

Research on the Transformation and Upgrading of Manufacturing Industry under Low Carbon Development

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Abstract. With the increasing global attention to environmental issues, the low-carbon economy has become an important way to promote the transformation and upgrading of the manufacturing industry. The purpose of this study is to explore the transformation and upgrading of the manufacturing industry under the background of dual-carbon development, deeply analyze the concept of low carbon economy, the status of the manufacturing industry and energy consumption, as well as the challenges and opportunities faced by the upgrading and transformation of the manufacturing industry under the background of low carbon. First, by explaining the importance of a low-carbon economy, the need to promote the development of the manufacturing industry in the low-carbon direction. Secondly, the current development status of the manufacturing industry is analyzed and reveals the existing problems and challenges. At the same time, some possible ways and strategies to solve these problems. To sum up, this study puts forward in-depth analysis and thinking in the field of transformation and upgrading of the manufacturing industry under the background of low carbon and provides theoretical support and practical guidance for promoting the sustainable development of the manufacturing industry under the background of dual-carbon development.

Keywords: Low-carbon; transformation; green energy.

1. Introduction

Double Carbon, which is the abbreviation for carbon peaking and carbon neutrality, is the goal the president of the People's Republic of China Xi Jinping declared at the 75th United Nations conference. In the conference, he announced that China will reach carbon peaking by the end of 2030, and then reach carbon neutrality by the end of 2060. This commitment means that China, as the world's largest developing country, will complete the world's biggest reduction in carbon emission intensity and achieve carbon neutrality from carbon peak in the shortest time in global history. Even though this requires a lot of effort, it is necessary. After entering the 21st century, China's economy has ushered in vigorous development. However, this rapid economic development has unavoidably brought serious environmental pollution problems. Among all these issues, the global warming problem brought by greenhouse gases such as carbon dioxide is the most serious. Global warming isn't just one country's problem, it is a global issue that requires the involvement of all the countries around the world together. 2024 is the fourth year of implementing the double carbon policy. By now, this policy has achieved a great breakthrough. China has accomplished the "1+N" policy framework for carbon peak and carbon neutrality. The green and low-carbon transformation of energy has been steadily advancing, and a total of more than 520 million kilowatts of energy-saving and carbon-reducing transformation, flexibility transformation, and heating transformation of coal power units have been completed. What's more, the renewable energy installation capacity exceeded 1.3 billion kilowatts, surpassing coal power in history. The "Three New Products" represented by solar cells, lithium batteries, and electric passenger vehicles have become the propelling power of foreign trade growth, increasing total exports of the new three products by 61.6%, and driving overall export growth by 1.8% [1]. At present, China is completing domestic industrial structure optimization in which the double carbon policy will play a significant role. The double carbon policy has an

impressive effect on the Secondary Industry since the fact that the annual emission of carbon from the Secondary Industry accounts for 40.8% of the total emissions in the past 22 years by the end of 2022, which together with such a policy environment makes it a good opportunity for realizing manufacturing transformation under low-carbon development [2]. After entering the 21st century, the impact brought by global warming which is caused by greenhouse gases has made the manufacturing transformation the duty of each country to slow down global warming. China is the second largest economy in the world, which means the size of its manufacturing industry has an enormous influence on the globe, thus the transformation of the manufacturing industry will have a great impact on the globe. The accomplishment of low-carbon manufacturing industrial transformation fits the “Lucid waters and lush mountains are invaluable assets” ecological civilization strategy and action in the first place, it also has great benefits on the improvement of the global climate environment. Economic development in the 21st century cannot repeat the past mistakes of high pollution and high energy consumption. The “London Fog” incident in 1952 is a precedent worth learning from. The fulfillment of the low-carbon transformation of manufacturing structure is significant to domestic low-carbon economic development and meantime ameliorates the energy consumption structure, thus propelling the improvement of environmental pollution. There have been successive breakthroughs in the key technological territory, which indicates that technical barriers will no longer be the obstacle to the technology transformation in China. Compared with other developed countries, China entered the industrialization era comparatively late. It will inevitably encounter the problems that other countries encountered in the early stages of industrialization. How to carry out reasonable planning and layout, and smartly combine environmental protection with rapid development, making them complement each other.

2. Manufacturing Related Concepts

In the trend of global economic development, it is inevitable that carbon dioxide emissions are increasing day by day, and a large amount of pollution poses a serious threat to the human living environment. The issue of low-carbon economy has also emerged. In 2003, the British government released the white paper "Our Energy Future: Creating a Low Carbon Economy", marking the first time the concept of a "low-carbon economy" was proposed.

Pan Jiahua et al. believe that a low-carbon economy refers to an economic form where both carbon productivity and cultural development have reached a certain level, with the aim of achieving the global desire to control greenhouse gas emissions by coordinating the relationship between carbon emissions and economic development [3,4]. Carbon productivity refers to the GDP produced per unit of CO₂ emissions, and the improvement of carbon productivity means that more social wealth can be produced under the same material and energy consumption. Humanistic development means achieving economic development and social progress on humanistic scales such as economic capacity, education, ecological environment, and health. The low-carbon economy of different countries has different connotations and meanings. For developed countries that have already achieved high levels of cultural development, low-carbon economy means the obligation to undertake energy conservation and emission reduction, and achieve absolute reduction of total carbon emissions while maintaining high cultural levels. For developing countries, as the basic needs for human development have not been met, promoting a relative decrease in carbon emissions while increasing economic output can be considered low-carbon development.

