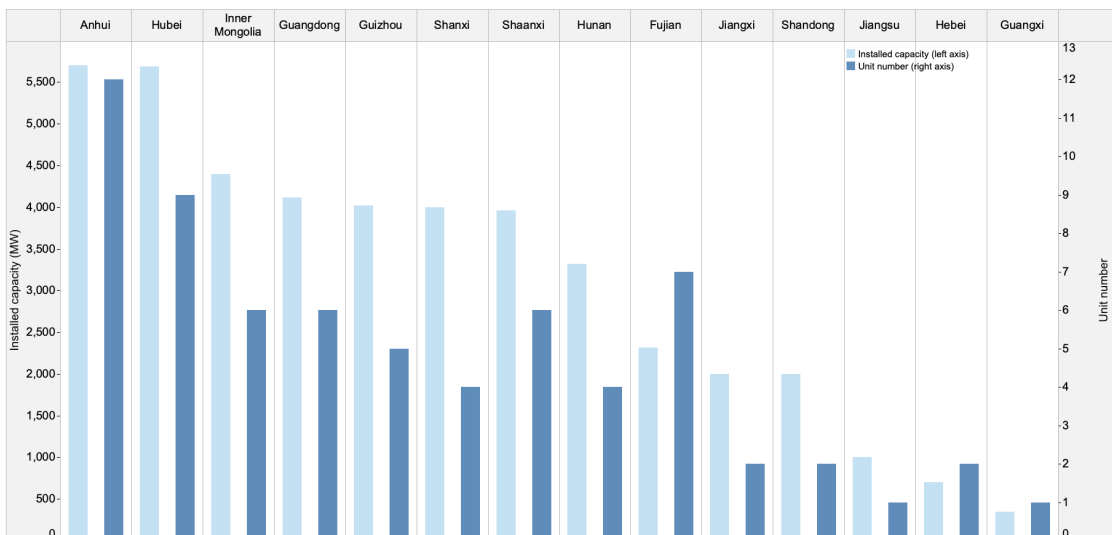


Figure 12 Additional installed capacity and added number of coal-fired electric generating units in the first half of 2021 (by province)

Data source: www.bjx.com

Electricity Demand

1. Rapid growth in electricity consumption

In the first half of 2021, the total electricity consumption in China was 3,933.9 billion kWh, with a year-on-year growth of 16.2%. In terms of industrial structure, the rapid economic recovery led to the accelerated industrial production and the rapid growth of electricity consumption, with an average growth rate of more than 20% in the first half of 2021 for electricity consumption in the primary, secondary, and tertiary industry. The primary industry consumed 45.1 billion kWh of electricity, with a year-on-year growth of 20.6%, accounting for only 1.1% of the total electricity consumption in China. As China's industrial production has reached world-leading standards and China is also the world's largest exporter of goods, the proportion of industrial electricity consumption is extremely large^[11]. From January to June, the secondary industry consumed a total of 2,661 billion kWh of electricity, with a year-on-year growth of 16.6%, accounting for about 67.6% of the total electricity consumption in China. Secondary industry remained the largest electricity consumer in China. In addition, with the continued optimization of China's electricity consumption structure and flourishing of the digital economy and high-tech industries, in the first half of 2021, the tertiary industry consumed a total of 671 billion kWh of electricity, with a year-on-year growth of 25.8%, accounting for about 17.1% of the total electricity consumption. The growth rate of its electricity consumption not only surpassed that of the primary and secondary industries but also increased by 29.8% compared to that in 2020. The cumulative electricity consumption of urban and rural residents was 556.8 billion kWh, with a year-on-year growth of 4.5%. Affected by policies such as the orderly use of electricity across China, the growth rate was 2.1% lower than that in 2020. By region, Guangdong, a major manufacturing province, ranked first in China in terms of electricity consumption in the first half of 2021, with cumulative electricity consumption of 364.3 billion kWh. It is followed by other large industrial provinces – Shandong (358,979 million kWh), Jiangsu (338,479 million kWh), Zhejiang (253,331 million kWh), and Henan (178,438 million kWh). The other five in top ten energy consumption provinces are Yunnan (151,766 million kWh), Sichuan (151,274 million kWh), Xinjiang (134,153 million kWh), Fujian (130,132 million kWh), and Anhui (127,536 million kWh)^[12].

