

Exploring the Transformation Path of High Energy-consuming Industries in A Low-carbon Economy

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Abstract: In recent years, under the background of "double carbon", reducing carbon emission and realizing green transformation and green development have become the necessary way for high energy-consuming enterprises to achieve sustainable development. However, the green transformation of high energy-consuming enterprises faces the problems of high investment cost and slow transformation, which makes it difficult for many high energy-consuming enterprises to take the step of green transformation. Based on the above background, this paper analyzes the concepts and theories related to low carbon economy and proposes the transformation path of high energy-consuming industries under low carbon economy environment.

Keywords: Low-carbon economy; High energy-consuming industries; Transformation path.

1. Introduction

Global warming has brought devastating effects to the human living environment, which makes the survival and development of human beings face a severe test. How to solve the resource and environment crisis has become the most important problem that human society will face. Low carbon economy, as an economic development model that considers both development and sustainability, has become the focus of global attention. Low-carbon economy refers to a new economic development model that constructs a clean energy structure through institutional innovation and technological innovation, solves the energy efficiency problem, transforms the social economy to the direction of high energy efficiency, low energy consumption and low carbon emission, and finally achieves the goal of sustainable development.[1]

2. Concept Definition

2.1. Double Carbon Policy

The "double carbon" policy target is China's "peak carbon"

and "carbon neutral" policy target in 2020, which requires China to reach the peak by 2030 and strive to In the context of this policy, the National Development and Reform Commission (NDRC) has proposed the policy goals of "carbon peaking" and "carbon neutrality" in 2020. Against this policy background, the National Development and Reform Commission (NDRC) has issued the "Implementation Guide for Energy-saving and Carbon-reducing Transformation and Upgrading in Key Areas of High Energy-consuming Enterprises (2022 Edition)", which sets out specific targets and requirements for high energy-consuming enterprises to reduce carbon emissions and energy consumption per unit and improve resource utilization efficiency.

Carbon emission reduction in the manufacturing industry is the top priority for achieving the goal of carbon peaking and carbon neutrality. This means that China needs to accelerate the transformation and upgrading of traditional industries and vigorously cultivate new industries to meet the requirements of the new era

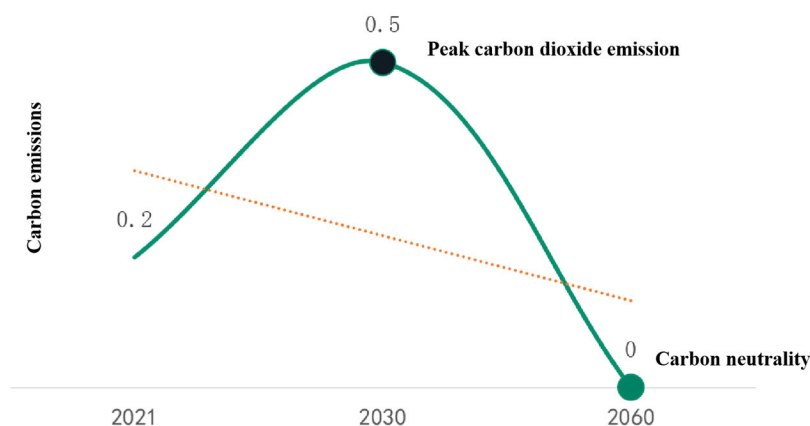


Figure 1. China's plan on carbon dioxide emission [2]

2.2. High-energy-consuming enterprises

High energy-consuming enterprises mainly refer to those industrial enterprises that consume a high amount of energy

(especially primary and secondary energy) and cost in the production process, which are often accompanied by high carbon emissions and energy consumption in the production process, and therefore are the target of "double carbon". They

are mainly gathered in six major industries such as petroleum processing, ferrous metal smelting and rolling processing industry, etc. The main business of the selected case company in this paper is ferrous metal smelting, so it is a typical high energy-consuming enterprise. Since the introduction of the "double carbon" policy, the state has put forward strict energy-saving and carbon reduction requirements for high-energy-consuming enterprises, and issued the "Program for Improving the Double Control of Energy Consumption Intensity and Total Amount" in 2021. The production and operation activities of high-energy-consuming enterprises are facing great challenges under the background of "double carbon" policy.[3]

2.3. Green Transformation

There are relatively few studies on green transformation, and there are several different perspectives on the definition of green transformation in academic circles. However, the relatively widely accepted definition of green transformation refers to the process of changing from development focusing only on economic benefits to a comprehensive and sustainable and coordinated development approach of economy, environment and society based on the concept of sustainable development and green development. Combining the characteristics of high energy-consuming enterprises and related research results, this paper defines green transformation as a dynamic process of changing from a high pollution and high energy consumption development mode to a sustainable green development mode with green strategy as the guide and energy saving, emission reduction and carbon reduction as the goal.

