China's solar photo-voltaic power generation industry policies analysis

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Abstract. Solar photovoltaic, as a new type of energy, is a clean, efficient energy that China strongly encourages and supports to use. With the proposal of the “Carbon-neutral” and “Carbon-peak” strategic goals, China’s photovoltaic power generation industry has developed rapidly in recent years. In order to support the development of China's photovoltaic power generation industry, both central and regional governments issued policies and measures. However, there are also some problems such as incomplete policies, monopoly of upstream enterprises, the inability of mutual transmission among various places, photovoltaic cell consumables and recycling. In order to solve the above problems, this paper focuses on the development background and characteristics of the solar photovoltaic power generation industry, systematically expounds on the evolution process of China’s photovoltaic energy generation industry policies at the national and local levels, and finds that the characteristics of the policies issued in the photovoltaic field in China are that subsidy policies dominate, and there are many subsidy policies aimed at the mid-stream and down-stream of the industrial chain. Besides that, there are also few policies for photovoltaic transmission between different places; In terms of benefits, the installed capacity of photovoltaic power generation in China has gradually increased, and the environment in China has indeed improved, but the upstream of the industrial chain has obvious interest concentration and monopoly. Therefore, this paper puts forward several policy recommendations to accelerate the high-quality development of China’s photovoltaic industry.

Keywords: Photovoltaic Power, Sustainable Development, Carbon Peak Carbon Neutrality, Policy Analysis, Industrial Policy.

1. Introduction

As a kind of clean, green and efficient renewable energy, photovoltaic has been widely concerned and valued by all countries worldwide. As a new energy mode, the development of photovoltaic power generation has regional, national and global multi-dimensional significance, so the development of the photovoltaic industry cannot be separated from the governmental macro policies’ guidance and the adjustment of the market mechanism. China’s photovoltaic industry began in the 1980s. Then, in 2001, China launched the "bright project plan", which aims to address the power consumption problem in remote mountainous areas with photovoltaic. In 2006, China launched the "golden sun project" to boost the industrialization and large-scale development of China’s photovoltaic power generation industry. After 20 years of exploration, China’s photovoltaic industry began in 2010.

In terms of the policies, China mainly adopts the installed capacity and electricity price subsidy policies. For example, in 2013, “The notice on improving the price policy of photovoltaic power generation” was issued; In 2014, “The notice of the National Energy Administration on Further Strengthening the construction and operation management of photovoltaic power stations” was issued.

In 2020, with the proposal of the “Carbon-neutral” and “Carbon-peak” strategic goals, photovoltaic gradually became the leading role in China’s energy transformation. From the “12th Five-year Plan” to the “13th Five-year plan”, the photovoltaic industry was officially listed as a strategic emerging industry. It can be seen from the following data that China’s photovoltaic grid-

connected installed capacity has increased year by year: 34.54 million kilowatts in 2016,53.06 million kilowatts in 2017, 44.26 million kilowatts in 2018, 30.11 million kilowatts in 2019, 48.2 million kilowatts in 2020 and 54.93 million kilowatts in 2021. In 2022, the National Energy Administration issued “the implementation plan on promoting the high-quality development of new energy in the new era”,which proposed that by 2030, the total installed capacity of solar power generation should reach more than 1.2 billion kilowatts. According to the National Bureau of Statistics, by 2021, the newly added grid-connected installed capacity of photovoltaic power generation has reached 300 million kilowatts, which is 900 million kilowatts away from the 2030 target. Therefore,the prospect of the market is very broad.

To sum up, it is undeniable that China's solar photovoltaic power generation industry has indeed developed rapidly. At the same time, the government has also given a lot of policy support at the level of electricity price and installed capacity. However, throughout the development process of the photovoltaic industry, most of China's policies are biased towards the middle and lower reaches of the photovoltaic industry chain, and there are few relevant policies on the upstream supply side to restrict monopoly. Besides that, the policies on integrating solar photovoltaic power generation into the State Grid and the surplus power trading market have also not been established and improved.

