

Research on the Current Situation and Economic Development Trends of China's Energy Economy Structure: Taking Shandong Province as an Example

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Abstract: Shandong Province is a province with strong economic growth and high energy consumption in China. The energy consumption structure is mainly composed of coal and oil. While the regional GDP is increasing with each passing year, carbon emissions are also increasing year by year, and carbon emissions are mainly concentrated in high energy consuming industries. Coal plays a very significant part in the growth of social economy and has become a necessity for people's production and life. The coal based chemical industry is one of the six leading industries of Shandong Energy Group. The coal chemical industry is a significant component of China's energy construction, and how to improve the quality and efficient utilization of coal chemical products is currently the focus of close attention in the coal chemical industry. Promoting economic transformation and upgrading, as well as energy structure adjustment, is a necessary path for China to achieve the objective of "carbon peaking and carbon neutrality". Carbon peaking and carbon neutrality "is the main foundation and new engine for China's economic and social growth in the next 40 years, which will inevitably drive systematic changes such as low-carbon transformation, structural reshaping, and technological innovation in the energy industry. This article takes Shandong Province as an example to study the current situation of China's energy economy structure and economic development trends.

Keywords: China's Energy Economy, Structural Status, Development Trends, Shandong Province.

1. Introduction

Energy is the cornerstone of national economic guarantee and provides significant material guarantees for social stability and growth [1]. In response to the situation of energy depletion and ecological environment degradation, countries around the world are actively exploring and developing clean energy technologies, especially renewable energy technologies [2]. The characteristics of China's energy resources are mainly reflected in aspects such as abundant coal, low oil, and gas shortage, which determine the status of coal as China's main consumer energy and will not change in the short term [3].

In recent years, the economic growth rate of Shandong Province has significantly slowed down, with "high energy use, high pollution, and overcapacity" bringing economic growth to enterprises while also damaging the ecological environment [4]. The growth of clean energy and energy interconnection has become a research hotspot in various countries around the world, and the energy internet has become a pointer in the future growth of energy [5]. Enterprises must transform towards a low-carbon and environmentally friendly economic model guided by new technologies, models, and formats, seek new growth drivers, optimize industrial structures, and accelerate the transformation of old and new economic growth drivers. Promoting the "dual carbon" work is an imperative need to solve renowned resource and environmental restraints, achieve sustainable growth, comply with the pointer of technological process, promote economic structure transformation and upgrading, meet the growing requirement for a beautiful ecological environment among the people, and push harmonious coexistence between humans and nature. China is a rapidly developing country, but its regional economic growth is uneven. New energy has not been fully

explored and is insufficient to support the rapid growth of the local economy. Economic growth still relies on conventional fossil fuels at the cost of sacrificing the ecological environment. The global response to climate change has embarked on a new journey, with over 130 countries proposing carbon neutrality goals, and accelerating the low-carbon transformation of energy has become a consensus. The cost of developing new energy is high, there is a lack of financial support, and there are relatively few channels for the growth and application of new energy. The central information technology has not been further improved, and the output of new energy is inversely proportional to the investment of investors. The interweaving of new and old risks in China's energy security, the long-standing shortage of oil and gas resources, and the frequent occurrence of regional and temporal energy supply and demand tensions, as well as the increasingly prominent non-traditional security risks such as network security, make it particularly important to ensure energy security [6].

The growth level of new energy varies in different regions. Local governments should fully explore and utilize modern information technology to leverage local advantageous resources, further clarify the relationship between the new energy industry and regional relevant industries, promote the integration and growth of the two through cooperation, innovation, industry integration, and other modes, and thereby enhance the level of coordinated growth between the new energy industry and regional economy [7]. The effective growth of modern coal chemical technology is of great significance for the clean and efficient utilization of coal and the promotion of economic growth. The purpose of developing coal chemical industry is to promote the clean and efficient utilization of coal resources and achieve sustainable social growth. Relying on the comprehensive green transformation of economic and social growth and promoting

the economy to embark on a path of green and low-carbon circular growth is the fundamental strategy to solve China's resource, environmental and ecological problems, and the primary way to achieve the objective of "carbon peaking and carbon neutrality".

