

Country Assessment Report-China (2019-2020)

Country/Region name: China

China is an upper-middle-income country and the world's second largest economy, but China is also the largest emitter of greenhouse gases. Many of the complex development challenges that China faces are relevant to other countries, including transitioning to a new growth model and promoting a lower carbon energy path, etc.

(World Bank)

Generation and demand: (type, MW, TWh)

China had a stable electric power generation and operation, and a balance between power supply and demand in 2019. In addition, China had continuously promoted a green and low-carbon power development and increased the proportion of renewable energy power generation capacity. By the end of 2019, China installed a total capacity of over 400,000MW renewable energy, 34% of the world's total.

It is expected that the overall power consumption will be steadily increased by 4%-5% in 2020, and the expected total installed power generation capacity will be 2,130,000MW by the end of 2020, of which the proportion of renewable energy will be expected increased to 43.6% at 930,000MW, and the expected newly installed renewable energy power generation capacity will be around 87,000MW.

By the end of 2019, the installed power generation capacity was 2,010,660MW, up by 5.8% over that at the end of 2018, among which the installed thermal power generation capacity was 1,190,550MW, up by 4.1%; the installed hydropower generation capacity was 356,400MW, up by 1.1%; the installed nuclear power generation capacity was 48,740MW, up by 9.1%. The installed grid-connected wind power generation capacity was 210,050MW, up by 14.0% and the installed grid-connected solar power generation capacity was 204,680MW, up by 17.4%.

The total newly installed power generation capacity was 101,730MW in 2019, decreased by 20.43% over that in 2018, among which the newly installed wind power generation capacity was 25740MW, up by 21.02%, and the newly installed solar power capacity was 26810MW, decreased by 40.75%.

The total electric power generation¹ was 7,325.30TWh in 2019, increased by 4.7% over that of 2018, among which the thermal² power generation was 5,045.00TWh, up by 2.4%; the nuclear power generation was 348.70TWh, up by 18.2%; the hydropower generation was 1,301.90TWh, increased by 5.7%; the wind power generation was 405.70TWh, raised by 10.9%; the solar power generation was 223.80TWh, up by 26.5%. The total renewable energy power generation accounted for 32.6% of overall power generation in 2019, increased by 1.7% over that in 2018.

The operational hours of hydro power and solar power plants was 3726h and 1285h in 2019, increased by 119 hours and 55 hours respectively, while the operational hours of wind power plants was decreased by 21 hours at 2082h in 2019.

¹ The statistical data quoted by has minor difference with the data in Statistical Communique of China on the 2019 quoted by National Bureau of Statistics of China.

² Thermal power refers to electricity generated by coal, oil, gas, residual heat, pressure and gas, waste incineration and biomass.

The consumption of electric power was 7225.50TWh in 2019, increased by 4.5% over that of 2018, among which the power consumption of Primary industry, Secondary industry and Tertiary industry was 78.0TWh, 4,936.2TWh (industrial power consumption was 4,847.3TWh) and 1,186.3TWh respectively; the household power consumption was 1,025TWh.

Statistics of China Power Industry 2019

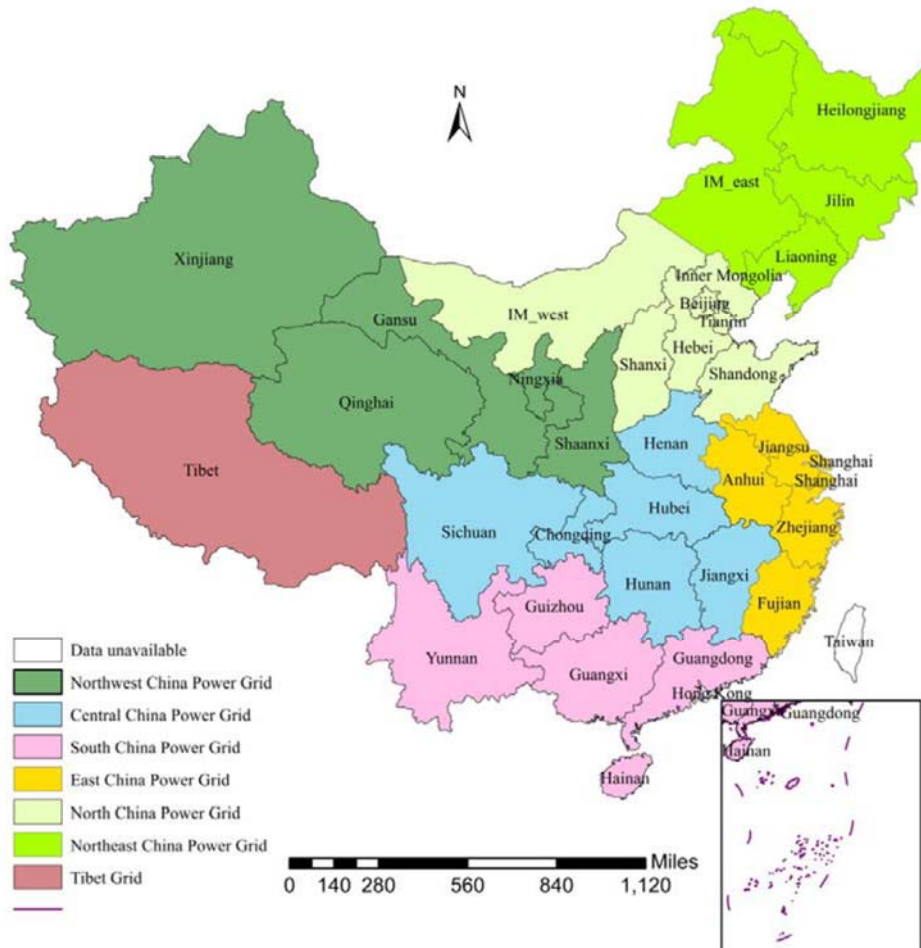
Item	2019 (TWh)	2018 (TWh)	Increased by
Electricity Generation	7,325.3	6,994.7	4.7%
Hydro	1,301.9	1,232.1	5.7%
Thermal	5,045.0	4,924.9	2.4%
Nuclear	348.7	295.0	18.2%
Wind	405.7	365.8	10.9%
Solar	223.8	176.9	26.5%
Electricity Consumption	7,225.5	6,916.3	4.5%
Primary Industry	78.0	74.7	4.4%
Secondary Industry	4,936.2	4,788.1	3.1%
Including: Industrial	4,847.3	4,710.1	2.9%
Tertiary Industry	1,186.3	1,083.8	9.5%
Residential	1,025.0	969.7	5.7%
Item	2019 (MW)	2018 (MW)	Increased by
Total installed capacity	2,010,660	1,900,120	5.8%
Thermal power	1,190,550	1,144,080	4.1%
Hydro power	356,400	352,590	1.1%
Nuclear power	48,740	44,660	9.1%
Wind power	210,050	184,270	14.0%
Solar power	204,680	174,330	17.4%
Newly installed capacity	101,730	127,850	-20.43%
Hydro power	4,170	8,590	-51.46%
Thermal power	40,920	43,800	-6.58%
Nuclear power	4,090	8,840	-53.73%
Wind power	25,740	21,270	21.02%
Solar power	26,810	45,250	-40.75%

Source: Statistical data 2019 by China Electricity Council; Statistical Communiqué of the People's Republic of China (PRC) on the 2019 National Economic and Social Development

Electrical interconnection and import/export:

Based on Electric Power Sector Reform Scheme (popularly known as Document no. 5) announced in 2002, China restructured electricity market by adjusting the accountability relationship between the central and provincial governing authorities, and reduced monopolistic control in the power sector by creating two major power grid companies, i.e. State Grid Corporation of China (including five regional grids: Northwest China Power Grid, Central China Power Grid, East China Power Grid, North China Power Grid, Northeast China Power Grid) and China Southern Power Grid (CSPG) Company, and five large power generation corporations (China Huaneng Group Co., Ltd.(CHNG); China Datang Corporation Ltd. (CDT); China Huadian Corporation Ltd. (CHD); China Power Investment Corporation (now is merged with State Nuclear Power Technology Corporation by State Power Investment Corporation (SPIC)); China Guodian Corporation (now is merged with Shenhua Group by China Energy Investment Corporation (China Energy)).