2. Electricity supply and demand in tight balance

Since 2021, China's highest electricity load has hit a record high for the same period in history for six consecutive months, with some areas implementing an orderly power consumption policy. China's total society electricity consumption reached 3,933.9 billion kWh, with a year-

on-year growth of 16.2%. The total society electricity consumption of East, Central, West, and Northeast China increased by 17.7%, 16.9%, 14.8%, and 9.6% year on year, and the demands for electricity consumption in all regions increased significantly. Especially, the growth rate of 15 provinces exceeded the average nationwide growth rate in electricity consumption. Some regions in South China suffered electricity supply constraints due to climate change and industrial & economic recovery¹¹. For the western part of South China, the delay of the rainy season led to varying degrees of power shortages in major hydropower-generation provinces - Sichuan, Yunnan, Guangxi, and Hunan, with the growth rate of electricity generation lagging 15%, 7.3%, 5.8% and 3.8% behind the growth rate of electricity consumption respectively. For the eastern part of South China, the electricity demand increased significantly due to cold wave or high temperatures. Against this background, the electricity demand of Jiangsu and Zhejiang rose by 20.3% and 22.9%, respectively year-on-year. After the pandemic was effectively controlled, the rapid recovery of the industrial economy also contributed to the growth of electricity consumption. With a year-on-year growth of 18.3% in the value-added of manufacturing industries, Guangdong's electricity consumption rose by 22.9% year on year in the first half of 2021. As the East China is affected by the West to East power transmission project, the much contracted transmission capacity in West China led to a tight electricity supply situation in East China.

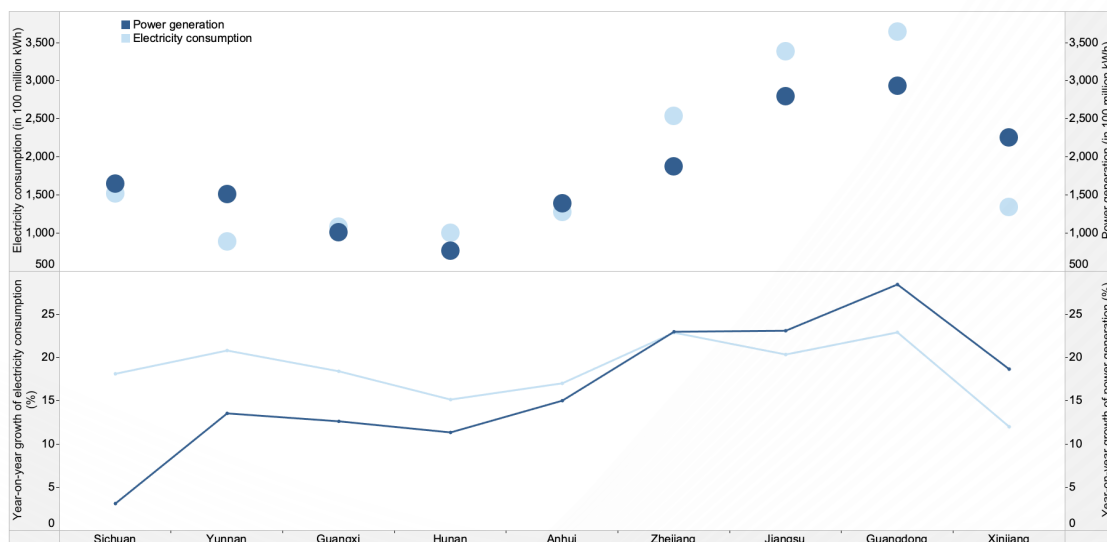


Figure 13 Power generation and electricity consumption in provinces with power shortage from January to June 2021