2. Current Situation of China's Energy Economy Structure

2.1. Energy Consumption Structure

Economic growth requires energy support, especially in the stage of rapid industrialization. With the increasing demand for coal resources in society, the widespread use of coal not only promotes social and economic growth, but also improves people's quality of life and standards [8]. For a long time, coal has dominated China's energy structure. The coal based chemical industry is one of the six leading industries of Shandong Energy Group. Shandong ranks first in terms of energy use and sulfur dioxide emissions in the country. From the perspective of energy structure, Shandong Province accounts for nearly 1/10 of the country's coal consumption. Table 1 shows the energy consumption structure of Shandong Province from 2018 to 2020. With the continuous deepening of reform and opening up, coupled with the continuous optimization and upgrading of industrial structure, the energy supply capacity has significantly improved, and the variety of supply has become increasingly diverse. The linkage between industrial structure adjustment and energy consumption structure is increasing, presenting the characteristics of "each industry taking what they need" [9].

Table 1. Energy consumption structure of Shandong Province from 2018 to 2020

| Type | 2018 (Proportion/%) | 2019 (Proportion/%) | 2020 (Proportion/%) |
|-------|------------------------|------------------------|------------------------|
| Coal | 69.3 | 67.3 | 66.8 |
| Oil | 18.7 | 16.5 | 13.6 |
| Gas | 3.2 | 5.4 | 6.3 |
| Other | 8.7 | 11.3 | 13.9 |

According to Table 1, coal accounts for the dominant position in Shandong Province, with a proportion basically maintained at around 70%, indicating the significant characteristics of Shandong Province's single energy structure and "high carbon, high coal". Although the proportion of natural gas and other energy use shows a significant upward trend, and the growth rate of raw coal consumption shows a downward trend, due to the fact that the total consumption of raw coal is far greater than that of other energy use, China's energy structure mainly composed of raw coal and crude oil has not undergone substantial changes. That is to say, China's economic growth still relies on the extensive growth and utilization model mainly composed of fossil fuels such as raw coal and crude oil, which has not changed.

2.2. Industrial Structure

The rapid growth of China's economy in the past 20 years has driven rapid growth in energy expenditure. However, compared to developed countries, China's industrial structure is "biased", and the energy expenditure per unit output value of the secondary industry is much higher than that of the primary and tertiary industries, resulting in a higher energy expenditure per unit of GDP in China. With the rapid growth

of the social economy, the demand for energy is also increasing. Nowadays, the world is facing an energy crisis, and in this context, people are gradually realizing the importance of renewable energy. The rapid raise in industrial energy use in China, especially the enhancement in industrial coal consumption, has caused a series of ecological and environmental issues [10].

In the context of energy transformation, the role of countries around the world in promoting clean, low-carbon, and renewable energy is becoming increasingly evident, with increasing emphasis on the growth of green, low-carbon, and clean environments. They are also placing the growth of renewable energy ideas under the fabric of the Paris Agreement and engaging in international cooperation in the area of clean energy sources. Limiting the rapid growth of the "two high" (high energy use, high emissions) industries and eliminating outdated production capacity is of great practical importance for optimizing China's energy consumption structure and achieving the "dual carbon" goal. Nowadays, under the energy crisis, renewable energy has turned into the centre of global energy transformation. Developing renewable energy is a fundamental demand for implementing the Scientific Development Concept and constructing a resource-saving society, as well as a significant measure to protect the environment and response to climate change.

3. Economic Development Trends and Countermeasures Suggestions

3.1. Development Trends

As the growth rate of China's working age population slows down, the population aging and savings rate decrease, the reallocation of production factors between departments is nearing its end, and the space for improving total factor productivity brought about by technological catch-up is significantly reduced. China's presumable economic growth rate will tend to decline, and the economy will shift from high-speed growth to medium to high-speed growth. As a traditional energy source, it has indeed brought benefits and growth to China's economy, but simultaneously, the accompanying environmental problems are very acute, bringing many environmental pollution problems to this Earth's home that relies on survival. In the later period of transformation towards industrialization, the combination of production factors will undergo significant changes, upgrading from labor-intensive to capital and technology intensive industries, and developing from resource and energy intensive industries to energy-saving and emission reduction industries.

In order to assure the long-term production and growth of humanity, and in response to China's current conditions, promoting the growth of energy-saving energy and developing green energy will be the task and mission of China's long-term energy economy growth. There are three general directions for global energy transformation, namely optimizing energy layout and promoting sustainable growth of renewable energy; Vigorously raise the consumption and production of green and low-carbon natural gas; Foster and enlarge new business models represented by multi energy complementary system integration optimization and Internet+smart energy engineering. The deep integration of digital technology with production and daily life has brought more precise innovation, promoted intelligent manufacturing

and lean production, overturned traditional consumption methods, and become the driving force for a new round of global economic growth.