In order to solve the above problems, this paper analyzes the relevant policies and industrial development status of China’s photovoltaic power generation industry, implementation paths and effects issued by China in the photovoltaic power generation field from the economic and environmental benefits aspects. At last, several countermeasures and suggestions are put forward in this paper to establish or improve the policy balance and the price system of China’s photovoltaic industry so as to promote the orderly and healthy development of China's photovoltaic power generation industry.

2. China’s photovoltaic industry policy development background

Achieve carbon neutrality and carbon peaking goals. China’s photovoltaic industry has become one of the most important engines of China’s energy revolution. This article divides the development process of China’s photovoltaic industry policies into three different stages: the first stage is the embryonic stage. When underdeveloped. The second stage is the promotion stage. From the Eleventh Five-Year Plan (2006-2011) to the Thirteenth Five-Year Plan (2016-2020), the Chinese government proposed specific policies to stimulate the photovoltaic industry. In the third stage, China will list the photovoltaic industry as a strategic emerging industry in the 14th Five-Year Plan (2021-2025) and focus on planning and developing a new energy structure.

2.1 The Embryonic Stage of photovoltaic in China (1980-2005)

China’s photovoltaic power generation started in the 1980s. The central and local governments first invested in the photovoltaic industry, which enabled China’s tiny photovoltaic industry to gain initial development and opened the prelude to China's photovoltaic power generation.

In 2005, China’s photovoltaic industry began to receive demand from the European market, and the main link was the export of polysilicon and batteries[1]. China’s installed capacity is relatively small at this stage, and the Chinese government has no clear photovoltaic policy support.

2.2 The initial stage of China's photovoltaic industry: (2006-2020)

In 2006, China promulgated the “Renewable Energy Law of the People’s Republic of China”, in which set the development and utilization of renewable energy as the priority area of energy development and aimed to promote the increase of energy supply, improving the energy structure and ensuring energy security[1]. To encourage and support the development of the photovoltaic industry, the Chinese government has issued regulations and policies to support and regulate the development of China’s photovoltaic industry and the relevant fields of industry such as finance, taxation, subsidies and land policies. Relevant policies and timing will be mentioned in the Regional Policies section.

Due to the financial crisis in Europe in 2008, the photovoltaic industry lost its original subsidies[2]. The demand for photovoltaic modules was significantly reduced, resulting in severe unsalable products for Chinese photovoltaic enterprises, requiring enterprises to stop production or even close down. Therefore, China issued the policy of "Several Opinions on Restraining Overcapacity and Duplicated Construction in Some Industries and Guiding the Healthy Development of the Industry" to promote the healthy development of the polysilicon industry and successively launched the "Golden Sun Project" project to guide the development of the domestic photovoltaic industry. In 2013, Japan had to close down due to the leakage of the Fukushima nuclear power plant, which led to high demand for electricity, and the photovoltaic industry introduced by Japan was very supportive. Chinese companies seized this opportunity to enter the Japanese market, such as Suntech and Canadian Solar. The photovoltaic manufacturing industry has begun to focus rapidly on China, and China has become the primary market for global photovoltaic development. From 2013 to 2017, China's photovoltaic installed capacity increased from 12.92GW to 53.06GW, an increase of 40.14GW compared to 2013[1]. The substantial growth in the number of photovoltaic installations has made photovoltaic technology more mature, and the cost of photovoltaic power generation has been dramatically reduced. Before this, the photovoltaic subsidies proposed by the government were unbearable. In 2017, China's subsidy per degree was about 0.4/ kWh, and the total installed capacity was about 50GW. If the sufficient sunshine time is 1,200 hours a year, the subsidy for one year is 24 billion yuan. This is a substantial financial expenditure. So in 2018, in order to solve this problem, China issued the "Notice on matters related to photovoltaic generation in 2018" policy, which included the suspension of the construction of centralized photovoltaic power plants, and only 10GW of distributed photovoltaic were arranged. This significantly impacted the photovoltaic industry at that time, and the development of photovoltaic also entered a freezing period. In 2019, China's energy department convened a symposium with photovoltaic industry companies to clarify the bidding model. Enterprises will declare electricity prices to the state based on the cost of their production. The lower the price, the fewer subsidies required, but the chance of winning the bid. Becomes bigger.