Data source: China Electricity Council

Policy Trends in Energy Sector from January to June

Curb on the haphazard development of energy-intensive and high-emission projects

In May 2021, the Ministry of Ecology and Environment issued the *Guidance on Strengthening the Prevention and Control of Eco-environmental Sources in Development Projects with High Energy-Intensive and High Emissions* (hereinafter referred to as the *Guidance*) to resolutely prevent the arbitrary development of high energy-consuming and high-emission projects and drive green transformation and high-quality development. The *Guidance* proposes to strengthen eco-environmental zoning control and planning constraints, to perform strict environmental assessment and approval of energy-hungry and high-emission projects to promote pollution reduction and achieve synergetic carbon emission carbon in the dual-high industries. In addition, the *Guidance* highlights the enhanced supervision over and regulation of emission permits and takes multiple measures to ensure the effectiveness of policy implementation. Currently, high energy-consuming and high-emission projects are temporarily divided into six categories by industry: coal-fired power, petrochemicals, chemicals, steel, non-ferrous metal smelting, and building materials^[13]. In July 2021, the Ministry of Ecology and Environment issued the *Notice on Piloting the Environmental Impact Assessment of Carbon Emissions from Construction Projects in Key Industries*. Several pilot regions including Hebei, Jilin, Zhejiang, Shandong, Guangdong, Chongqing, and Shaanxi have been selected to perform the environmental impact assessment of carbon emissions in pilot industries, such as electricity, steel, building materials, non-ferrous metals, petrochemicals, and chemicals. It is required that by the end of December 2021, the pilot regions shall issue guidelines on the environmental impact assessment of carbon emissions from construction projects and establish mechanisms for the environmental impact assessment of carbon emissions from construction projects in key industries^[14].

A number of places released electricity consumption plans for meeting summer peak demand

In 2021, driven by the steady economic recovery, operation of new industrial projects, and hot weather, the electricity load in many regions in China set a record high. Electricity grids of 3 regions - East China, Central China, and Southwest China - as well as 15 provincial electricity grids hit records for 35 times in total. Additionally, the load of Northeast China, North China, Northwest China, and 11 provinces exceeded last summer's peak^[15]. Between June 16 and 18, the electricity load of China Southern Power Grid hit three consecutive record highs, exceeding 200 million kW for the first time and reaching a new high of 209 million kW^[16].

In order to guarantee electricity supply, a number of cities and provinces released their electricity consumption plans to meet the summer peak demand. The Energy Administration of Shandong

Province issued the *Orderly Electricity Consumption Plan of Shandong Province for 2021* (referred to as the *Shandong Plan*), taking into account the provincial load growth, electricity generation capacity, and imported electricity in Shandong Province. It is expected that there will be a short-term electricity supply gap of 2 million kW during the summer peak 2021, and the gap will be further expanded due to the concurrence of tight thermal coal supply, reduced imported electricity from other provinces, and extreme weather. The *Shandong Plan* proposes that with the approval from the provincial Energy Administration, the State Grid Shandong Electric Power Company shall prioritize launching demand response or partial demand response in accordance with the principle of giving priority to demand response and guaranteeing orderly electricity consumption^[17]. The Development and Reform Commission of Hebei Province issued the *Orderly Electricity Consumption Plan of Hebei Province for 2021* (hereinafter referred to as the *Hebei Plan*). The *Hebei Plan* points out that it is necessary to give holistic consideration of the production and overhaul of generating units within the grid as well as external electricity purchase plans. During the summer and winter peak periods of electricity consumption, the electricity supply and demand for the south part of the grid in Hebei is tight, and the maximum gap is expected to be 890,000 kW in summer and 1.23 million kW in winter under extreme conditions^[18]. The Development and Reform Commission of Hunan Province issued the *Orderly Electricity Consumption Implementation Plan of State Grid Hunan Electric Power Co. Ltd. to Meet the Summer Peak Demand in 2021* (referred to as the *Hunan Plan*). The *Hunan plan* points out that it is expected that the province will experience a power shortage of 4 million kW during the summer peak period and proposes to take into account the new economic development mode of "carbon dioxide peaking" and "carbon neutrality". It also insists on saving electricity and controlling load, prioritizes demand-side power-saving measures, and manages unreasonable electricity consumption behaviors. Shanghai Municipal Commission of Economy and Informatization issued the *Orderly Electricity Consumption Plan of Shanghai to Meet the Summer Peak Demand in 2021* (referred to as the *Shanghai Plan*). The *Shanghai Plan* sets four levels and 15 sub-plans. The *Shanghai Plan* at each level contains several sub-plans, and different orderly electricity consumption plans can be adopted under different supply gaps of the grid^[19].

