Policy Instruments for Renewable Energy Development in China

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The impact of energy shortage and environmental pollution on the world economic development is increasingly prominent. On the 5th anniversary of the Paris Agreement, China declared its national goal of achieving “emission peak” by 2030 and “carbon neutrality” by 2060. In terms of China’s current energy consumption structure, fossil energy represented by coal is still the mainstay of current energy utilization. However, traditional fossil energy sources such as coal and oil are being replaced by renewable energy sources such as solar, wind, and nuclear energy. The Chinese government is aware that in order to achieve long-term economic development, it is necessary to properly deal with climate change, energy demand and environmental protection. The development of renewable energy provides an effective solution to these problems. The renewable energy industry needs policy instruments to support it in order to survive in the market in the early stages of development. However, subsidies do not last long. As the renewable energy industry develops, the support and subsidy mechanism will be phased out, and the energy industry will enter the commercialization stage. Finally, a policy system combining government guidance and market mechanism will form.

Keywords: policy instruments ; renewable energy ; legislation

1. Main Policy Instruments for Renewable Energy Development in China

1.1. Total Target Planning Policy Instrument

Total target planning is an important policy instrument to promote the development of renewable energy in China, and the development of solar photovoltaic industry is also carried out around this policy. China has developed a series of five-year, medium and long-term plans that set out guidelines and objectives for the promotion of renewable energy [1]. China formulated the total target of renewable energy development through the Fourteenth Five-Year planning and other form. In the 14th Five-Year Plan period, China will accelerate the green transformation of the development mode and promote the high quality of economic development and the high level of ecological environment protection [2]. Total target planning needs to be predictable, coherent, strategic, mandatory and so on.

However, China’s total amount of solar energy development goals were short of forward-looking and lacked full evaluation of the development of the photovoltaic industry, therefore the target was modified several times. Frequent changes are not conducive to maintaining the stability and authority of the total target system. The reason for this phenomenon is the scientific investigation of photovoltaic industry market is missing, and the total target will be divorced from reality without basing on scientific investigation. In addition, the total amount of development of solar photovoltaic industry in China is based on the measure of the installed capacity, rather than the standard of actual power generation. Measures of the design is easy to cause the enterprise blinding production of photovoltaic modules, launch huge installed capacity of the project, but the actual power generation is rare, resulting in vicious competition and waste of resources and enterprises. The total target system needs to be optimized in the measure of the standard.

1.2. Feed-In Tariff Policy Instruments

Feed-in tariff is the policy instrument of mandatory requirements in which the government purchases renewable energy electricity at a specific price from power grid enterprises for encouraging the development of renewable energy power generation industry [3]. Due to the lack of stability and the high cost of power generation, photovoltaic power generation has less competitive advantage in competing with the traditional energy generation. In order to protect the survival of the solar photovoltaic industry, mandatory access to electricity tariff subsidies and the acquisition system is inevitable choices.

“*Renewable Energy Law of the People’s Republic of China*” (the “*Renewable Energy Law*”) provided the statutory obligations of power grid enterprises, regulations that power grid enterprises must acquire its full grid coverage of

renewable energy generation projects within the scope of power, and to provide the necessary services on the Internet for renewable energy. The State Council also issued a series of documents to support the system of electricity tariff subsidies, and specific rules for the operation of the provisions. In 2006, the national development and Reform Commission promulgated the "*Renewable Energy Power Generation Price and Cost Sharing Management Pilot Scheme*", providing the acquisition of electricity price benchmark. The National Energy Administration issued a "*Notice on Matters Relating to the Construction of Wind Power and Photovoltaic Power Generation Projects*" in 2020 on 5 March 2020, to promote parity projects and projects requiring state financial subsidies.