3. Analysis of Manufacturing Industry and Energy Consumption

The manufacturing industry is an important condition for any country to develop economically. As one of the major manufacturing countries in the world, the current situation of the manufacturing industry and energy consumption has attracted much attention. There are some positive trends in China's manufacturing sector. With the growth of China's economy, the expansion of the scale of the

manufacturing industry, the gradual improvement of technology level, product quality, and influence are also constantly improving. China's manufacturing industry continues to enhance its independent innovation ability, and its status in the world is gradually rising. More and more international well-known enterprises choose to build factories in China for production. In addition, with the change in market demand, China's manufacturing industry is transforming and upgrading to high-end manufacturing and intelligent manufacturing, and accelerating industrialization and digital transformation and upgrading, which has laid a foundation for the sustainable development of China's manufacturing industry. At the same time, with the improvement of environmental awareness and the popularity of the concept of sustainable development, the application of green, energy-saving, and renewable energy is becoming more and more extensive. However, China's manufacturing industry also faces some challenges. On the one hand, the structure of the manufacturing industry still has problems such as simplicity, relying too much on the help of traditional industries and external resources, and the innovation ability and core technologies are still relatively weak. On the other hand, with more and more attention paid to environmental protection, China's manufacturing industry needs to accelerate its transformation and upgrading. Finally, the change in the global supply chain has also brought uncertainty and challenges to China's manufacturing industry. In terms of energy consumption, as one of the largest energy consumers in the world, the current situation of energy consumption has also attracted much attention. With the rapid economic growth and the accelerated urbanization process, China's energy demand is constantly increasing. At present, China's main energy consumption is coal, oil, and natural gas, which can cause serious environmental pollution. To achieve green development, China is increasing the development and utilization of clean energy and promoting the transformation and upgrading of the energy consumption structure. In the future, China's manufacturing industry and energy consumption will face more challenges and opportunities. China's manufacturing industry needs to further transform and upgrade, promote green development, and enhance the sustainable development capacity of the industry. At the same time, China also needs to increase the development and utilization of clean energy, improve the utilization rate of energy, and realize the transformation and upgrading of the energy consumption structure. By continuously promoting the transformation of manufacturing and energy consumption, China will make a greater contribution to achieving sustainable economic development and ecological progress [5].

4. The Problem of Upgrading and Transforming the Manufacturing Industry under the Background of a Low-carbon Economy

From a demand-side perspective, different regions and industries have varying demands for renewable energy. The demand for renewable energy is closely related to economic growth and population density. In addition, regional industrial structure will also affect demand. Different industrial structures have varying levels and structures of energy demand, and the energy efficiency of production processes also varies significantly. The energy economy also points out that at the same level of technology, changes in industrial structure determine the level of energy utilization efficiency. Whether in the long or short term, adjustments in industrial structure will affect the demand for energy and changes in demand structure.

The development of renewable energy is closely related to the "dual carbon" goal. For different levels of urbanization, renewable energy exhibits significant differences. For provinces and cities with high urbanization, the consumption of renewable energy is much lower than that of other provinces and cities. Therefore, it can roughly infer that an excessively high level of urbanization will inhibit the development of renewable energy, thereby hindering the achievement of the "dual carbon" goal.

The optimization and upgrading of industrial structure, that is, the development of the tertiary industry, is an important driving force for promoting economic growth and thereby affecting the development of renewable energy. According to the research of some scholars, the optimization and upgrading of industrial structures will cause reverse changes in energy consumption, which is

conductive to suppressing the rapid growth of energy consumption. At the same time, the industrial structure will greatly promote the development of the renewable energy industry in the process of energy structure adjustment.

5. Conclusion

Through this research, it can see that there are still many problems remaining in China's manufacturing transformation under the low-carbon development. There are many problems in this entire transformation process. For example, in terms of energy consumption structure, due to the comparatively late start of industrialization and the uneven economic development between different regions in China, traditional high-pollution energy still occupies a considerable share in China's energy consumption structure. The reliance on traditional energy such as coal and thermal power is so strong that it is hard to complete the energy transformation in a short period. At the same time, there are many technological problems in the process of realizing the transformation of the manufacturing industry at this stage, but these problems will eventually be solved with continuous innovation and breakthroughs in technology. Although there remains a quite long distance to the achievement of the 2030 carbon peaking and the 2060 carbon neutrality, it is never easy for China to accomplish these goals. The course of the transformation will arouse many industry-related issues that cannot be previewed, so this whole transformation course should be completed step by step prudently. The low-carbon transformation of the manufacturing industry not only requires technological development, but also requires active intervention in policy by the state, giving the green light and greater support to green advantageous industries, and providing strong support and guarantee for achieving efficient and high-quality transformation. Changing the energy consumption structure and developing new energy can transform the production mode of the manufacturing industry from "High input, High Energy Consumption, High pollution" to "Low Input, Low Energy Consumption, Low Pollution" while maintaining a higher output. The development of a low-carbon economy provides a surging driving force. The low-carbon transformation of the manufacturing industry is imperative, and in this process, the speed and rhythm of the transformation should be controlled.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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