3. The Theory of Low Carbon Economy

3.1. Theory of Sustainable Development

The theory of sustainable development originates from the issue of environmental protection, but goes beyond simple environmental protection. Its main content involves the harmonization of sustainable economy, sustainable ecology and sustainable society, and its connotation includes common development, coordinated development, multidimensional development, equitable development and efficient development, emphasizing the need to meet the development needs of the present without compromising the needs of future generations. The theory of sustainable development provides the goal for low-carbon economic development, which is to ensure both economic efficiency and emphasize the harmony between human and nature in the development process.[4]

3.2. Environmental Kuznets theory

The environmental Kuznets curve was first proposed by Panayotou in 1996. This curve reveals the changes in the environment during the process of economic development. In the initial stage of economic development, the level of economic development is low and people focus on economic growth rather than environmental quality, and the government does not control environmental pollution too much, so the environment will deteriorate with economic growth. When the environmental pollution reaches the highest point, with the gradual improvement of economic strength, people will pay more and more attention to the quality of living environment, and government departments will also

introduce corresponding environmental policies to control environmental deterioration, and the environmental quality will gradually become better. The details are shown in Figure 2.[5]

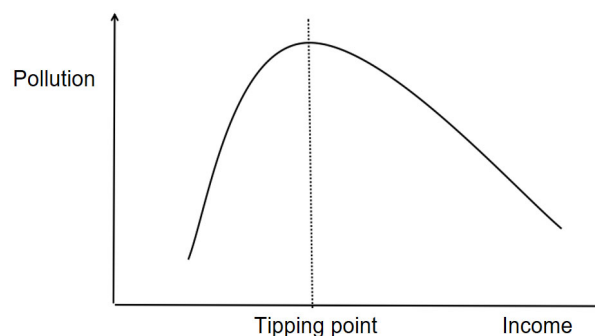


Figure 2. Environmental Kuznets curve

The transition from a high-carbon economy to a low-carbon economy, through institutional innovation, technological innovation and ecological innovation, can significantly reduce the kurtosis and shift the turning point to the left, if not completely change to a U-shaped curve. From the environmental Kuznets curve, we can see that we should focus on environmental protection and resource conservation at the early stage of economic development, and early intervention in environmental protection can significantly reduce the cost of treatment, improve the effect of treatment, and also eliminate the impact of health problems caused by environmental pollution on economic development.

4. Problems of High Energy-consuming Enterprises

4.1. Dysfunctional industrial structure

In the process of China's economic development, there has always been a high proportion of secondary industries, and most of the secondary industries have been developed in a rough production mode, among which high energy-consuming enterprises are typical. Such enterprises have high energy consumption per unit of output value, high pollutant emissions and serious problems of homogenization of industrial structure. Take the steel industry as an example, the main steel products in the market are low-end steel products produced under the crude production mode, which not only consume a lot of resources and energy in the production process, but also fail to meet the higher demand in terms of product performance. In addition to the saturated market environment, the output of each producer does not have special highlights in terms of performance, so the industry is particularly competitive, and the problem of excess capacity of low-end products is serious. On the other hand, the domestic supply of high-end steel products has never been able to meet the demand, so it still has to be obtained by way of import. The unreasonable industrial structure and overcapacity make the energy consumption and pollutant emissions of high-energy-consuming enterprises remain high.[6]

4.2. Insufficient application of innovative technology

China's high energy-consuming enterprises have been adopting a rough development mode, and the awareness of

green development is relatively weak, and green innovation has started late. In recent years, although the Chinese government has vigorously advocated scientific and technological innovation and green innovation, and some high energy-consuming enterprises have also responded positively, the innovative technology has not been popularized among high energy-consuming enterprises for a short time. Take the steel industry as an example, although many steel enterprises vigorously research and develop new, high-end steel products, but due to the limited mastery of technology, research and development of new steel added value is still low, far from international standards, and therefore can not form export advantages. In addition, enterprises often need to pay high costs for technological innovation, technology introduction costs, equipment acquisition costs, equipment maintenance and personnel training costs, etc., will bring greater pressure on enterprises, coupled with the transformation of technological innovation takes a certain amount of time, many enterprises can not bear the risk of technological innovation, so innovation technology in high energy-consuming enterprises.

Therefore, the innovative technology is not popular among high energy-consuming enterprises, and the transformation rate of scientific and technological achievements is low.