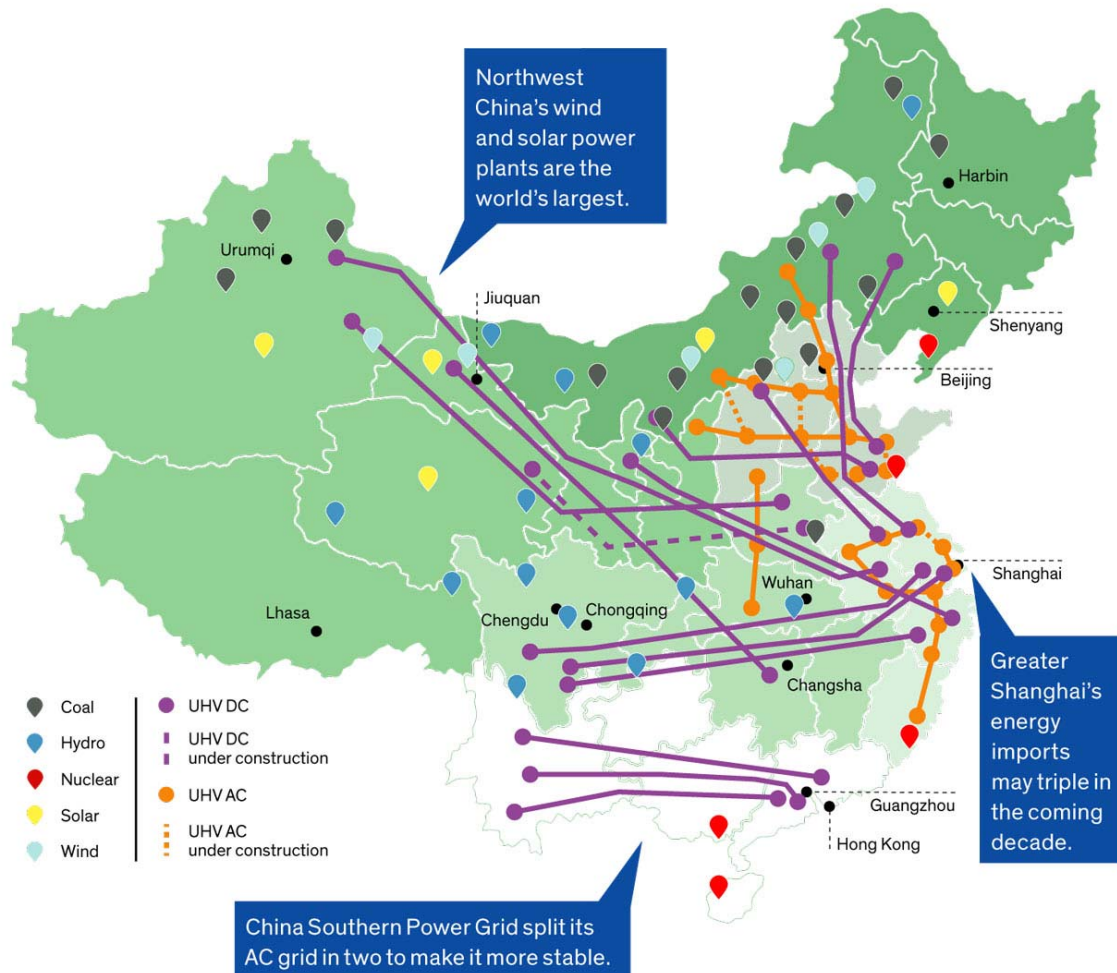
In 2005, as illustrated in the figure below, six major regional power grids in China were successfully interconnected. State Grid Corporation of China, as the largest public utility in the world, takes the investment, construction and operation of power grid in 27 provinces, autonomous regions and municipalities, covers 88% of Chinese national territory; while CSPG constructs and operates power grids in 5 southern provinces namely Guangdong, Guangxi, Yunnan, Guizhou and Hainan.



In recent years, the inter-regional power transfers have become more complex and the demand for transmission lines have increased while the Chinese government are actively promoting the development of renewable energy. However, it is extremely vulnerable to transfer the renewable energy from western energy resources abundant regions to eastern power consumption centers through the long-distance transmission. Therefore, in order to achieve the long-distance and high-efficiency inter-regional power transfer, it is significant to construct a strong and national smart power grid with ultra-high voltage (UHV) transmission system, which will optimize the resources allocation, promote the large-scale integration into grid of renewable energy, and further mitigate the power shortage in eastern and southern China while promoting the common economy development of both east and west regions.

In 2015, Chinese government released *Speeding up the Construction and Transformation of Power Distribution Networks (NDRC Energy [2015] 1899)* and *the Notice on the Release of Power Distribution Network Construction and Transformation Action Plan (2015-2020) (National Energy Administration, Power, [2015] 290)* to promote the development of a new type of industrialization, urbanization, agricultural modernization. In recent years, both State Grid and CSPG have reached a remarkable

achievement on UHV technology development and project construction. For example, as illustrated in the figure below, CSPG developed ± 800 kV UHVDC power transmission project from Northwest Yunnan Province to Guangdong Province; By June 2019, 9 AC and 10 DC UHV power transmission projects have been built by State Grid, with a total line length of 27,570 km and a transforming (converting) capacity of more than 296.2 GVA(GW), and another 3 AC and 1 DC UHV transmission projects are under construction.



(source: <https://spectrum.ieee.org/energy/the-smarter-grid/chinas-ambitious-plan-to-build-the-worlds-biggest-supergrid>)

