

Development and Prospects of China's Renewable Energy Export Trade under the Belt and Road Policy

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Abstract: Under the trend of economic globalization, the cost of renewable energy development has been decreasing globally, and renewable energy development has become the focus. But since 2018 the trade war between China and the United States has been escalating, and China's renewable energy development has been hindered by the United States because China's core technology is still not fully mastered. How to deal with related issues is crucial for China's development. The article uses literature analysis to analyze the impact of the US-China trade war and China's own overcapacity problem on China's renewable energy development, and to provide countermeasures to address the corresponding problems. This paper argues that the sustainable development of China's renewable energy industry faces three basic problems, which are restricted by the trade barriers of the US-China trade war, the lack of some core technologies, and the potential overcapacity problem in the future. In order to achieve sustainable development of renewable energy in China, it is suggested seizing the opportunity of the Belt and Road policy development with energy cooperation as the key area of development. By analyzing the various factors affecting the development of China's renewable energy industry, and by giving suggestions and countermeasures, this paper hopes to give a comprehensive understanding of the development history and prospects of the renewable energy industry in China and provide reliable suggestions for the development of related industries in China.

Keywords: Belt and Road, renewable energy, China's export trade

1. Introduction

In June 2021, the U.S. put a number of Chinese photovoltaic companies on the entity list for sanctions on the grounds of the so-called forced labor problem in Xinjiang, and the renewable energy industry has been restricted. The development of the renewable energy industry has been restricted. On the one hand, a series of energy issues such as the imbalance between supply and demand caused by high oil and gas prices have profoundly affected the development of the global energy industry; on the

other hand, this energy crisis has also successfully inspired the relevant countries to strengthen their energy autonomy. As the largest renewable energy country, China has proposed the Belt and Road Initiative to actively develop economic partnerships with countries along the route.

Many scholars have published studies on the development of renewable energy industry in China. Most of the renewable energy sources in China have a certain technology level and industrial scale, the state has been encouraging the development, giving policy support, and the enterprises are also developing [1]. However, the weak basic research in the field of renewable energy [2]; the policy and regulation system are not yet perfect [3]; the problems of grid connection and consumption of wind power and photovoltaic are highlighted [4] and other problems restrict the development of the industry. Therefore, many scholars believe that China should encourage the introduction of highly qualified talents [5], accelerate the marketization of investment in new energy industry [6], and optimize the market structure of China's renewable energy product export trade under the leadership of the Belt and Road Strategy [7].

In this paper, we will summarize the conclusions and thoughts of scholars in the context of China-US trade war, briefly describe the development status of China's renewable energy industry, analyze the impact of China's Belt and Road Policy on the development of renewable energy, analyze the development dilemma of renewable energy industry, and thus summarize how the renewable energy industry should In this paper, we will discuss how the renewable energy industry should ride on the fast train of China's Belt and Road Policy development, so that the industry can break through the difficulties and achieve rapid development, and look forward to the new road of the industry development, so as to provide reference for future related research.

Renewable energy is highly efficient, clean, low-carbon and environmentally friendly, which is conducive to promoting ecological environment and sustainable socio-economic development, therefore, it is of great practical significance to study the development of China's renewable energy industry to promote green development and achieve carbon neutrality. It is also of great economic importance for China to promote "one belt and one road" in renewable energy to help the countries along the route to achieve green and low-carbon transformation, thus achieving a win-win situation.

2. China's Renewable Energy Industry Development History

The development of renewable energy in China began with the development of hydropower to solve the electricity supply and the use of biogas, charcoal forests and solar energy to solve the rural energy supply. In the early 1980s, the State Council set up the Rural Energy Leading Group, which put forward the policy of effectively solving the rural energy problem by using renewable energy to solve the rural energy supply problem. around 1980, the State Council approved the formation of more than a dozen energy research institutions and set up the renewable energy department in the central government's comprehensive department, and began to comprehensively study and deploy the renewable energy development problem. "During the Seventh Five-Year Plan, rural energy was included in the outline of the national development plan. During the 8th Five-Year Plan, the country began to implement renewable energy development in a systematic manner. In the later stages of the 13th Five-Year Plan, from 2019 to 2021, China's renewable energy industry is slowly transitioning from relying on state subsidies or economic incentives to a subsidy-free era [8]. Now, at the 75th UN General Assembly, General Secretary Xi Jinping clarified the goal of carbon neutrality at the peak of carbon. He proposed that China should implement renewable energy substitution actions and accelerate the construction of a new type of power system, and that carbon peaking and carbon neutrality has put forward new and higher requirements for renewable energy development [9].