4.3. Imperfect disclosure of environmental information

Unlike the mandatory disclosure of financial information, the environmental information and data of enterprises have been rarely presented to the public. The high pollution and emission characteristics of high-energy-consuming enterprises make the importance of their environmental data particularly important. However, although many high energy-consuming enterprises have released social responsibility reports, incomplete disclosure years and imperfect disclosure data are still very common. Since the marketization of energy conservation and emission reduction is relatively low, many environmental indicators are not mandatorily required to be disclosed, and there is no standardized and unified format for social responsibility reports, it is difficult for the public and investors to find the environmental information of high energy-consuming enterprises to evaluate them. This is precisely why the pollutant emissions and energy consumption of high energy-consuming enterprises are not subject to effective external supervision.

5. Research Recommendations

5.1. Increase investment in environmental protection and R&D

In order to achieve long-term high-quality development, high energy-consuming enterprises are facing greater pressure from environmental policies in the context of "double carbon", and they also need to pay attention to technology research and development and application, which is well understood by enterprise managers, but now they need to pay more attention to technological innovation and application combined with environmental protection. Most of the key emission units are traditional production and manufacturing industries with high energy consumption and pollutant emissions. At the crossroads of deciding the fate of enterprises, it is necessary to recognize the situation, grasp the opportunity, take green innovation as a new concept of technology development, and accelerate the construction of

green manufacturing system. In the technical research and development work, make high efficiency and energy saving as the goal of chasing go, so that the whole process of production is in line with the concept of environmental protection. Enterprises should actively respond to the new and old energy conversion policy, eliminate backward production capacity, seek new kinetic energy, accelerate the process of converting old and new energy, improve the added value of products, and optimize their own industrial structure. In addition enterprises should focus on the introduction of new technologies and techniques, strengthen inter-industry cooperation, share the results of experience, achieve technical cooperation and sharing, forming a synergy to promote the overall development of the industry. High energy-consuming enterprises should further increase investment in environmental protection and research and development, increase investment in environmental protection projects, strengthen cooperation with research institutions, research teams, and thus accelerate the transformation of scientific and technological achievements. In the main business of enterprises, enterprises should also grasp the market demand, and vigorously research and develop high quality and low energy consumption high-end products to achieve their own competitive advantage and seize more market share.

5.2. Accelerate the extension and upgrade of industrial chain

Enterprises are in the ecological network, and their survival and development are closely related to upstream and downstream enterprises. In order to achieve sustainable development, traditional high energy-consuming enterprises must change their high consumption and inefficient production mode. The requirement of green energy saving and emission reduction under the "double carbon" policy will certainly bring higher costs to enterprises, thus affecting their economic benefits. In order to achieve the dual goals of cost reduction, energy saving and carbon reduction, enterprises should actively extend the structure of the industrial chain and develop diversified businesses in the upstream and downstream markets, so as to seek new profit increase points for enterprises. At the same time, through the involvement in upstream and downstream industries to achieve resource integration and synergistic effects, enterprises should further achieve cost reduction and market development.

5.3. Enhance the transparency of environmental information

In the context of "double carbon" and high-quality economic development, the information of the whole society and enterprise stakeholders is no longer limited to the traditional financial indicators or economic benefits. While governments, investors and the public are concerned about the economic efficiency of high energy-consuming enterprises, they are also more concerned about the environmental information and the fulfillment of social responsibility of such enterprises. However, the disclosure of environmental information in their social responsibility reports is rare, and most of them choose not to disclose the information or select some years for partial disclosure. In the case of Hangang Steel, the disclosure of environmental information and the fulfillment of social responsibility is incomplete, which to a certain extent affects the public's perception and evaluation of high energy-consuming enterprises and thus affects their economic efficiency.

Therefore, high energy-consuming enterprises, as the primary team of energy saving and carbon reduction, should take the initiative to strengthen the disclosure of environmental information such as pollutant emissions, energy consumption, investment in environmental protection projects and R&D achievements, improve the environmental information disclosure index system, make the data quantified and visualized, and consciously accept public supervision.

5.4. Strengthen policy guidance and support

The green transformation of high energy-consuming enterprises is often accompanied by high economic costs such as the purchase of environmental equipment and the placement of environmental protection industries, and the economic benefits brought by green transformation often have a certain lag, so in the current changing external environment, enterprises need to take greater risks in green transformation. As the supervisor of the market economy, the government should strengthen the publicity and advocacy of green transformation of high energy-consuming enterprises, so that high energy-consuming enterprises can consciously build up the awareness of green transformation. At the same time, the government should strengthen its support for the green transformation of high energy-consuming enterprises and the development of environmental industries through some financial subsidies, tax preferences and other policy

means.

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