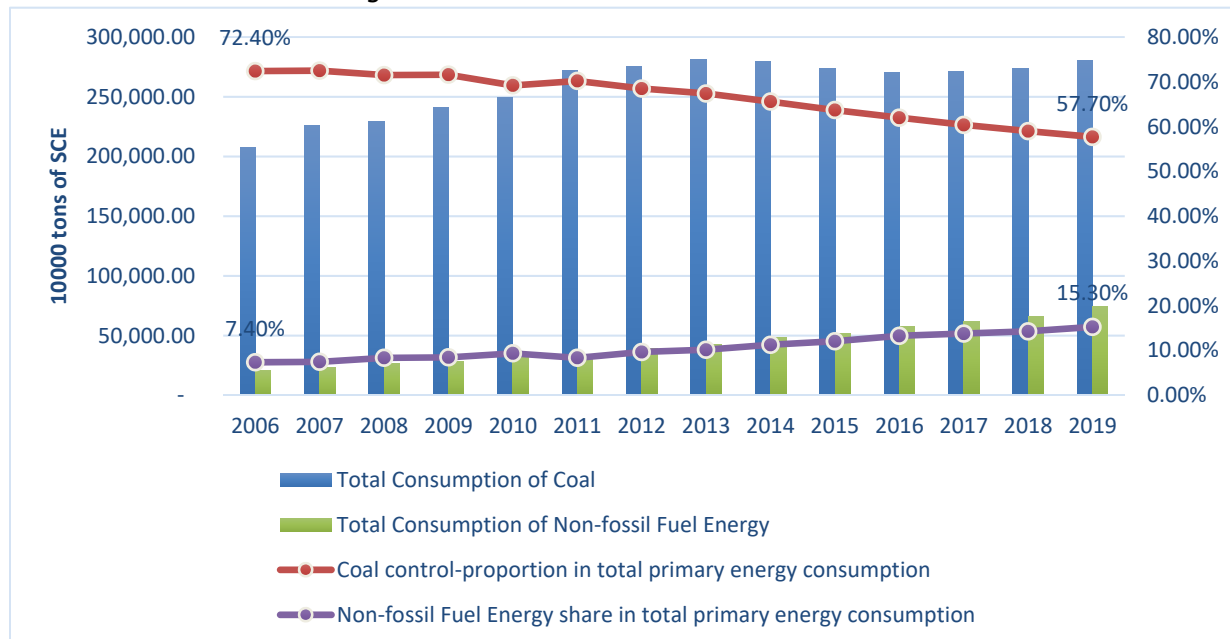
Under the Belt and Road Initiative, energy cooperation between China and neighbouring countries has continued to grow rapidly. In particular, CSPG has carried out extensive power resources cooperation with Hong Kong and Macao and borders Vietnam, Laos and Myanmar. So far, it has been interconnected with the Vietnam Power Grid through two transmission lines; it is interconnected with the local power grid in Myanmar through three transmission lines; and interconnected with the Laos National Grid through one transmission line. Moreover, CSPG's first international general contracting project, the Mindanao-Visayas Interconnection DC Transmission Project in the Philippines, has started full-scale construction in 2019 (www.csg.cn); Additionally, State Grid has built 10 transnational transmission lines with neighbouring countries including Russia, Mongolia and Kyrgyzstan, with electricity trading volumes accumulating to over 31 TWh. Currently, State Grid is advancing the feasibility study of China-Nepal and China-Korea Interconnection projects. The company has also played an active role in cross-border interconnection projects. The Mindanao-Visayas Interconnection Project (MVIP), a key project under the MOU on Energy Cooperation between China and the

Philippines, has begun full-scale construction, and the Ethiopia-Kenya DC Power Transmission Project has been completed (www.sgcc.com.cn).

Historical support or development of renewables in the country/region:

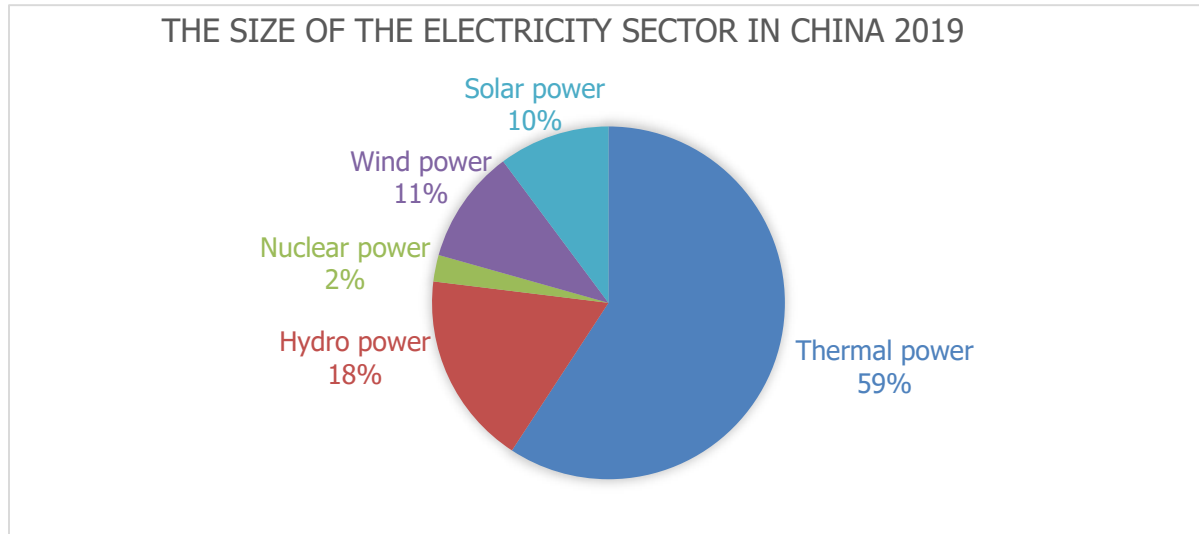
As early as the 1980s, with strong support from the head, the State Science and Technology Commission organized a expert team to undertake a study research on China's energy policy. The results showed that renewable energy is an important way of energy development in the future. Therefore, the State Science and Technology Commission officially integrated renewable energy into the national science and technology (S&T) policy system, and for the first time included relevant renewable technologies as key S&T research and development program in the Sixth Five-year Plan(1981-1985). It became the starting point for China's renewable energy technology research and development, although only 3 million yuan was allocated for the program due to financial difficulties. Since then, the Chinese government clearly formulated the relevant policies in the 7th Five-year Plan and the medium-and long-term plan of 2000 for the development of renewable energy.

In June 2003, the National People's Congress (NPC) Standing Committee included the Renewable Energy Law into the legislation plan for that year. In 2005, the Renewable Energy Law was approved, it clearly emphasizes *the law is enacted for the purpose of promoting the development and utilization of renewable energy, increasing the supply of energy, improving the structure of energy, safeguarding the safety of energy, protecting environment and realizing a sustainable economic and social development*. According to the Medium and Long-term Development Plan for Renewable Energy in China, released in August 2007, the share of renewable energy consumption shall reach 10% by 2010 and 15% by 2020. Since the renewable energy law enforced in January 2006, China has been rapidly and thoroughly developing its renewable electric power system. Now China has become the world's biggest renewable energy consumer. As illustrated in the figure below, energy intensity continues to decline and can be expected to decline continuously. From 2006 to 2019, the non-fossil fuels in primary energy consumption increased from 7.4% to 15.3% which achieved the medium and long-term RE plan and the 13th FYP in advance. In terms of electricity generated, the contribution of thermal power has dipped from 72.4% to 57.7% which also meet the target of 13th FYP.



Note: Non-fossil Fuel Energy includes hydro power, Nuclear Power and Wind Power
(Source: National Bureau of Statistics of China)

By the end of 2019, the size of thermal power was 59% of total installed power generation capacity, reduced from 60% in 2018; the installed hydropower generation capacity was declined by 1% while both the wind and solar power increased by 1%.



(Source: Statistical data 2019 by China Electricity Council)

Electricity market structure:

The market centralization of electric power industry in China is still very high as State Grid and CSPG have a monopoly almost on the whole electricity retail market except those captive power plants. On 15th March 2015, the CPC Central Committee and the State Council issued *Several Opinions on Further Deepening Reform of Electric Power System* (Document No.9) to make a new round of the power sector reform, which aims to establish a competitive power market structure and gradually separate electricity sales from power transmission and distribution. In order to support Document No.9, NDRC and NEA jointly released the six major power system reform supporting documents on 26th November 2015, including:

- the reform of transmission and distribution electricity tariff;
- promoting the construction of electricity market;
- establishing electricity trading agencies and their normative operation;
- accessing to power generation and electricity dispatch plan;
- promoting the reform of electricity-sales side;
- strengthening and regulating the power plant supervision and management of coal-fired captive power plants.