3. The Impact of Belt and Road policy on Renewable Energy Industry

In 2022, the ninth year of implementing the *Belt and Road* construction, China has signed more than 200 cooperation documents with 147 countries and 32 international organizations and has achieved fruitful results in practical cooperation under the framework of building the "Belt and Road" together [10]. The Chinese PV industry market has achieved rapid growth over the past 10 years, and the global PV module production center has shifted from Europe and the United States to China. Currently, China is the world's largest PV industry, and its solar power and wind power equipment production capacity has led the global market [11].

With the support of the Belt and Road policy, China's overseas development of renewable energy is also shifting from simple power plant construction to more comprehensive capacity cooperation. Especially in Southeast Asia, Chinese renewable energy representative enterprises, such as JinkoSolar and LONGi, have started to lay out upstream product manufacturing and put the industrial chain of product manufacturing, power plant investment and construction, and services into overseas markets [12]. Chinese investment in scenery projects in Pakistan, Poland, South Africa and other places have achieved remarkable success. The Belt and Road policy is driving Chinese renewable energy companies to go abroad, promoting foreign investment and project construction, allowing the renewable energy industry to gradually form industrial chains overseas, while providing more jobs for countries along the way and promoting the development of the energy economies of both sides.

Figure 1 shows the rapid development of China's renewable energy industry by taking PV cell production as an example and choosing panel data from 2013 to 2022 from the Statistical Bulletin of National Economic and Social Development of the People's Republic of China. After the Belt and Road policy was introduced in 2013, the production capacity has been increasing year by year until 2022, and the production growth rate of Chinese PV cells has been as high as 46.8%.

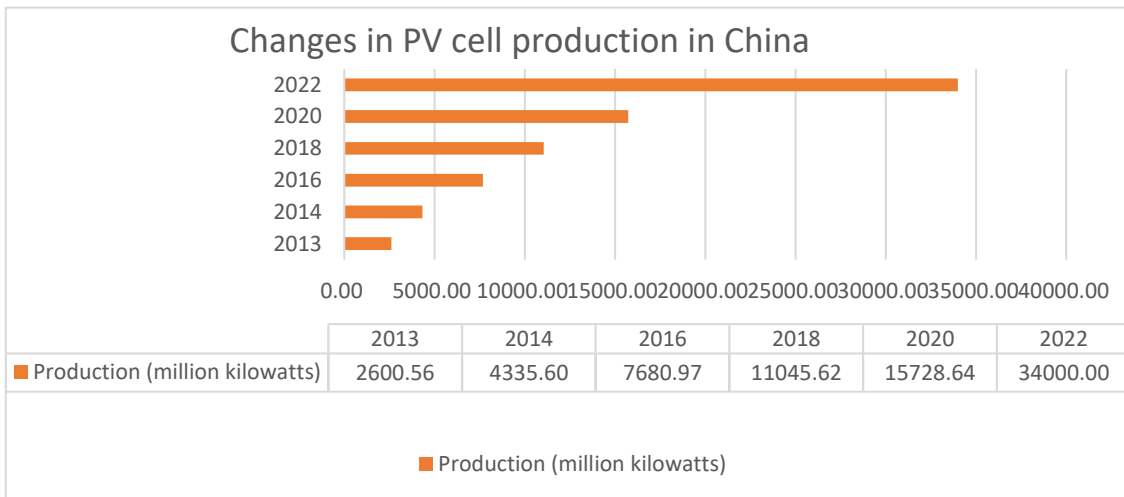


Figure 1: China PV cell production change, 2013-2022.

Data source: Statistical Bulletin of the National Economic and Social Development of the People's Republic of China, 2013-2022.