China implemented mandatory price subsidy policy instruments by force to solar power and other renewable energy power, providing power companies must purchase provisions within the grid coverage of renewable energy power and purchasing power at a certain price, thus encouraging Internet sales and profit of renewable energy power generation. This system solves the problem of photovoltaic power companies' difficult to a certain extent. However, limited by the current low level of technology, grid enterprises need to bear the high cost of connection and transmission costs for grid connected photovoltaic power generation. Even if the "*Renewable Energy Law*" stipulates that generated related costs of the power grid enterprises for the acquisition of renewable energy power generation of electricity can be included in the transmission cost of power grid enterprises and recovered from the sale price of electricity, but in the actual operation, the cost price recovery is not enough to bear the expenses of grid enterprises for the acquisition of renewable energy power generation of electricity, thereby affecting the enthusiasm of the grid connected photovoltaic power grid enterprise acquisition.

For the generation of solar photovoltaic power generation, China is currently implementing in the classification of electric power policy instruments. Article 19 and chapter 5 of the "*Renewable Energy Law*" of China provided implementing classification of the price of electricity, which means in the framework of the law ensuring the main market objects' return on investment according to the specific investment cost and the corresponding tariff provisions in different periods in different regions. The policy promoted the investment enthusiasm of main market players on photovoltaic power generation projects in different areas and different time to a certain extent, but restricted the healthy competition of enterprises, and caused restricted effect with the development of photovoltaic industry.

1.3. Cost Sharing Policy Instrument

Cost allocation refers to the policy instrument to solve the problem of low price gap between the higher price of solar photovoltaic power generation and conventional power generation, and the price difference will be added to the sales price [4]. The system is conducive to encouraging investment in the main increase in the investment of solar photovoltaic industry. the "*Renewable Energy Law*" stipulates that the grid enterprises can share the cost generated by purchasing renewable energy power. The cost of production included reasonable installation costs and infrastructure construction costs.

Cost sharing refers to demand electricity consumers assuming the additional cost generated by the renewable energy, thereby promoting the large-scale development of renewable energy. This policy solves the problem of additional cost of photovoltaic power generation project but exists issues such as single source of compensation funds and long capital compensation cycle length. According to the "*Renewable Energy Law*", China's cost sharing funds came from the electricity price, cannot narrow the gap between the cost of solar photovoltaic power generation costs and the cost of traditional energy. At the same time, China's whole network sharing policy instrument cannot effectively motivate producers and consumers to develop clean energy.

Renewable energy development fund is a powerful measure to promote the development of photovoltaic industry with public investment, and it is widely used in the world. The state finance established the renewable energy development fund, supported renewable energy development and utilization of science and technology research, standards development and demonstration projects, and energy resources exploration, evaluation and construction of relevant information systems. As a new energy industry, PV industry needs to have sufficient financial support to develop healthily in the early stages of development. The "*Renewable Energy Law*" does a special provision on the establishment of renewable energy development fund. The financial department of the state established special funds for renewable energy development, supporting research and demonstration projects, supporting domestic photovoltaic power generation project in rural, pastoral and island areas, supporting the construction of investigation of the renewable energy and evaluation system, and supporting the program of localizing the photovoltaic industry equipment. In order to coordinate the implement of law, on 3 July 2020, the Ministry of Finance issued a "*Notice on Matters Relating to the Construction of Wind Power and Photovoltaic Power Generation Projects*", specifying a total national renewable energy tariff subsidy funds budget of about 92.4 billion yuan in 2020, of which PV projects received about 47.3 billion yuan, accounting for

about 51%. However, the provisions of the renewable energy made by the "*Renewable Energy Law*" are still vague and there is no clear source of funding, which cannot fundamentally solve the problem of the lack of funds in the development of solar photovoltaic industry, and the problem of PV subsidy arrears is expected to be solved only in 2040 [5].

1.4. Tax Preference Policy Instrument

For China's solar photovoltaic industry, tax incentives are reflected in the tariff, VAT (Value-Added Tax) and corporate income tax, the specific form of tax cuts and exemptions. The "*Renewable Energy Law*" stipulates that the state gives preferential tax policies to the projects listed in the development of renewable energy industry. According to China's *Renewable Energy Law*, governments can use tax credits to promote the development and adoption of renewable energy [6]. The state adopts preferential policies of deducing the collection of value-added tax to photovoltaic equipment manufacturers.