According to the "Document No.9" and its supporting documents, the main body of the electricity market includes power grid enterprises, power generation enterprises, electricity retailers and power consumers (end-users). The end-users are the buyers of electricity market and demand side of the market. The power generation enterprises, power grids, power selling companies are the main body of the sellers of electricity market and providing various types of power and services to the end-users in the market, in particular:

Two power grids: State Grid, CSPG;

Five big power generation corporation: CHNG, CDT, CHD, SPIC, China Energy;

Three supplementary corporation: China Energy Engineering Group Co., Ltd.; Power Construction Corporation of China; Sinohydro Group Ltd.;

Other important and provincial power generation group: SDIC Power Holding Co., Ltd. (wholly owned by State Development & Investment Corp., Ltd. (SDIC)); China General Nuclear Power Corporation (CGN); China Resources Power Holdings Co., Ltd. (CR Power); Luneng Group Co., Ltd. (wholly owned by State Grid); Zhejiang Energy Group Co., Ltd.; Shenergy Group; Jinneng Group Co., Ltd.; Beijing Energy Holding Co., Ltd.; etc.

In order to comply with the new requirement of energy reform and establish cooperative relationship with end-users in the competitive market, the power generation enterprises should make commitments on energy conservation and emission reduction to take more social responsibilities; change position and business role to explore diversified forms of power supply, energy saving and other forms of auxiliary services. On the other hand, except the unchanged functions in the field of power transmission, grid companies will change the traditional service model and explore new revenue mechanism and redefine the grid functions, such as providing integrated energy solutions with value-added services to the demand side, ensuring a fair power grid platform without discrimination, etc. In addition, the electricity retailers should also explore their profit models by reducing the cost, removing market protection difficulties, establishing market trading platform, providing market information, etc.

Description of renewables support mechanism:

Since the implementation of the Renewable Energy Law in 2006, China's renewable energy sector has developed rapidly with the supporting policies which mainly includes investment subsidies or preferential policies, tax incentives and exemptions, venture capital funds, low-interest loans and credit guarantees, green certificates, and polluter pay system, among which the most direct and effective one is the national tariff subsidy policy or feed-in tariff (FIT) pricing mechanism.

In January 2006, NDRC released *Provisional Administrative Measure on Pricing and Cost Allocating for Renewable Energy Power Generation* to mandate the purchase of renewable energy over the national grid based on a government predetermined price or a guidance price as FIT for renewable energy power generation projects. In 2009, NDRC implemented the FIT policy for wind power generation projects. According to the policy, the country was divided into four areas of wind energy resources with different guiding FIT. In 2011, NDRC released the solar FIT policy to provide a fixed tariff ranging from 1.0RMB/kWh to 1.15RMB/kWh based on different solar project status. In August 2013, NDRC released another notice to improve the solar FIT policy by using different guiding FIT in different solar energy sources areas. The table below provides an overall review of guiding FIT price for onshore wind farms and concentrated solar power stations in China.

(It is also noticed, as illustrated in the table below, while China is continuously reducing FIT subsidies, China is pursuing a fair tariff to renewable energy projects for phasing out renewable subsidies at the end. Particularly, in 2018, NEA released a new policy by introducing auction system for future wind projects from the FIT model. Moreover, NDRC, MOF and NEA jointly released another new policy to reduce the FIT for solar projects. In January 2019, NDRC and NEA jointly announced the plan to launch subsidy-free wind and solar pilots in regions. With this policy, China is ready to welcome a subsidy-free renewables era by introducing different supporting mechanisms to promote renewable energy in the most cost-effective ways and accelerate the phase-out of FIT subsidies).

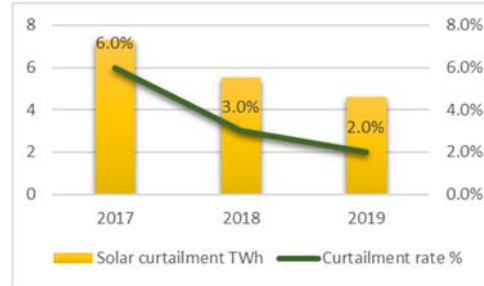
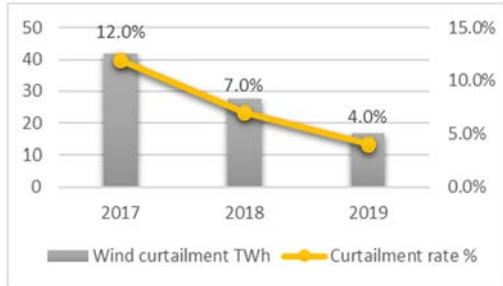
Onshore wind farm	Guiding FIT (RMB/kWh)					
Energy Zone	2009-2014	2015	2016	2018	2019	2020
Category I	0.51	0.49	0.47	0.44	0.34	0.29
Category II	0.54	0.52	0.50	0.47	0.39	0.34
Category III	0.58	0.56	0.54	0.51	0.43	0.38
Category IV	0.61	0.61	0.60	0.58	0.52	0.47
Category I energy zone: Inner Mongolia-excl. Chifeng, Tongliao, Xing-an County, Hulunbei-er, Xinjiang, incl. Urumqi, Yili-Kazak Autonomous Region, Changji County, Kelamayi, Shi-he-zi Category II energy zone: Hebei Province, incl. Zhangjiakou, Chengde; Inner Mongolia, Incl. Chifeng, Tongliao, Xiang-an, Hulunbei-er; Gansu Province, Incl. Zhangye, Jiayuguan, Jiuquan Category III energy zone: Jilin, Incl. Baicheng, Songyuan; Heilongjiang Province, Incl. Jixi, Shuangyashan, Qitaihe, Suihua, Yichun, Daxing-anling; Gansu Province, excl. Zhangye, Jiayuguan, Jiuquan; Xinjiang, excl. Urumqi, Yili Kasak Autonomous Region, Changji, Kelamayi, Shi-he-zi; Ningxia Category IV energy zone: Other region not included in Categories I,II,and III						

Concentrated solar power station	Guiding FIT (RMB/kWh)					
Energy Zone	before 2015	2016	2017	2018	2019	2020
Category I	0.90	0.80	0.65	0.55	0.40	0.35
Category II	0.95	0.88	0.75	0.65	0.45	0.40
Category III	1.00	0.98	0.85	0.75	0.55	0.49
Special region		1.05	1.05	1.05		
Category I energy zone: Ningxia, Qinghai-haixi, Gansu Province, Incl. jiayuguan, Wuwei, Zhangye, Jiuquan, Dunhuang, Jinchang, Xinjiang, Incl. Hami, Tacheng, A-le-tai, Kelamayi, Inner Mongolia, Excl. Chifeng, Tongliao, Xing-an County, Hulunbei-er Category II energy zone: Beijing, Tianjin, Heilongjiang, Jilin, Liaoning, Sichuan, Yunnan, Inner Mongolia Incl. Chifeng, Tongliao, Xing-an County, Hulunbei-er, Hebei Province, Incl. Chengde, Zhangjiakou, Tangshan, Qinhuangdao, Shanxi Province, Incl. Datong, Suzhou, Xinzhou, Yangquan, Shanxi Province Incl. Yulin, Yan'an, Qinghai, Gansu, Xinjiang Excl region included in Category I. Category III energy zone: Other region not included in Categories I and II Special energy zone: Tibet						

Source: NDRC

The FIT policy has stimulated China's renewable energy sector development and particularly accelerated the installed wind capacity increased from 17,599MW in 2009 to 210,050MW in 2019 and the installed solar capacity increased remarkably from 3,113MW to 204,680MW in the same period.