2.3 Rapid Development Stage (2021)

Since 2020, China's photovoltaic industry has begun to develop rapidly. The scale of photovoltaic bidding projects exceeded expectations. The Ministry of Energy of the Chinese government issued the "Notice on Announcement of the 2020 National Subsidy Bidding Results for photovoltaic Power Generation Projects". About 434 projects nationwide were included in the 2020 bidding subsidies, slightly exceeding the industry's 20-25GW expectation. According to the data from the NEA, the total installed capacity of photovoltaic power generation in China will meet 307 MW by the end of 2021, and the newly installed capacity will reach 55 MW 2021. The "Implementation Plan for Promoting the High-quality Development of New Energy in the New Era" issued by China's energy department at the end of May 2022 set the goal as: by 2030, China's total installed capacity of wind and solar power will reach the target of more than 1.2 billion kilowatts. Promote the application of new energy in the industrial and construction fields. From the national level, the photovoltaic industry is a sunrise industry supported by the state. In the next ten years, China will vigorously increase the scale of photovoltaic installations, promote industrial development, and reshape the energy system. From the enterprise side, close cooperation with the government has become a key reason for the substantial increase in installed capacity. For example, the agreement signed between Baofeng Group and the Jiuquan government of Gansu Province includes an annual output of 30GW of photovoltaic modules and 15GW of photovoltaic. The other is Shangji Automation. This company plans to invest in a project with an annual output of 150,000 tons of high-purity industrial silicon and 100,000 tons of high-purity crystalline silicon in Guyang County, Baotou City, Inner Mongolia, in order to expand new silicon material supply channels [3].

Table 1. China's photovoltaic Industry Policy over 1993-2021

Name	Type	Time
Science and Technology Law	Law	1993
9th five-year plan	National Plan	1995
The China Electric Power Law	Law	1995
10th five-year plan	National Plan	2001
11th Five-year Plan	National Plan	2006
Catalog of Chinese High-Tech Products for Export includes photovoltaic industry	National Plan	2006
Renewable Energy Law	Law	2006
Energy Conservation Law	Law	2008
Thousand Talents Plan	National Plan	2008
Renewable Energy Law (Amendment)	Law	2009
12th five-year plan	National Plan	2010
12th Five-Year Development Plan for the Solar photovoltaic Industry	National Plan	2012
Energy Development Strategy Action Plan	National Plan	2014
13th Five-Year Plan	National Plan	2015
14th Five-Year Plan	National Plan	2020
Guidance on energy work in 2021	National Plan	2021

3. Regional photovoltaic Policies

3.1 Beijing-Tianjin-Hebei Region's policies

The “Beijing-Tianjin-Hebei Energy Coordinated Development Action Plan (2017-2020)” jointly formulated by the Beijing-Tianjin-Hebei Development and Reform Commission (2015) was issued and implemented, and measures for the development of renewable energy based on geothermal energy, wind energy and solar energy [4]. In the later period, in 2022, Beijing issued the local policy of the “14th Five-Year Plan for Energy Development in Beijing” to encourage residential photovoltaic applications and lead new urban and rural residential photovoltaic power generation in old urban residential buildings and comprehensive renovation projects. Tianjin issued the “Work Plan on Implementing Several Policies and Measures to Support the Construction of Bincheng”, encouraging the use of idle anchorages and idle anchorages such as built docks and breakwaters to build decentralized clean energy projects. At the same time, the government is also working hard to build offshore photovoltaic. Hebei Province is rich in light resources and has become one of the critical provinces for photovoltaic development. According to China's energy sector, the cumulative installed capacity of photovoltaic in 2021 has reached 29.21 GW. In June 2022, Hebei Province strives to increase the installed capacity of more than 8 million kilowatts and also drives 37 counties to add rooftop distributed photovoltaic development pilots, promote pilot demonstrations, and ensure that 50% of the total tasks are completed in 2022.