At present, China's renewable energy development and utilization of existing tax concessions mainly include the following. "Notice of the Ministry of Finance and the State Administration of Taxation on value-added tax policy for photovoltaic power generation" (fiscal 2013 No. 66) regulates implementing the 50% VAT refund policy to solar power products produced by the taxpayer for sale.

China's preferential tax policies for solar photovoltaic products are less, and most of the tax preferential policies are formulated by the State Council departments, and has single form and are short of stability. The form of tax preference is relatively single, and the preferential amount is not high, which does not have a system of tax incentives to the investment business of photovoltaic power generation projects. Nonetheless, it has been pointed out that the power plants of most companies refuse to pay additional taxes for renewable energy, to which the "*Renewable Energy Law*" provides no specific penalties.

2. The Legal Challenges of Renewable Energy Policy Instruments

Many countries have formulated legal systems to support the construction and use of their renewable energy industries, facilitating the rapid growth of this industry [7]. Admittedly, China has established a relatively complete renewable energy law and policy system to promote renewable energy development. On 28 February 2005, the "*Renewable Energy Law*" was passed by the National People's Congress, marking a new stage of renewable energy development in China. Since the "*Renewable Energy Law*" was introduced, a number of supporting regulations and guidelines have been put into place to implement the law [8].

However, compared with other states, China's renewable energy laws and policies have some disadvantages to be improved [9]. For example, there is a mismatch between the existing laws and industrial development needs, which restricts the future development of photovoltaic power generation in China [10]. As a conclusion, the current legal system of renewable energy provides an important foundation for promoting the healthy development of the renewable energy, but there are still many problems to be solved in terms of the legal system, the content of the system and the safeguard mechanism.

2.1. The Legal System Is Not Reasonable

First, the classification legislation is incomplete. The "*Renewable Energy Law*" is the only one specialized renewable energy law in China at present. Relevant departments of the State Council introduced some provisions involved in wind energy, biomass energy, solar energy and so on which is incomplete. Some provisions are too scattered to meet the inherent needs of the development and utilization of the renewable energy industry. For solar energy legislation, only the "*Renewable Energy Law*" involves solar energy development and utilization of the law; part of the principal provisions is only provided in the "The Solar Photovoltaic Building Application Financial Subsidies Provisional Measures" and other departmental regulations, without special administrative regulations. In addition, the implementation of solar energy development and utilization of the implementation of the rules are not balanced, and more focused on solar thermal requirements, in some areas such as photovoltaic power generation, only part of the electricity price and other renewable energy power generation jointly adjusted by the relevant law. The use of this form of photovoltaic power itself, both sectoral regulations and industry standards, are still a gap. At the same time, the implementation details of solar energy development and utilization do not reflect the core technology support. Basic on different types of renewable energy, development and utilization of technology, the characteristics and conditions of surgery, as well as regional endowments and other resources, personality characteristics, the development of classification legislation in the specialized area of renewable energy became an urgent need.

Second, supporting regulations need to be improved. Although there are dozens of supporting regulations and rules related to renewable energy in our country at present. Therefore, the legislation of important fields such as financial subsidies for renewable energy and preferential tax credit, investigation of renewable energy resources, development of technical standards for renewable energy integration and so on has been delayed.

Third, the local legislation needs to be strengthened. With a vast territory, our country has its own characteristics of reserves, structure, and consumption of energy resources. However, some major provinces that use renewable energies have not formulated corresponding local legislation. Some provinces that have formulated relevant laws and legislations have only limited development and utilization activities and their legal regulation to a certain status.

2.2. The Legal System Is Imperfect

Renewable energy quotas, green electricity prices, government green procurement system plays a prominent role in the renewable energy law, but it needs improvement. However, the renewable energy quota system has so far failed to be fully implemented in our country. The green electricity tariff system is also not clearly stipulated in the law, and some regulations and regulations are not binding. In November 2006, China formally incorporated environmental criteria into government procurement. However, due to the lack of experience and the lack of sound laws and supporting laws and regulations, there are still some problems such as the non-uniform procurement standards, the limited procurement scope and the limited scale, and the related information construction lag, the lack of high-quality procurement of specialized personnel and other issues.