However, the rapid renewable energy development and expanded use of FIT policy also face many challenges such as wind/solar curtailment (the curtailment rate is going down in recent years as illustrated in the figures below), power limitation, long-distance transmission, over-capacities, delays in paying subsidies, etc.



In order to overcome these challenges, China considered to improve its supporting mechanism for renewable energy development mainly include the following mechanisms:

(1) GEC and RPS

In January 2017, NDRC, the Ministry of Finance (MOF) and NEA jointly released a pilot program for the issuance of Green Electricity Certificates (GEC) to renewable energy (wind and solar) producers in order to promote the renewable energy consumption and improve the subsidy mechanism for wind and solar power generation.

In order to promote the renewable energy development in the cruel competitive power market and overcome the key challenges, in May 2019, the NDRC and NEA announced the *Circular on Establishing and Improving the Mechanism for Guaranteeing the Consumption of Electricity from Renewable Energy Sources*, effective from 2020, which establishes mandatory annual renewable consumption targets for each province in China. This policy is also interpreted as Chinese renewable energy portfolio standard (RPS). Under the RPS scheme, the grid companies, electricity retailers, electricity buyers in the wholesale market and captive power plants are required to fulfil the renewable energy consumption target and responsibility.

(2) Development of provincial electricity spot markets

The electricity spot market construction is an important part of the new round of power system reform to encourage the greater utilization of the curtailed renewable energy and drive more cost-competitive renewable energy in China. In August 2017, NDRC and NEA jointly released the notice to launch the electricity spot trading markets in 8 pilot regions. Except the pilot markets, the interprovincial curtailed renewable spot trading allows the curtailed renewable power to be traded between different provinces, which effectively promote the allocation and consumption of renewable energy and accelerate the development of national electricity spot market.

(3) ETS

Since 2013, China has been implementing several pilot carbon markets in order to encourage enterprises to reduce emissions and meet the goal of low-carbon development. In December 2017, China announced to launch a national emission trading system (ETS) which is expected to start in 2020. The ETS will initially cover the power sector and may expand to other key sectors in the future. As the majority of carbon emissions come from fossil-fuel consumptions, the carbon market also plays an important role to stimulate renewable energy development while pursuing a cost-effective emission reduction, for example, the China Certified Emission Reduction (CCER) credits generated from renewable energy sources can be used to offset the carbon allowance in the pilot market, thus the renewable energy producers can benefit from the additional revenues from selling carbon credits. It is also noticed that Chinese government suspended to approve and issue CCERs since 2017, the detailed rules on the use of CCERs in the national ETS have not published yet.

Responsible government department: (include key contacts)

In China, the legal framework is a sophisticated system with distinctive hierarchies. The national laws provide broad guidance and are procedurally more difficult to amend. Accordingly, it is the secondary regulations and rules that truly drive the reforms in the industry. The NDRC regulates pricing. The SERC focuses on administration and market regulations. The SASAC, in turn, supervises power corporations. Other specific regulations, such as environment issues and land use rights, are developed by the corresponding governmental bodies. (World Bank)

According to Article 5 of the Renewable Energy Law of the People's Republic of China, "*The administrative department of energy of the State Council shall conduct unified administration of the development and utilization of renewable energy throughout the country. Other relevant departments of the State Council shall, according to their respective functions and duties, conduct administration of the development and utilization of the relevant renewable energy*".

The key administrative departments of renewable energy

(1) National Development and Reform Commission (NDRC)

NDRC is responsible to promote the strategy of sustainable development; to undertake comprehensive coordination of energy saving and emission reduction; to organize the formulation and coordinate the implementation of plans and policy measures for recycling economy, national energy and resource conservation and comprehensive utilization; to participate in the formulation of plans for ecological improvement and environmental protection; to coordinate the solution of major issues concerning ecological building, energy and resource conservation and comprehensive utilization; to coordinate relevant work concerning environment-friendly industries and clean production promotion.

In accordance with relevant regulations of the State Council, the NDRC is also responsible for the administration of the National Energy Administration.

The website: <https://en.ndrc.gov.cn/>

(2) National Energy Administration (NEA)

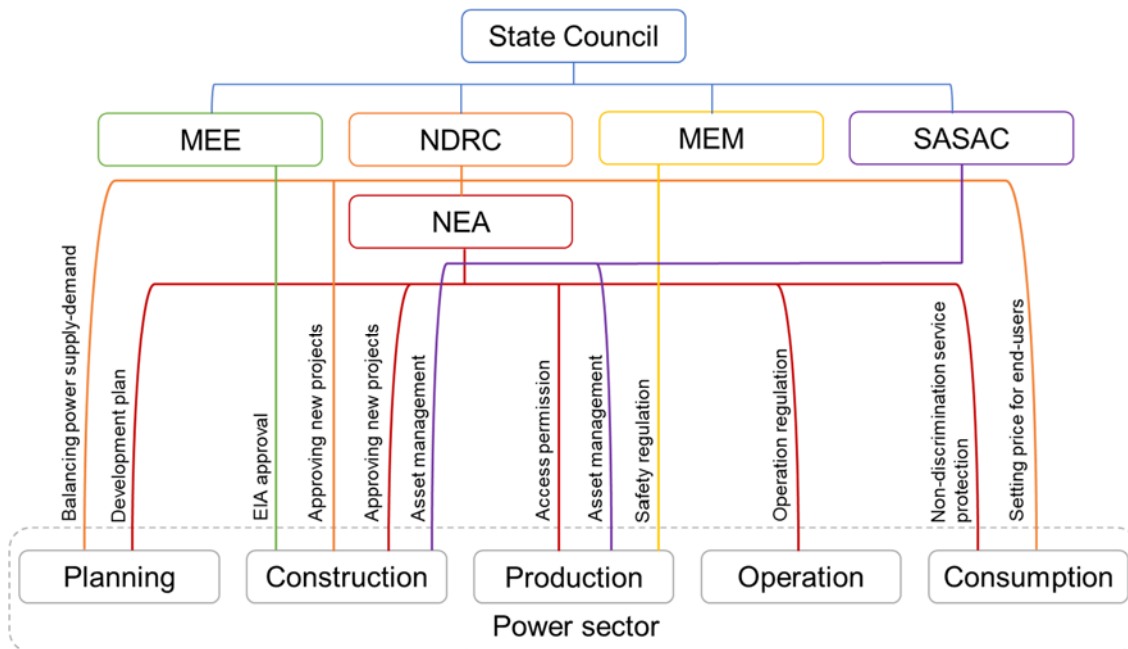
NEA is responsible:

- To draft laws and regulations concerning the supervision and administration of energy development; draft and organize the implementation of development strategies, plans and policies related to the development of energy industry; promote the institutional reform of the industry; draft reform proposals; and coordinate major issues concerning the process of energy development and reform;
- To formulate industrial policies and standards related to coal, petroleum, natural gas, electricity, new energy, renewable resources, the petroleum refining industry, the coal-made fuel industry, and the fuel alcohol industry; examine, approve and verify the investment in fixed energy assets within the jurisdiction; guide and coordinate energy development in rural areas;
- To be responsible for energy conservation and integrated use of natural resources; participate in analyzing and setting minimum-cost goals for energy consumption; guide, supervise and control total consumption of energy; rationalize energy production; and achieve balance between supply and demand;
- To supervise, regulate and standardize the electricity market; supervise and examine power rates; set prices for ancillary electricity services; analyze and provide advice on general electricity services; take charge of administration and law enforcement concerning the electricity industry; and ensure the quality of oil-gas pipeline equipment;

- To supervise and regulate the safety and reliability of electricity production; take action during any electricity emergencies; formulate rules and regulations of operational security and engineering quality in terms of the electricity industry - except for the use of nuclear power; issue administrative permission according to the law; organize or participate in the investigation of safety mishaps during electricity production.
- To organize and promote international cooperation on energy development; negotiate and sign contracts with departments and organizations from overseas; coordinate the exploitation and utilization of energy outside China; and examine and approve major overseas energy investment projects.
- To participate in formulating policies on energy, natural resources, finance and taxation, environmental protection, and solutions to climate change; provide advice on price regulation and total quantity of importation and exportation.
- To undertake specific tasks entrusted by the National Energy Commission; take charge of the general coordination of development strategies and policy decisions on energy development; provide services to ensure energy security; and promote the establishment and improvement of an interactive coordination mechanism.
- To undertake other tasks as requested by the State Council, the National Energy Commission, and the National Development and Reform Commission.