Although the Beijing-Tianjin-Hebei regions are geographically adjacent, their respective research and formulation of energy plans under their jurisdiction lack coordination. The action plan proposes “eight major synergies”, including energy strategy synergy, energy facility synergy, energy governance synergy, energy green development synergy, energy operation synergy, energy innovation synergy, energy market synergy, and energy policy synergy, so as to promote the construction of ecological civilization and improve air conditions. Under the background of coordinated development of Beijing-Tianjin-Hebei region, there are four conditions for vigorously

developing photovoltaic power plants in this region: First, it is in line with industrial policies; Second, the natural conditions are superior, and the light resources are abundant; Third, the region is relatively broad; Fourth, the reduction in construction costs provides favorable conditions for the large-scale promotion of the construction of distributed photovoltaic power stations. In order to better develop the regional photovoltaic industry, the government needs to increase policy support, such as tax reduction, loan guarantees and other preferential policies; Secondly, it is necessary for everyone to coordinate efforts and orderly in matters such as layout and location selection; Thirdly, it is necessary to increase the financing of the project to prevent the shortage of funds from causing problems such as the failure of the project risk assessment. By 2020, the installed capacity of photovoltaic power generation in the Beijing-Tianjin-Hebei region will reach 16.96 million kilowatts; At the same time, the Zhangjiakou Renewable Energy Demonstration Zone and the Chongli Low-Carbon Olympic Zone have also been successfully constructed; Green energy consumption accounts for 30% of the total final energy consumption [5].

3.2 Northwest photovoltaic Development Policies

Compared with other regions, the five northwestern provinces are more suitable for the development of the photovoltaic industry due to their unique geographical and climatic conditions. Since the Shaanxi Provincial Bureau of Quality Supervision officially issued the “Inspection Regulations for Monocrystalline Silicon Rods for Solar Cells” and “Inspection Regulations for Monocrystalline Silicon Wafers for Solar Cells” in 2011, the five northwestern provinces have been increasing policy support for the photovoltaic industry for 11 years. , including but not limited to, in 2014, the Chinese government jointly issued the “Notice on Implementing the Work Plan for photovoltaic Poverty Alleviation Projects” [4]. In 2015, the General Office of the Shaanxi Provincial Government issued the “Implementation Opinions on Demonstration and Promotion of Distributed photovoltaic Power Generation”. In order to better implement this policy, multiple departments in the province cooperated and jointly issued the “Provincial Measures for the Administration of Subsidy Funds for Distributed photovoltaic Power Generation Demonstration and Promotion” [4]. The Gansu provincial government has formulated the "12th Five-Year Plan"-an annual plan for developing green and sustainable energy in Gansu Province to further accelerate the construction of the photovoltaic application market in the province [5] and regulate and boost the healthy and sustainable growth the photovoltaic industry in the province. The policy support is perfect and powerful; The equipment manufacturing capacity is expanded, the local consumption power is significantly enhanced, and the contribution rate of the photovoltaic industry to the province's economic development is significantly increased [6]. In 2021, Xinjiang Autonomous Region Government will issue the “2021 Development and Construction Plan for Wind Power and photovoltaic Power Generation”, continue to deepen the reform of “decentralization, management and services”, optimize the business environment, and standardize development and construction orders. Although the policy continues to provide preferential treatment to the photovoltaic industry in the five northwestern provinces, there are still several problems that need to be solved: the lack of unified planning for photovoltaic power plants and power grids; The large-scale overcapacity of photovoltaic, and the long-term and large-scale high abandonment of light, resulting in a severe waste of resources; The development of photovoltaic resources is out of touch with industrial upgrading; The sustainable development capacity of the photovoltaic industry is insufficient. The high electricity price subsidy incentive policy has created the “superficial prosperity” of the photovoltaic industry. As the country continues to adjust the photovoltaic subsidy policy, China's photovoltaic industry is facing the problem of insufficient “hematopoietic function”. The barriers between provinces in the northwest region have not been effectively broken through. To this end, governments in the northwest need to coordinate resource development conditions and power supply transmission channels, scientifically and rationally select new energy distribution points, actively implement project construction conditions, and mobilize the investment enthusiasm of various market players. Strengthen the communication and coordination between the ecological ministries and the housing construction departments among the provinces,