As for the pricing mechanism, there are still some problems such as low implementation, unrealistic practices and lack of flexibility. Taking the price of wind power as an example, the offshore wind power generation basically uses the concession bidding price. The bidding price of the first round of bidding projects ranges from 0.62 yuan/kWh to 0.74 yuan/kWh, which is close to the highest on-grid electricity price of onshore wind power [11]. Some land-based wind power resources in four areas of the benchmark feed-in tariffs, due to various types of resource areas covering a wider area, the regional division is not fine, resulting in electricity prices chaos. In addition, as far as the current price of about 0.5 yuan/kWh coal price, the photovoltaic Internet benchmark price of 1 yuan/kWh is still high enough.

2.3. The Safeguard Mechanism Is Not Sound

First, the threshold is too high and only supporting a narrow range. Loan discount interest is mainly used for inclusion in the National Renewable Energy Industry Development Guidance Catalog and the projects which are in accordance with the credit conditions of renewable energy development and utilization. Only when the bank loans are in place and the project undertaking entities or individuals have already paid interest can be arranged discount interest. in most cases, only listed companies that have a leading position in renewable energy and strong research and development capabilities will be able to obtain “The Development Fund”. Additional subsidies for renewable energy tariffs are mainly determined by the Ministry of Finance, the National Development and Reform Commission, and the National Energy Administration through the promulgation of a list of supplemental subsidies for renewable energy tariffs. So far, the State Grid has announced 14 batches of renewable energy subsidy lists. Among them, 24,142 solar power projects with capacity of 73.84 GW; 455 wind power projects with capacity of 32.69 GW; 204 biomass power projects with capacity of 3.88 GW. However, the main beneficiaries are large state-owned enterprises.

Second, lack of funds and financial support. Although the state has set up a renewable energy development fund, the total amount of investment in renewable energy by the fiscal authorities is not sufficient. At the central level of China, the cost of tackling renewable energy science and technology projects arranged annually by the government is insufficient, and most of them are occupied by the operation of institutions and personnel resources, with even fewer investments by local governments and industries. In addition, renewable energy investment and financing channels are relatively simple, which is lack of private capital and international capital absorption capacity.

Third, technological development lags behind and research and development capabilities are weak. China’s renewable energy technology innovation is not high, high-tech basically relies on imports, and the localization of key equipment is low. At the same time, the integrated application of renewable energy technology is relatively weak, the economic and environmental benefits brought by the development are not obvious, and it is difficult to have a large demonstration effect. Another more serious problem is that less investment in scientific research, scientific research institutions and commercial cooperation is not active, leading to the development of basic technology behind the low level of system technology.

Fourth, lagging grid construction and difficulties in Internet access. The geographical distribution of wind power and solar energy resources in our country does not match with the existing power load, and lags behind the construction of power

grids. There is no net connection for a large number of wind power generation. The direct consequence is the equipment outage and the loss of enterprises. According to statistics, From January to September in 2021, the national abandoned wind power was about 14.78 billion kWh. A large amount of power generation cannot access the Internet, making the wind power enterprises that are already heavily invested in the earlier stage facing the challenge of survival [12]. Although our country is actively building a smart grid, there are difficulties in R&D, safety and security, technical standards and profitability modes of new technologies, which require a long period of research and development and practical exploration.

Finally, the supporting service system is not perfect. Due to the lack of long-term capital and technical input, China's manufacturers of renewable energy products have not formed a specialized manufacturing industry. They have a small scale of production, low level of intensification, backward manufacturing processes, unstable product quality, low localization manufacturing rate, so it's difficult to reduce manufacturing costs and providing the required units and spare parts timely [13]. In the meantime, the unit manufacturers have not invested enough in the quality and after-sales service of the existing products, the resource utilization efficiency is low. Take wind energy as an example. Some of the wind power equipment in the same batch of wind power supply projects have adopted a variety of products from different manufacturers for their internal electrical components and control systems. This has resulted in the spare parts storage of the wind farm put into operation difficult. If after-sales service, for large wind farms that operate hundreds of fans at the same time, the pre-generation efficiency will be directly affected by the maintenance speed [14].

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