The website: www.nea.gov.cn

In terms of power sector, as well as renewable electric power, as illustrated in the figure below, NDRC and NEA are also the key administrative departments for the supervision and control of electric power industry according to the *Electric Power Law of the People's Republic of China*.



NDRC: National Development and Reform Commission; NEA: National Energy Administration; MEE: Ministry of Ecology and Environment of the PRC; MEM: Ministry of Emergency Management of the PRC; SASAC: State-owned Assets Supervision and Administration Commission of the State Council.

Source: Tan Rongyao and Zhao Guohong, *Exploration and practice of energy regulation in China (2016)*

Existing/Planned energy legislation: (is there a CPO)

There are national laws, ministerial regulations, guiding opinions, measures and procedures, local rules and regulations, self-regulation rules of the industry and internal governance rules in China. (World Bank)

The main laws in the energy sector are listed below:

National Laws:

The Electric Power Law of the PRC (adopted in 1995; amended in 2009, 2015 and 2018);
Renewable Energy Law of the PRC (adopted in 2005; amended in 2009);
The Energy Conservation Law of the PRC (adopted in 1997 and enforced in 2008; amended in 2016 and 2018)

Recently, in April 2020, NEA announced a public consultation for a draft Energy Law, which has been modified since 2017, setting the agenda for “green, low-carbon” production and a “safe and efficient” energy system. The draft energy law highlights the priority of developing renewable energy and increasing the proportion of non-fossil fuel energy. Besides, the draft law also includes the RE target scheme, the RE consumption guarantee scheme, developing and incentive policy, and the RE preferential access to the grid.

Environmental legislation for RE:

On 28 February 2005, the *Renewable Energy Law of the PRC* was adopted at the 14th Meeting the Standing Committee of the 10th National People’s Congress (NPC) and enforced on 1 January 2006 and was amended in 2009. The law is enacted for the purpose of promoting the development and utilization of renewable energy, and plays an important role in the adjustment of energy structure, reduction of energy intensity and carbon emissions. Pursuant to the law, a series of renewable regulations were formulated by relevant departments and local governments including *Catalogue for the Guidance of the Industrial Development of Renewable Energy*(29/11/2005); *Provisional Administrative Measure on Pricing and Cost Allocating for Renewable Energy Power Generation* (04/01/2006); *Administrative Provisions on Renewable Energy Power Generation* (05/01/2006); *Interim Measures for Management of Special Fund for Renewable Energy Development* (30/05/2006); *the Interim Measures for Allocation of Income from Surcharges on Renewable Energy Power Prices* (11/01/2007); *Regulatory Measures for Grid Enterprises’ Full Purchase of Renewable Energy Electricity* (25/07/2007); *the Interim Measures for the Administration of the Collection and Use of the Renewable Energy Development Fund* (29/11/2011); *The 11th Five-year Plan on the Development of Renewable Energy* (2011); *The 12th Five-year Plan on the Development of Renewable Energy* (2013); *The 13th Five-year Plan on the Development of Renewable Energy* (2016); *Administrative Measures on Protective Full Purchase of Renewable Energy Generation (also known as "Document 625")* (2016); *Notice on Trial Operation of Green Certificate Issuance and Voluntary Trading of Renewable Power* (2017); *Circular on Establishing and Improving the Mechanism for Guaranteeing the Consumption of Electricity from Renewable Energy Sources* (2019);

Existing/Planned energy certificate systems:

The existing energy certificate systems

In January 2017, NDRC, the Ministry of Finance (MOF) and NEA jointly released the notice “*Notice on Trial Implementation of Renewable Energy Green Electricity Certificate Issuance and Voluntary Subscription System*”, which aims to promote the renewable energy consumption and improve the subsidy mechanism for wind and solar power generation. According to the rules of GEC, enforced immediately on 1 January 2017, the GEC trading is a voluntary subscription and selling behaviour, and

the GEC can only be traded once on the GEC trading platform. The State Renewable Energy Information Management Center is the official unit to issue the GEC.

The GEC scheme pegs a price for the mechanism to the level of renewable energy subsidies and as such in some ways is not entirely market driven. As a result, once the GEC is sold to the voluntary buyers, the wind or solar power producers will no longer receive the equivalent subsidies from the government.

The planned energy certificate systems

In order to promote the renewable energy consumption in a mandatory scheme, in May 2019, the NDRC and NEA announced the *Circular on Establishing and Improving the Mechanism for Guaranteeing the Consumption of Electricity from Renewable Energy Sources (Fagai Energy [2019] Doc. 807)*, effective from 2020, which establishes mandatory annual renewable consumption targets for each province in China. Instead of the policy name as renewable energy “quota” system, the policy name is changed as renewable energy “consumption guarantee” that aims to mandatorily promote renewable energy consumption from provincial level. This policy is also interpreted as Chinese renewable energy portfolio standard (RPS) with tradable GEC. Under the RPS scheme, the grid companies, electricity retailers, electricity buyers in the wholesale market and captive power plants are required to fulfil the renewable energy power (REP) and non-hydro renewable power (NREP) consumption target and responsibility. If they fail to meet the target, they can either to purchase the excess amount of power consumed by another market participant who would otherwise exceed its annual power consumption standard, with the price being solely determined by the two parties; or willing to purchase GEC from the market. The GEC under RPS scheme includes all renewable energy sources not only wind and solar power under the current voluntary GEC market but also other renewable sources such as biomass, municipal solid waste incineration (MSW) power generation, etc. In accordance with the “Opinions on promoting the healthy development of non-hydro renewable energy power generation”, the GEC under the RPS will start trading from 1 January 2021.

However, the regulatory notice for RPS and GEC market is just a beginning, the detailed rules of GEC market shall be further identified, for instance, the role of voluntary GEC and its relationship with RPS shall be clearly defined before the GEC market under RPS starts in 2021. In addition, currently, some wind power and solar power projects can be developed as CCER projects to claim carbon credits and obtain additional revenues. Meanwhile, they can also apply for GEC, which may cause double-counting. Thus, the relationship between GEC and carbon credits, i.e. Chinese Certified Emission Reduction (CCER), or the integration of different schemes, shall be also considered.

International REC Standard (I-REC Standard)

The I-REC Standard has allowed the issuance of I-RECs in China to majority State-owned renewable energy production devices if the equivalent energy is not presented on the GEC to eliminate a double counting or double issuance. The I-RECs issued from Chinese renewable energy production devices can be sourced either from Chinese participants or international participants who registered on the I-REC Standard registry. Similar to all energy attribute certificate systems, the I-RECs issued from a device in China can be redeemed for use in every province of China or even other countries. On the other hand, the I-RECs provide an alternative option for Chinese RE producers to benefit from selling I-RECs while the global end-users are aiming to achieve a green target.