and create favourable conditions for investment and utilization of photovoltaic power generation projects. The leap-forward development of photovoltaic in the northwest region has driven the rapid development of China's photovoltaic industry chain and cultivated manufacturing enterprises with a world influence, including photovoltaic inverters, photovoltaic crystalline silicon and other equipment and products, and China's photovoltaic equipment manufacturing equipment and products have become the world's most significant a critical force.

3.3 "Yangtze River Delta" 's Policies and "Pearl River Delta" 's Policies

Since neither the "Pearl River Delta" nor the "Yangtze River Delta" have the ideal geographical and meteorological conditions for the installation of photovoltaic industry, there are many distributed photovoltaic industries, which are far smaller than those in the northwest region [6]. In 2014, the two economically developed regions successively issued a number of Policies to encourage distributed photovoltaic industry: The Shanghai Municipal Government issued a notice on the "Administrative Measures for photovoltaic Power Generation Projects in Shanghai"; "Implementation Opinions on Promoting the Healthy Development of the Power Generation Industry", Jiangsu Province's Opinions on Promoting the Healthy Development of Distributed photovoltaic Power Generation (2014-2020) [6], which clarified the development goals of the photovoltaic industry and clarified the development goals of the photovoltaic industry. In addition, Shenzhen, Foshan, Guangzhou and other places have also successively issued policies to support photovoltaic power generation projects. Among them, Guangzhou and Foshan have issued drafts for kWh subsidy policies for distributed photovoltaic projects. Installations are mainly concentrated in government-led industrial and commercial park demonstrations and market-oriented industrial and commercial parks, with fewer distributed photovoltaic projects built by residents [6]. Through the construction of intelligent photovoltaic bus stations, photovoltaic parking lots, photovoltaic energy storage and charging projects, photovoltaic in industrial plants, photovoltaic in sewage plants, etc., a renewable energy park with photovoltaic characteristics will be formed. Subsequent policies enacted in 2018 and 2019 mainly supported rules for clean energy generation and generation time trading.

Zhejiang and Shanghai are among the best in the country in terms of lighting, subsidies, and residents' acceptance of distributed photovoltaic. When distributed photovoltaic power generation is still "black technology" for many people, people in Jiangsu and Zhejiang have gradually realized that photovoltaic power generation can not only bring convenience to residents' lives but also increase family income, and it is also a fashionable way of life. The development of the photovoltaic industry in Jiangsu, Zhejiang and Shanghai is inseparable from the support of photovoltaic policies. Since 2013, cities and counties in Jiangsu, Zhejiang and Shanghai have introduced photovoltaic policies to encourage, support and subsidize photovoltaic power generation. The number of policies and subsidies is unmatched by other provinces. Specifically, the local subsidy in Shanghai is 0.4 yuan/kWh, which means that the resident can get 80 cents per kWh of electricity; Zhejiang Province provides 0.1 yuan/kWh, and cities and counties also have high municipal subsidies. At the same time, the development of the photovoltaic industry in the Yangtze River Delta region is due to a certain extent due to the local enlightened photovoltaic loan policy. Most importantly, residents in the telephoto delta are generally wealthier and more likely to be encouraged by policies to invest part of their money in photovoltaic power plants. With an initial investment of 30,000-100,000 yuan, residents can have a high rate of return of more than 10% for 25 years. Such a rate of return and affordable input costs make photovoltaic power generation more popular. The vigorous promotion of distributed photovoltaic power generation has also brought positive comprehensive benefits to the Yangtze River Delta and Pearl River Delta regions, including stimulating effective investment, subsidy income, ecological benefits, and social benefits.