Benchmark coal-fired power price increased by 10% in some regions

In 2019, the National Development and Reform Commission issued the *Guidance on Deepening the Reform of the Feed-in Tariff Formation Mechanism for Coal-fired Power Generation* and changed the 15-year benchmark feed-in tariff mechanism for coal-fired power generation to a market-based price mechanism of "benchmark price + fluctuations". The benchmark price is determined by the prevailing local benchmark feed-in tariff for coal-fired power generation, with a range of fluctuations of up to 10% and down to 15% in principle. Since 2021, the cost of coal-fired power generation enterprises has increased greatly, and large losses have been incurred due to the increase in thermal coal price. To ease the operating pressure of coal-fired power generation enterprises, Inner Mongolia and Ningxia governments introduced policies to increase the local benchmark coal-fired power price by 10%. Department of Industry and Information Technology and Development and Reform Commission of Inner Mongolia Autonomous Region published the *Notice on Matters Relating to Clarifying the Upper Limit of Price Fluctuation in the Electricity Trading Market in the Western Part of Inner Mongolia and Adjusting the Market Trading Policies of Some Industry Markets*^[20], and the Development and Reform Commission of Ningxia Hui Autonomous Region published the *Notice of the Development and Reform Commission of the Autonomous Region on the Adjustment of Matters Relating to the Direct Trading of Electricity in 2021*^[21]. In the second half of 2021, more provinces are expected to float their benchmark coal-fired power prices to ensure reasonable returns for coal-fired electric generating generation companies and make full use of price signals to ease the conflict between electricity supply and demand.

Historic development opportunity for energy storage

1. Further improving the price formation mechanism of pumped storage hydropower

The establishment of a new power system dominated by new energy sources cannot be enabled without flexible electricity sources and large-scale energy storage. Recently, a series of supportive policies on energy storage have been released to ensure its healthy development in terms of the energy storage scale and market mechanisms. In April 2021, the National Development and Reform Commission issued the *Opinions on Further Improving the Price Formation Mechanism of Pumped Storage Hydropower* (hereinafter referred to as the *Opinions*), stating that it is necessary to adhere to the two-part tariff policy, further improve the price formation mechanism of pumped storage hydropower, form electricity tariffs in a competitive manner, incorporate capacity tariffs into transmission and distribution price recovery. The *Opinions* is aimed to improve the cost recovery and apportionment mechanism for pumped storage hydropower. In addition, the *Opinions* proposes to strengthen the construction and operation management of pumped storage hydropower stations as well as the supervision of the implementation of the tariffs. The economic benefits of non-grid investment entities are guaranteed and social capital participation is expected to be motivated through monthly settlement^[22].