Extent of engagement with government:

Although the GEC will be purchased in a voluntary and market-based scheme in both existing GEC market and planned GEC market under RPS practically starts in 2021, the GEC market is still a government driven market and the government will play a leading role in the RPS scheme and GEC market. In accordance with “*Circular on Establishing and Improving the Mechanism for Guaranteeing the Consumption of*

Electricity from Renewable Energy Sources", the State Council and its key administrative departments will be responsible for establishing the renewable energy quota obligations and targets to each province. The provincial energy authorities, together with the other administrative departments and local government, will take a lead to motivate, regulate and track the power producers, power grids and power consumers to fulfil the obligations and achieve the targets correspondingly.

In addition to the responsibilities on the quota allocation and supervision, the government will be also engaged in establishing the fairness of initial RE quota allocation process, based on the allocation formulas in a transparent way, and administrative punishment mechanism; securing the quality assurance of RE consumption auditing and measurement; capacity building/training and evaluating the impacts of RPS/GEC market, etc.

As indicated above, the I-RECs provide an alternative option for Chinese RE producers to benefit from selling I-RECs while the global end-users are aiming to achieve a green target. However, neither Chinese RE producers nor international end-users have sufficient understanding and recognition on I-RECs due to a limited national involvement. The I-REC Standard has engaged with entities from NEA, China Renewable Energy Engineering Institute, National Renewable Information Centre (NRIC) and other organizations at various times. These engagements have been fruitful and suggested the continuation of issuance of I-RECs is seen as beneficial for renewables producers. Via conversations with SOEs there is a perceived need for I-RECs given the current policy framework and an expectation for the involvement in the international REC market.

Response from Government in relation to attribute tracking systems:

Before the enforcement of RPS scheme, the RPS has been compromised to the FIT subsidy policy for a long time. The key difference between FIT policy and RPS is the benefit allocation. Under the FIT subsidy policy, RE power generation enterprises have an explicit promised economic incentive, while the local governments are competing for national financial subsidies. The increased electricity costs will be finally allocated to the whole nation, and the local governments do not have any pressures for the additional charges to the price of electricity generated by using renewable energy resources. Under the RPS, however, RE power producers will obtain such revenues depends on how much GEC they can sell, and local governments will under pressure to raise local electricity prices. In general, the FIT incentive policy is easier to the local government and RE power producers, but the central government has to take all pressures on the subsidy and decision-making. Under the RPS, on the other hand, the enterprises have to face competitive pressures, and the local governments will take decision-making risks.

Following the enforcement of RPS scheme, one of the questions emerging to the government is how to promote or integrate the GEC in the voluntary market with different markets. As Chinese government will continuously enhance international cooperation, there should be a need to establish a cooperative mechanism with different especially the effective international REC markets. Recently, the I-REC and Chinese GEC has not established a linkage or mutual recognition scheme yet, however, this would be possible due to government engagements in the past and the consideration for linking and involving international REC market as a proposed plan.

Demand-side market potential or strategic nature of market development:

Potentials in the existing GEC market

Since July 2017, according to the statistics from the GEC trading platform, the volume of total issued GEC is over 27 million, which includes over 23.6 million for wind power generation and over 3.8 million for

solar power generation. However, the voluntary GEC market demand is not strong, only less than 40,000 GEC were transacted in the past years. The key reasons for over-supplying GEC includes (Hong Ruichen-Internatioanl Institute of Green Finance):

- (1) the weakness of voluntary purchase: unlike other financial products, GEC can only trade once that weakens the nature of trading. Besides, an enforceable and voluntary subscription of GEC is not economic attractive and important for the potential buyers.
- (2) Wind varieties of GEC products and price: according to the statistics, more than 670 GEC products are available on the GEC platform which would be difficult for the potential buyers to choose from 524 types of wind GEC and 146 types of solar GEC. In addition, the price of GEC is between 128.6RMB to 872.8RMB that is relatively high for the potential buyers especially for the international buyers.
- (3) The rules of GEC under RPS: although the RPS scheme will definitely stimulate the GEC market, the detailed rules of GEC should be further improved.

Potentials in the planned GEC market

Despite the problems of existing GEC market, the GEC will still play an important role in RPS scheme to allow the provincial buyers to fulfil the RPS obligations and targets through a voluntary subscription of GEC as an alternative way. Based on the notice on the provincial rate of renewable energy power consumption in 2020 recent issued by NEA in June 2020 (illustrated in the table below), 10 provinces or regions have a minimum target for RE power consumption above 30%, while 9 provinces/regions have a minimum target for NREP consumption above 15%. If the targets could be achieved, according to the assumptions by NEA, the share of power consumption from renewable energy in the total national power consumption will be 28.2%, and the share from NREP consumption will be 10.8% in 2020.

Based on the official report on the evaluation of national development of renewable energy power in 2018 published by NEA in June 2019, 19 provinces missed the target for the NREP consumption. On the other hand, thanks to the abundant renewable resources, 10 provinces exceed their obligated targets in 2018 and probably becomes the potential GEC suppliers. Yunnan, Xinjiang and Liaoning provinces are the largest three GEC suppliers who share 2/3 of total surplus RE quota. According to an assessment report (Wang Rui), the total surplus RE quota is 20,100GWh while the demand of RE quota is 81,700GWh in 2018, which may result in many GEC demands. Besides, based on the difference between the costs of wind power generation and the FITs of coal-fired power generation, the assessment report assumes the GEC price should be ranged from 7.43RMB to 79.06RMB, and emphasizes that the price will not be lower than 79.06RMB due to the lack of GEC supply. However, BloombergNEF has an opposite opinion on the GEC price and RE power consumption. According to their assumption, the surplus RE quota will be 3-13 times more than the RE quota demands that will cause an over-supply for GEC and have a significant impact on the GEC price in 2020.

Based on report on the evaluation of national development of renewable energy power in 2019 published by NEA in May 2020, the fulfilment for both NREP and RE targets were remarkably improved, only 6 provinces missed their target for RE power consumption and 9 provinces missed the NREP consumption target in 2019, and both RE quota and NREP quota had a net surplus at 149,528GWh and 60,606GWh. Thus, it would be anticipated the surplus RE/NREP quota will have a considerable impact on the GEC price.

The potential GEC market demands will become clear when the actual data in 2020 is available and the detailed rules of GEC is defined by the government, and the clear trend is China will continuously promote renewable energy development through various market-based measures and overcome problems and obstacles to the RPS and GEC market.