4. The Consideration of China photovoltaic Industry

Through years of development, China has already developed a matured photovoltaic industry from upstream silicon material production, and midstream photovoltaic battery production to downstream maintenance and part suppliers.

4.1 The Era After Huge Subsidy

By scrutinizing the policies of China's photovoltaic industry, could find out that the development process is not going smooth, but instead with a spiral development. The industry once fell into a dilemma in 2018 as the implementation of "Notice on matters related to photovoltaic generation in 2018" (known as "531" Policy and hereinafter referred to as "531") this policy further reduced the benchmark electricity price and subsidy standard of photovoltaic power generation projects included in the scope of new construction specifications. The standard electricity price of ordinary photovoltaic power stations will be reduced by 0.05 yuan. Moreover the first to third class areas will be 0.5 yuan, 0.6 yuan and 0.7 yuan per kilowatt hour, respectively; The subsidy standard for distributed photovoltaic power generation in the mode of "self-use and surplus on Grid" was also having a 0.05 yuan decrease, specifically 0.32 yuan/kWh;[7] The benchmark price of the village photovoltaic power station in which helping the poor was in line with the national policy remains unchanged. after implementing of the "531" new policy, China's newly installed photovoltaic capacity exceeded 43GW in 2018, a yearly decrease of 18%; Among them, about 23GW is centralized, a yearly decrease of 31% .[7]

The "531" policy also urged the photovoltaic industry to be controlled by a few oligarchs, for example, Tongwei and Longji. The data shows that from 2018 to 2020, the number of new industrial enterprises decreased by 24% year by year. Especially during this pandemic era, the production of silicon chips is limited; With the increase of the price of silicon chips, the building progress of new photovoltaic infrastructure is facing trouble.

Unquestionably, the "531" policy shocked the photovoltaic industry; However, it is unavoidable and encourages the industry to step into a brand new era. With the arrival of the era of photovoltaic parity, with the dual drive of technological progress and market demand, the production cost and power generation cost of photovoltaic products in China are also decreasing. In 2019, in terms of photovoltaic modules, the cost of single crystal PERC modules was reduced to about 1.31 yuan/W, the initial total investment cost of photovoltaic system was reduced to about 4.55 yuan/W, and the cost was reduced to 0.28-0.51 yuan/kWh. The current China photovoltaic market is proving that China's photovoltaic industry could not only survive but also thrive without the government's massive amount of subsidies.

The government adjusted the power generation subsidy to the user subsidy. The government's subsidy to users is to subsidize the users and consumers of photovoltaic power generation. The government can implement a step-by-step subsidy according to the proportion of self-consumption of electricity at the user's end. With more of the proportion of self-consumption, the higher the kWh subsidy. When building photovoltaic power stations on a large scale in China, we must let photovoltaic power generation users. The development of the photovoltaic market can only be genuinely driven by making profits and promoting photovoltaic applications in households. The government should reform its subsidy policy and transform industrial and enterprise subsidies into consumption and market subsidies as soon as the time is ripe. Subsidizing users will promote solar energy utilization in ordinary people's homes and realize the "home" era of photovoltaic power generation. In addition, subsidizing users can enable enterprises to compete in a fair market environment, which is conducive to reducing costs and technological innovation.

Formulate a classified electricity price system based on the on-grid electricity price of distributed energy. Based on the resource situation of distributed energy, the power generation cost and the difference in regional power demand, the classified electricity price is formulated, which is resolved by the government price management department according to its power generation cost and the cost level of similar power generation projects, and announced regularly. Considering the operating

pressure of distributed energy on the state grid enterprises, the government should also give corresponding subsidies. After all, the State Grid has the advantage of power balancing load and power use safety and plays an irreplaceable role in the early stage of China's power system reform. When necessary, the electricity sales price can be adjusted appropriately to make the price have a certain price elasticity.