3.2. Countermeasures Suggestions

Based on the background of energy transformation, the growth of renewable energy needs to be steadily and continuously promoted. Accelerating the growth of imaginative energy and building a clean, safe, and efficient energy economy system is the key of the key for enhancing China's energy efficiency and accelerating the process of economic growth. The growth of energy technology plays a crucial function in China's current distribution of energy resources. Low carbon transformation cannot be accomplished without the assistance of technology. China should prioritize the growth of energy technology, which will advance energy technology and provide technical support for sustainable energy resources.

Renewable energy, including solar energy, wind energy, biomass energy, hydro energy, geothermal energy, and ocean energy, is a widely existing, inexhaustible, and ultimately reliable primary energy source. Among them, biomass energy is presently the most popularly used renewable energy in the

world, with a total consumption ranking fourth only after coal, oil, and natural gas. It is also the only recyclable and renewable carbon source. Biomass energy generation is shown in Figure 1. To improve the energy use situation in Shandong Province, it is necessary to actively build first-class infrastructure and construct a modern energy system that is clean, low-carbon, safe, efficient, and supply optimized. Biomass power generation has the feature of a long industrial chain and strong driving force. It is a significant carrier for the integrated growth of agriculture, industry, and service industries, and a sharp tool for industrial targeted poverty alleviation. Shandong Province is a major province in agriculture and forestry, with a large and extensive range of biomass energy resources. Accelerating the growth of efficient and low consumption industries such as energy resource protection, environmental protection, and new energy, Shandong Province can actively assist in the reformation of new and old energy in the province from both supply and demand perspectives. At the same time, China should establish a conservation-oriented industrial structure and use economic means such as taxation and pricing mechanisms or policies to indirectly promote long-term economic growth.

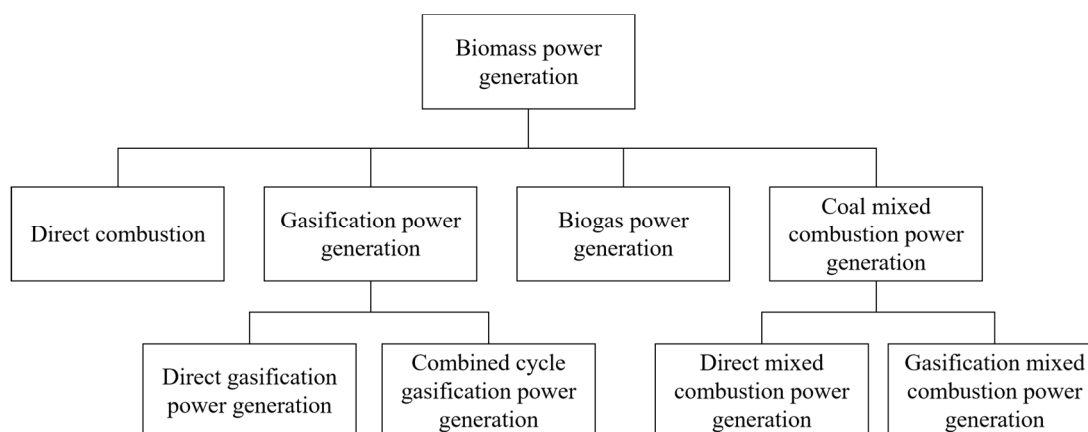


Figure 1. Biomass energy generation

4. Conclusions

Energy is the fundamental and industrial cornerstone of a country. In the context of the "dual carbon" goal, carbon reduction rather than decarbonization needs to be based on China's coal dominated energy situation, and carbon reduction needs to be promoted in an orderly and planned manner. The energy economy is also a significant component of China's economy, which is related to the long-term growth of the Chinese economy. With the increasing global warming phenomenon and the increasing emphasis on environmental protection by countries around the world, the active optimization and adjustment of industrial direction is not only a trend, but also an inevitable measure. Renewable energy can not only help improve the ecological environment, but also better drive social and economic growth, thereby enhancing the common growth of ecology, environment, and economy. As the backbone of energy, coal must implement the idea of green and low-carbon growth. The rice bowl of energy must be in one's own hands, covering and supporting the growth of the new energy industry. Only by adjusting the energy production structure in an orderly manner can we embark on a path of low-carbon transformation and growth. At the same

time, we need to pay more attention to the growth of renewable energy and propose effective growth strategies based on the current situation of renewable energy growth, in order to enhance the rapid growth of renewable energy. While vigorously developing the economy and optimizing industrial structure, we also need to actively enhance the energy revolution, optimize the energy supply structure, increase energy operation rate, and construct a clean, low-carbon, safe, and efficient modern energy system.

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