The Provincial target of RE/NREP power consumption in 2020

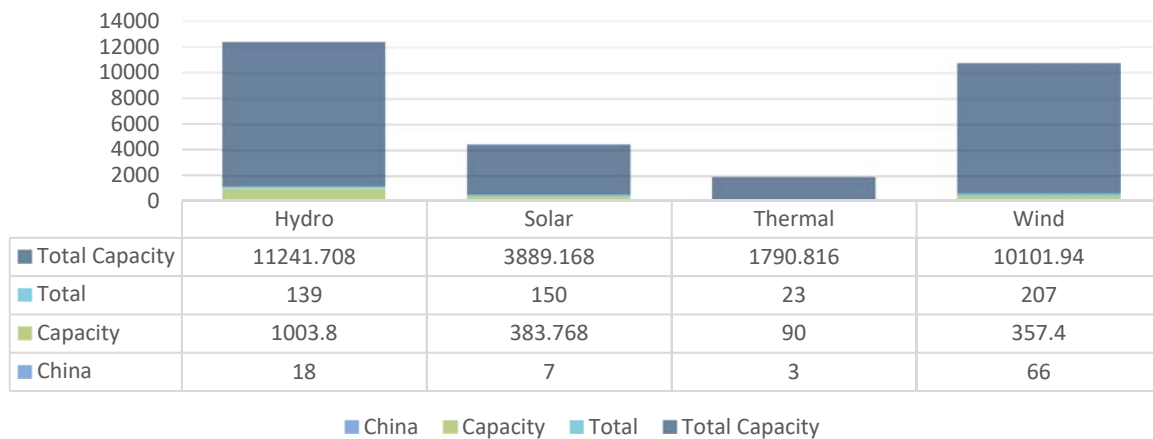
Province	RE power consumption		NREP consumption	
	Minimum target	Expected target	Minimum target	Expected target
Beijing	15.50%	16.90%	15.00%	16.50%
Tianjin	14.50%	15.90%	14.00%	15.40%
Hebei	13.00%	14.40%	12.50%	13.80%
Shanxi	17.00%	18.80%	16.00%	17.60%
Inner Mongolia	18.00%	19.70%	16.50%	18.20%
Liaoning	15.00%	16.60%	12.50%	13.80%
Jilin	24.00%	26.60%	18.50%	20.40%
Heilongjiang	22.00%	24.40%	20.00%	22.00%
Shanghai	32.50%	36.30%	4.00%	4.40%
Jiangsu	14.00%	15.40%	7.50%	8.30%
Zhejiang	17.50%	19.60%	7.50%	8.30%
An'hui	15.00%	16.70%	12.50%	13.80%
Fujian	19.50%	21.80%	6.00%	6.60%
Jiangxi	22.00%	24.40%	9.00%	9.90%
Shandong	11.50%	12.60%	11.00%	12.10%
Henan	17.50%	19.40%	12.50%	13.80%
Hubei	32.50%	35.60%	8.00%	8.80%
Hunan	40.00%	44.30%	9.00%	9.90%
Guangdong	28.50%	32.00%	4.50%	5.00%
Guangxi	39.50%	43.90%	7.00%	7.70%
Hainan	13.50%	14.90%	6.50%	7.20%
Chongqing	40.00%	44.50%	3.50%	3.90%
Sichuan	80.00%	89.30%	6.00%	6.60%
Guizhou	30.00%	33.30%	6.00%	6.60%
Yunnan	80.00%	89.00%	15.00%	16.50%
Shaanxi	17.00%	18.80%	12.00%	13.20%
Gansu	44.50%	48.80%	16.50%	18.20%
Qinghai	63.50%	70.70%	25.00%	27.50%
Ningxia	22.00%	24.10%	20.00%	22.00%
Xinjiang	20.00%	22.10%	10.50%	11.60%
Tibet	N.A.	N.A.	N.A.	N.A.

(Source: NEA)

International REC (I-REC)

According to the statistics in March 2020, over 8 million I-RECs were issued in China in 2019 which shares 47.3% of total issued I-RECs. As illustrated in the figure below, 94 renewable energy production devices in China were registered till March 2020, which shares over 18% of total registered devices approved by the I-RECs. In addition, over 14.6 million I-RECs was redeemed from April 2019 to March 2020.

TOTAL REGISTERED DEVICES AND CAPACITY



Analysis of political disruptions or market risks:

Although the government has experienced a market-based mechanism in many fields that should be helpful to regulate the RPS and GEC market, the political interruptions might be happened to mediate the market imbalance between the supply and demand of GEC. Such interruption has been used in the carbon market, particularly NDRC announced an unforeseen suspension notice for CCER issuance in March 2017 in order to avoid an over-supply; the government auctioned carbon allowance from the government reserve in pilot markets to overcome the shortage of allowance supply and reduce the market monopoly.

In addition, the government may also carefully concern how to interact with other energy attribute certificates (EAC) scheme such as I-REC to accelerate the renewable energy development and improve a diversified EAC system to maintain a stable RPS and GEC market. Any influences or conflicts shall be prevented from political interruptions.

Analysis of regulatory risks including linkages with carbon markets and support systems:

In addition to GEC market, carbon market, energy use right and energy saving market all carry out energy consumption control from the perspective of energy management and control, and the linkage between various mechanisms needs to be handled properly. For instance, currently, MEE is the administrative unit for ETS, and NDRC is the administrative unit for energy use right and energy saving market.

On 19 December 2017, NDRC announced the launch of the national carbon market, which is an important milestone in the construction of China's carbon emission trading system (ETS). At present, some wind power and solar power projects are developed as CCER projects to claim carbon credits and obtain additional revenues. Meanwhile, they can also apply for GEC, which may cause double-counting. Although NDRC temporarily suspended to issue CCER in March 2017, there might be a double-counting risk if CCER is re-opened and used to offset the carbon allowance in the national ETS. Therefore, to avoid the regulatory conflicts and risks between different mechanism, the relevant departments from different mechanisms should strengthen inter-departmental communication, design the system with an entire consideration, avoid double counting and issuance to accelerate RE development and emission reduction.

Current environmental reporting in energy:

National Bureau of Statistics of China provides national statistic reports in energy with annual statistical communique, statistical yearbook, quarterly and monthly data. More details are available on: <http://www.stats.gov.cn/english/>

The other reports in the specific fields such as renewable energy, electricity market, are mainly available on:

NEA: operational data for wind and solar power (2019-Q1Q2 of 2020):

http://www.nea.gov.cn/2020-02/28/c_138827910.htm

http://www.nea.gov.cn/2020-02/28/c_138827923.htm

http://www.nea.gov.cn/2020-07/31/c_139254298.htm

http://www.nea.gov.cn/2020-07/31/c_139254346.htm

China Renewable Energy Engineering Institute (CREEI):

China Renewable Energy Development Report 2019:

<http://www.creei.cn/portal/article/index/id/25365/cid/6.html>

<http://news.bjx.com.cn/html/20200724/1091729.shtml>

China Electric Power Planning and Engineering Institute (EPPEI):

China Energy Development Report 2019

China Electricity Development Report 2019

<https://mp.weixin.qq.com/s/utoECnHNeH46G7OSIGEemA>

China Electricity Council (CEC):

China Power 2019: <https://english.cec.org.cn/detail/index.html?3-851>

Mechanisms in place to support the reliable verification and issuance of I-RECs:

In order to have a reliable verification and issuance of I-RECs, the I-REC Standard has an in depth discussion with national authorities for authorizing a national issuer to implement I-REC based on the I-REC code rules and regulations in China. Such collaboration will provide a flexibility to the domestic RE producers to trade their certificates in different system or possible a coexist or mutual recognition system.

The qualified third parties can be certified by the national issuer to validate and verify the registration of RE devices and issuance of I-RECs.

Local organizations of importance and their opinion on local I-REC market development:

Neither many state-owned RE producers nor international organizations in China are familiar with I-RECs due to a very limited information about I-REC available in China. However, with the interview with some state-owned RE producers, most of them believe I-RECs provide a meaningful alternative for obtaining additional revenues since the FIT subsidy is delayed and the proposed RPS/GEC market is unclear. As the national policy does not prohibit the issuance of I-REC, many of them are considering to register some of their RE devices for issuing I-RECs, and they may consider to register more if the market demand is considerable.



Any other relevant information:

N.A.

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