4.2 The Era of Two-pronged Policy

The implementation of the "531" policy is, at the same time, promoting the development of distributed photovoltaic storage. In 2020, distributed photovoltaic accounted for 33.3% of the total photovoltaic power generation. The installed capacity in Western and northern regions' centralized photovoltaic power stations accounted for 55.9% of the total photovoltaic power generation.

According to different regional atmospheres and environments, each province and city takes different policies and measures to respond central government's guiding principles and policies. Kunshan issued the new policy in 2022 to promote the large-scale development of photovoltaic in industrial buildings. Factories with annual total energy consumption of 1000 tons of standard coal (equivalent value) or above or annual power consumption of 5 million kWh or above shall install distributed photovoltaic power generation facilities on the premise of meeting safety conditions.[8] For the existing standard plants and supporting buildings invested and constructed by state-owned enterprises, 100% of them will install with roof photovoltaic power generation facilities if they meet the installation conditions.

Qinghai is one of the most important provinces in China's photovoltaic industry owns a unique resource endowment, especially solar energy. The local government intends to increase photovoltaic installation to 70 million kW by 2022. In addition, the photovoltaic energy price of 0.2277 yuan/kWh is the lowest in China.[9] However, it is facing problems like delivering energy generated out of the province. However, work related constructing of a recycling system for old photovoltaic cells is on the way to implementation. According to the newly issued policy "Action plan for Qinghai to build a national clean energy industry highland (2021-2030)", Qinghai has become one of the pioneer provinces to plan on photovoltaic cells recycling step toward the future development of China's photovoltaic industry.

Centralized photovoltaic power station: from the perspective of 2021, the guaranteed and market scale of each province will reach 82GW and 28GW, respectively (excluding projects not differentiated by scenery); At the same time, 100GW of the first phase of enormous new energy projects has started at the end of 2021 (including 28.8GW of wind and scenery projects and 10GW of photovoltaic projects in 2022). The photovoltaic industry is expecting that the installed capacity of domestic centralized photovoltaic power stations will reach 45-50GW in 2022. Meanwhile, residents' time of use pricing mechanism and the action plan for urban and rural construction to achieve carbon peak will promote the development of distributed photovoltaic; In terms of household photovoltaic, the whole county has promoted 676 demonstration county projects. Currently, the project application has exceeded 150GW, which will support the sustained high growth of household photovoltaic; It is estimated that the installed capacity of domestic distributed photovoltaic power stations will reach 40-45GW in 2022. Under this scenario, China's photovoltaic industry is developing along both lines.

5. Conclusion

This research paper reviews the background of China's photovoltaic industry development and analysis various central or regional policies in different development stages of China's photovoltaic industry, at the same time points out the flaws inside the policies also put forward appropriate suggestions which could help consummate these flaws in the future. Throughout the history of the development of China's photovoltaic industry, the process is not always going smoothly. There are a few stages in the development of China's photovoltaic industry, China and regional governments implemented a series of policies to support the development of photovoltaic energy and to achieve

the proposal of the "Carbon-neutral" and "Carbon-peak" strategic goals, in the earlier stage of China's photovoltaic industry development, in order to gets rid of foreign photovoltaic technology barriers, both the central and regional governments implemented stimulation policies to encourage the talents and capitals flow into the industry which led to the formation a mature photovoltaic industry with enormous up-stream to down-stream enterprises, however only after the cancellation of massive subsidies, China officially stepped into an brand new era of using cheaper photovoltaic energy, and made the total photovoltaic installation capacity came to the first place in the world. It is undeniable that there are still many problems, for example, the monopoly of large companies, the power transportation of centralized photovoltaic fields, future recycling of photovoltaic industry materials. After all, China's national policies set the main direction for China's photovoltaic industry development, and the regional governments are looking forward to suiting their measures to local conditions to strengthen China's photovoltaic industry further, a matured industry needs to match more updated and sophisticated policies, so both the central and regional governments should always update and renew policies to catch the rapidly changing photovoltaic industry.

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