4. The Impact of China-United States Trade War on China's Renewable Energy

4.1. Policy Impact

On February 4, 2022, the White House of the United States announced that it will continue to impose tariffs of 14%-15% on imported crystalline silicon photovoltaic cells for the next four years,

extending the 201 tariff for four years. The carbon tariffs set by the European Union will also be implemented in 2026.

European and American countries are an important component of China's renewable energy exports, and the trade barriers and protection policies they implement will increase the product costs of China's exports, weaken the price competitiveness of Chinese enterprises, and force leading enterprises to establish factories globally, which will not be conducive to the formation of renewable energy industry clusters and chains. And it will further intensify China's carbon reduction pressure, and China will face greater emission restrictions, adding new obstacles to the already difficult carbon reduction path.

4.1.1. Stagnation of the Official Cooperation

With the impact of the China–United States trade war, most of the Sino US bilateral energy dialogue mechanisms and exchange activities have stagnated or even interrupted, and the process of institutionalization and institutionalization of Sino US energy cooperation has been seriously affected [13]. Many clean energy cooperation agreements have not been further advanced, leading to a lack of trust in China US relations. However, the development of China's renewable energy industry is not yet mature, and it is difficult to achieve efficient development on its own.

4.1.2. Technical Impact

The United States has mastered many advanced technologies and has taken the initiative in the Sino US trade war. China's manufacturing industry lacks core technologies, which has led to China being limited by some technologies in its competition with the United States, such as energy storage and smart grid technology.

At the same time, the energy transformation of Chinese enterprises is hindered, and some key technologies in renewable energy technology are still monopolized by Europe, America, and Japan. The key technologies and components of renewable energy equipment, such as motors, blades, crystalline silicon, and other core manufacturing technologies, are still in the hands of developed countries in Europe and America.

Compared to this, there is still a certain gap in China's technological level, so mastering all technologies such as production and development is crucial. Otherwise, even as the world's largest renewable energy supply chain and manufacturing power, it will continue to be constrained by developed countries or regions such as Europe, America, and Japan [14].

4.1.3. Increased Risk in the Funding Chain

What cannot be ignored is that the continued China-United States trade war and the constant interest rate increase of the Federal Reserve led to the return of US dollars, which led high-tech enterprises to face the risk of corporate credit. Due to the fragility of the financial system, financial risks are easy to form. In addition, the trade policy changes of China and the United States are unpredictable and have a wide range, making the financial system more volatile, Chinese renewable energy related enterprises are also facing greater pressure and risks.

4.2. Impact of the Indo-Pacific Economic Framework on the Renewable Energy Industry along the Belt and Road Region

Starting from the Trump administration, the United States has greatly hindered globalization by retreating, disrupting the World Trade Organization, imposing sanctions on China, and engaging in trade wars. In addition to using political, economic and diplomatic means to suppress China and

hinder the Belt and Road cooperation, the Biden government has also organized interest groups based on Political correctness and American value orientation, regional large and small circles such as the Indian Pacific Economic Framework (IPEF), which has seriously damaged the foundation and framework of globalization, making the WTO exist in name only and the trade norms cannot be implemented normally [15].

The number of countries in the Indo-Pacific region is large, the population is large, and the labor force is cheap. With the introduction of the Indo-Pacific strategy, the complexity of the situation in the Indo-Pacific region will be further deepened, which will undoubtedly have an impact on the pattern of maintaining security in Southeast Asia, especially the 21st Century Maritime Silk Road. The US government also claims that China's the *Belt and Road* policy is a *debt trap* for countries along the route from China [15]. This will not only increase China's geopolitical security risks, but also be detrimental to the development of the the Belt and Road in Southeast Asia.

The Indo-Pacific strategy geographically forms the so-called Indo-Pacific Strategic Arc from India in the Indian Ocean, through the Strait of Malacca, Australia, Japan and the United States in North America, blocking China at sea, curbing the development of China's *Belt and Road*, especially the Maritime Silk Road, and ensuring that the United States continues to maintain its strategic advantages in the Indo Pacific waters [16]. In fact, Indo Pacific strategy is a strategy of the United States to curb the rise of Chinese Century by establishing an alliance in Southeast Asia to confront China.