2. Improving time-of-use tariff mechanism for better profitability conditions for energy storage entities

In order to form an effective market-based time-of-use tariff signal to better protect the safe and stable economic operation of the electricity system while creating more favorable profitability conditions for energy storage entities, the National Development and Reform Commission recently issued the *Notice on Further Improving Time-of-use Tariff Mechanism* (hereafter as *Notice*). The main contents of the Notice include optimizing the time-of-use tariff mechanism, strengthening the implementation, and enhancing auxiliary support. Taking into account the local electricity supply and demand, ratio of new energy installed capacity, and other factors, subnational authorities should divide peak and valley hours scientifically, set price differences rationally, apply peak tariff

mechanism for the period with 95% and above of the highest load based on the actual situation in the previous two years, exploit the demand-side regulation capacity, and further improve the seasonal tariff mechanism. During the implementation of the time-of-use tariff mechanism, it is necessary to clarify the implementation scope, establish a dynamic adjustment mechanism, and improve implementation mechanism of the market-based electricity users. Furthermore, local government should enhance the support work by organizing implementation carefully, evaluating the implementation effect, and strengthening publicity and guidance. The issuance and implementation of the *Notice* are of great significance to the construction of a new power system dominated by new energy and to the achievement of the strategic goal of carbon dioxide peaking and carbon neutrality^[23].

3. Promoting the development of "renewable energy+ energy storage"

The key to achieving carbon peaking is promoting renewable energy development, the key to promoting renewable energy development is increasing consumption, and the key to ensuring renewable energy consumption is the grid connection, peak load regulation, and energy storage. In July 2021, the National Development and Reform Commission and the National Energy Administration issued the *Notice on Encouraging Renewable Energy Power Generation Companies to Enable Their Own or Purchase Peak Load Regulation Capacity to Develop the Grid Connection* (hereafter as *Notice*). The *Notice* points out that grid companies should bear the main responsibility for the new grid incorporation and consumption of renewable energy capacity each year, and electricity supply companies should appropriately bear the responsibility for grid incorporation and consumption of renewable energy. With advanced new energy power generation technology, improved efficiency, and lower cost of system peak load regulation, the scale and proportion of consumption responsibility undertaken by grid companies will be adjusted downward in an orderly manner. There are three methods for companies to build their own or purchase peak load regulation capacity as per the *Notice*. The first is to build peak load regulation capacity and conduct self-operation; the second is to build peak load regulation capacity and hand over the operation to the grid; and the third is to purchase peak load regulation capacity that is operated by the grid. The *Notice* specifies the peak load regulation resources that undertake the renewable energy consumption. Such resources include pumped storage hydropower, new energy storages like chemical energy storages, gas-fired power stations, solar power stations, and coal-fired electric generating stations with flexibility retrofit, which basically covers chemical energy storage and all other major forms of peak electricity regulation. The *Notice* proposes an initial connection rate based on 15% of power capacity and a duration of 4 hours or more^[24].

Reference

Data of Coal Market from January to June

[1]China National Coal Association. Briefing on the Economic Operation of Coal in the First Half of 2021.

<http://www.coalchina.org.cn/index.php?m=content&c=index&a=show&catid=9&id=131341>

[2]National Development and Reform Commission. The new advanced coal capacity is expected to exceed 200 million tons in this year.

https://mp.weixin.qq.com/s/bsqYHlfrM8ary_tf8SP2lw

[3]China National Coal Association. 961 million tons of coal were shipped by train in the first half of the year, with a year-on-year growth of 12.4%.

<http://www.coalchina.org.cn/index.php?m=content&c=index&a=show&catid=24&id=130855>

[4]National Energy Administration. The National Energy Administration held a press conference to introduce the energy economic situation in the first half of 2021.

http://www.nea.gov.cn/2021-07/29/c_1310093667.htm

[5]National Bureau of Statistics. From January to June 2021, the profit of industrial enterprises above designated size in China increased by 66.9% year on year, with a two-year average growth rate of 20.6%.

http://www.stats.gov.cn/tjsj/zxfb/202107/t20210727_1819877.html

[6]China Electricity Council. CEC News.

<https://cec.org.cn/menu/index.html?471>

[7]www.bjx.com. Coal is so expensive that these thermal power companies have announced expected losses!

<https://news.bjx.com.cn/html/20210727/1166206.shtml>

[8]China Electricity Council. Analysis and Forecast Report on the National Power Supply and Demand Situation in the First Half of 2021.