In order to cooperate with its containment strategy, the US media and the strategic community began to hype that the Belt and Road Initiative is predatory and will gradually occupy the land of Central Asian countries through economic contact. They also put forward false propositions that slander the the Belt and Road Initiative, such as geopolitical expansion theory, economic resources plundering theory, ecological environment destruction theory, threat theory of Chinese labor population, theory of Chinese cultural infiltration, debt trap theory and etc. [17]. This will lead to the deterioration of the international public opinion of the Belt and Road and the deepening of misunderstanding of China by the countries along the Belt and Road, which will shake the confidence of the countries along the Belt and Road in its implementation, which is not conducive to the sustainable development of the Belt and Road initiative.

5. Response Strategies

5.1. In the Context of US-China Trade

Now China's renewable energy products exported to the United States by two methods, one is to export high-end products, the second is to carry out industrial migration. The U.S. 201 tariff, while continuing for four years, excludes tariffs on specific types of bifacial panels and high-tech frontier technologies. This indicates that China has reached global leadership in PV technology, which encourages companies to continue to invest in high-end technology. In November 2021, the U.S. Department of Commerce determined that cells and modules originating in Southeast Asia are eligible for the exemption. The origin exemption will be beneficial to LONGi Green Energy Technology Co.,Ltd and other leading PV companies that will lay out their industries in Southeast Asia, so that LONGi and other leading PV companies that lay out early in Southeast Asia can effectively avoid 201 tariffs. According to the China Photovoltaic Industry Association statistics show that silicon wafers, in 2020 LONGi and JA Solar Technology Co.,Ltd in overseas silicon wafer production capacity has reached 4.5 GW, of which LONGi will be Malaysia silicon wafer production capacity expansion to 3 GW; cell, Ventec Electronics, LONGi and other companies in Southeast Asia to invest in the production of large-size products, and the original small size production line for technical reform to meet the increasing market demand; module. Southeast Asia is an important overseas production base, with companies such as Canadian Solar, Trina Solar Co., Ltd and Jinko Power

Technology Co.,Ltd focusing on Thailand, Vietnam and Malaysia.

In the face of the EU's carbon tariff, China's exports of traditional high-carbon products will be affected, so improve the export innovation of export enterprises and improve the comprehensive environmental performance of export products. It is advisable for enterprises to establish a perfect carbon management system as early as possible, set up an internal carbon management organization structure, organize regular training on interpretation of dual carbon policies and market analysis, formulate employee performance appraisal, and stipulate the greenhouse gas monitoring and reporting process, etc., so as to get a clear picture of the carbon family and achieve emission reduction targets scientifically and effectively. Technically save energy and reduce emissions, save energy and improve energy efficiency; promote advanced and applicable energy-saving and low-carbon technologies; improve the ratio of waste heat and waste energy self-generation in production-oriented enterprises; improve digitalization and intelligence. Strengthen the management of carbon assets and carbon trading, and enterprises are familiar with the workflow of carbon trading and information related to compliance.

5.1.1. Technical Cooperation

The government and enterprises should work together to increase technology investment, optimize the industrial layout, promote the commercial application of technology, and achieve a win-win situation for technology transfer and industrialization. In the future, a sound technology assessment mechanism should be established to improve the funding of renewable energy technology transfer, ensure the reliability and safety of the technology, and strengthen environmental protection supervision in the process of technology application to reduce the impact on the environment. Strengthen technical exchanges with Japan, Europe and other countries, support non-official organizations to cooperate, introduce foreign high-tech companies to build factories in the mainland and bring in talents.

5.1.2. Technology Development

China should continue to research high-end technologies. For one thing, China should learn from the earlier technologies that have been researched, study the direction of their application, and make the appropriate commercialization. For another, China should develop new energy storage technologies to improve the efficiency of power utilization and save costs for downstream ground power plants. Besides, introducing relevant policies to support the development of science and technology, and providing subsidies to help enterprises developing high-end technologies are important. Moreover, China should accelerate the full localization of key component technology and equipment, iterative updates of basic materials, and increase the production of key components.

5.1.3. Optimize Financing Structure

China should optimize its financing model and form a supply chain system centered around core enterprises and with small and medium-sized enterprises as nodes. Core enterprises should cooperate with local banks, using corporate credit as collateral to alleviate financing difficulties for upstream and downstream small and medium-sized enterprises. Small and medium-sized enterprises should ensure financial stability and technological competitiveness, and open up brand channels.

5.2. Confronting the Indo-Pacific Economic Framework

China should actively guide the transformation of the order in the Asia-Pacific region and neighboring countries and show positive expectations of the future development direction. Firstly, it should

actively integrate into the regional integration process and build a comprehensive and multi-level cooperation framework with neighboring countries, including the effective implementation of the preferential provisions in RCEP. Secondly, it should pay attention to the national security issues of neighboring countries and take the initiative to carry out bilateral and multilateral consultations and cooperation on security issues with them on the basis of safeguarding core national interests, so as to alleviate their security anxiety and skillfully, using the wedge strategy to dismantle the allies of the U.S. in the Indo-Pacific layout system. Thirdly, concept of goodwill and tolerance and the Belt and Road Initiative should be adhered in the peripheral diplomacy with the neighboring countries. In this way, the regional order vision of neighboring countries can be adapted to the regional order transformation promoted by China, thus effectively curbing the tendency of neighboring intermediate powers to balance China.

5.3. Facing Overcapacity

It is recommended to deepen the domestic market, such as expanding the development scale of renewable energy, promoting the integrated application of photovoltaic buildings, making reasonable use of infrastructure, such as government enterprises, industrial park factories, hospital roofs, etc., to install renewable power generation equipment. At the same time, the utilization rate of inefficient idle land resources should be improved, agricultural land should be used to develop composite photovoltaic systems, and the progress of offshore wind power generation, hydropower, nuclear power, etc. should be accelerated.

Secondly, the government should intervene to rationalize the market and promote further development of energy marketization from policy subsidies to market competition. Through the construction of large-scale renewable energy projects, promote long-term cooperation between neighboring residents and enterprises to purchase electricity. Residents should be encouraged to use green power and promote the enthusiasm of purchasing green power. The supporting policies for enterprise exit should be improved to reduce unnecessary loopholes and increase the activity of market entities. At the same time, it is necessary to improve the relevant policy system and continue to improve relevant laws and regulations based on the Renewable Energy Law. Furthermore, the orderly allocation of market-oriented competitiveness should be promoted and the monitoring and warning mechanism should be further improved.

Thirdly, foreign markets should be developed so that renewable products can be exported to countries along the Belt and Road to achieve a win-win situation. With new energy access to the grid, the long-distance transmission of coal power should be reduced as much as possible. Meanwhile, the construction of ultra-high voltage should give priority to renewable energy consumption and optimize Asian energy resources. The construction of renewable energy-based multi-energy complementary Asian integrated power system is a powerful driving force to realize the joint emission reduction in the Asian region along the *Belt and Road*, and has important practical and far-reaching strategic significance to promote energy transformation and green development.

6. Conclusion

Through the above analysis, under the future development of renewable energy, China should make full use of the Belt and Road policy to overcome the unfavorable conditions in the context of the Sino-US trade war, improve the utilization of existing technologies, and increase the research and development efforts. Optimize the market structure, improve the related system, and enhance the market vitality to cope with the possible overcapacity problem. China is increasing its influence in the Asia-Pacific region and neighboring countries, guiding the transformation of the regional order and showing positive expectations of the future direction of development.

Against the backdrop of such a complex world situation, China's commitment to the world's carbon peaking and carbon neutrality goals will be long and arduous to achieve. China's development will remain under U.S. sanctions for quite some time and in the future, which will affect China's renewable energy development process, but the experience brought to China by the U.S.-China trade war will instead facilitate China's development of large-scale energy storage technology to improve the use of renewable energy, and promote China's progress toward establishing a renewable energy-led multi-energy complementary energy system.

Authors' Contribution

All the authors contributed equally and their name are listed in alphabetic order.

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