<https://cec.org.cn/detail/index.html?3-298922>

[9]National Monitoring and Early Warning Center for New Energy Consumption. Analysis of National New Energy Power Consumption Assessment in the 2nd Quarter of 2021.

<https://mp.weixin.qq.com/s/QggH901B5ANQa7greKKrRA>

[10]www.bjx.com. Weekly Summary of Approved, Awarded and Commenced Thermal Power Projects.

<https://huodian.bjx.com.cn/hdxm/>

[11]China Electricity Council. Electricity Consumption from January to June 2021.

<https://cec.org.cn/detail/index.html?3-298630>

[12]www.bjx.com. Which is the largest electricity user in the regions operated by State Grid in the first half of 2021?

<https://shoudian.bjx.com.cn/html/20210722/1165269.shtml>

Policy Trends in Energy Sector from January to June

[13]Ministry of Ecology and Environment of the People's Republic of China. Guidance on Strengthening the Prevention and Control of Eco-environmental Sources in Development Projects with High Energy Consumption and High Emissions.

https://www.mee.gov.cn/xxgk/xxgk/xxgk03/202105/t20210531_835511.html

[14]Ministry of Ecology and Environment of the People's Republic of China. Notice on Piloting the Environmental Impact Assessment of Carbon Emissions from Construction Projects in Key Industries.

http://www.mee.gov.cn/xxgk/xxgk/xxgk06/202107/t20210727_851553.html

[15]State Grid News. How do the electricity grids cope with China's highest electricity load that hit a record high for the sixth consecutive month?

<https://mpower.in-en.com/html/power-2394983.shtml>

[16]China Southern Power Grid. Historic High - Electricity Load of China Southern Power Grid Exceeding 200 Million kW for the First Time!

<https://mp.weixin.qq.com/s/Ggt4WO8hWbM1iKAVAkZTrQ>

[17]Energy Administration of Shandong Province. Orderly Electricity Consumption Plan of Shandong Province for 2021.

http://nyj.shandong.gov.cn/art/2021/5/19/art_100393_10287355.html

[18]Hebei Development and Reform Commission. Orderly Electricity Consumption Plan of Hebei Province for 2021.

http://hbdcr.hebei.gov.cn/web/web/dlb_gzdt/2c9473847892004d0178a98ba1734edc.htm

[19]Shanghai Municipal Commission of Economy and Informatization. Orderly Electricity Consumption Plan of Shanghai to Meet the Summer Peak Demand in 2021.

<http://app.sheitc.sh.gov.cn/jjyx/689709.htm>

[20]Department of Industry and Information Technology of Inner Mongolia Autonomous Region. Notice on Matters Relating to Clarifying the Upper Limit of Price Fluctuation in the Electricity Trading Market in the Western Part of Inner Mongolia and Adjusting the Market Trading Policies of Some Industry Markets.

http://gxt.nmg.gov.cn/zwgk/fdzdkgknr/tzgg/202107/t20210723_1791584.html

[21]www.shoudian.bjx.com. Development and Reform Commission of Ningxia: Rise of prices in coal trading is allowed! Execution period: from August to December 2021.

<https://shoudian.bjx.com.cn/html/20210810/1169049.shtml>

[22]National Development and Reform Commission. Opinions on Further Improving the Price Formation Mechanism of Pumped Storage.

https://www.ndrc.gov.cn/fzggw/jgsj/zys/sjdt/202105/t20210508_1279457.html?code=&state=123

[23]National Development and Reform Commission. Notice on Further Improving Time-of-use Tariff Mechanism.

https://www.ndrc.gov.cn/xwdt/tzgg/202107/t20210729_1292068.html?code=&state=123

[24]National Development and Reform Commission. Notice on Encouraging Renewable Energy Power Generation Companies to Enable Their Own or Purchase Peak Load Regulation Capacity to Develop the Grid Connection.

https://www.ndrc.gov.cn/xwdt/tzgg/202108/t20210810_1293397.html?code=&state=123

