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Construction of Evaluation Index System for Coordinated Development of Economy, Energy and Environment of Coal Enterprises Based on Low-carbon Economy

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Abstract. As a special industry, the impact of coal enterprises on the earth and environment is inevitable. On the basis of conforming to China's sustainable development strategy, coal enterprises must be consistent with the development of international coal market. Energy development, energy production, transportation and conversion are limited. Especially, fossil energy is a non-renewable resource which is consumed once. There is a distance between the speed of energy development and production and people's daily life and economic development demand for energy, and this distance tends to expand. Energy and environment are the two major factors restricting the development of human society and economy, and energy is the basis of world economic development. Human beings are facing severe challenges of energy shortage, resource depletion and environmental deterioration. How to solve the increasingly urgent contradiction between energy, environment and rapid economic growth is a social development problem faced by all mankind. Based on the perspective of low-carbon economy, this paper analyzes the problems related to the coordinated development mode of energy and environment of coal enterprises.

Keywords: Coal enterprises; Low carbon economy; Energy environment.

1. Introduction

High-speed economic growth depends on the input of a large number of production factors. The industrial structure and low energy utilization rate of energy-intensive enterprises inevitably cause huge waste of resources. At the same time, with the consumption of carbon-based energy such as coal and oil, carbon emissions increase sharply [1]. From the perspective of circular economy, the process of social production activity itself is a large circular process, and the production activity of coal enterprises is a small branch [2]. Energy is one of the important material bases for the development of national economy, and it is also the most important basic resource in human daily life. Because of its importance, energy will always be the first consideration for any country and government in the world when formulating economic development policies and implementing economic development strategies [3]. Energy and environment are two major factors that restrict the development of human society and economy, and energy is the basis of the development of world economy. With the development of modern industry, the whole world economy grows rapidly, and people's living standards are greatly improved, followed by a greater demand for energy resources [5]. China's economy has entered a new normal stage, and the role of energy and environment in sustainable development is becoming more and more obvious. A series of energy and environmental problems accumulated under extensive development mode need to be solved urgently [6]. In order to ensure the sustainable development of coal enterprises, it is necessary to take the route of coordinated development of energy and environment and explore new ideas for the development of coal enterprises, so as to promote the realization of the sustainable development strategy of China's market economy.

For a long time, coal has accounted for more than 2/3 of China's primary energy production and consumption. Moreover, China's existing energy reserves, production and consumption structure determines that the coal-based energy supply pattern will not change for a long time to come [7]. Enterprises, especially coal enterprises, are closely related to the natural environment and play an important role in the problems of resources and environment. They draw energy, resources and

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information from the environment, and then input them into the environment through purposeful distribution and consumption [8]. The coordinated development mode of energy and environment of coal enterprises refers to thoroughly improving the previous unidirectional linear economic development mode, realizing the optimal allocation of resources of coal enterprises, reducing the input of resources and energy, and realizing zero emission of coal production and reducing the pollution to the environment and atmosphere through the recycling of waste [9]. The research on the ecological competitiveness of enterprises is related to the overall competitiveness of the country, which is the source of national competitiveness. The strength of enterprise competitiveness is directly related to the overall competitiveness of the country [10]. Under the framework of circular economy theory, combining with system theory, enterprise development theory and sustainable development theory, it is of great theoretical and practical significance for coal enterprises to establish an evaluation system for the coordinated development of energy and environment in coal enterprises, and to choose appropriate methods to evaluate the coordinated development of energy and environment in coal enterprises.

2. Co integration of energy consumption and economic growth

From the perspective of economics, the relationship between energy and economic growth is that economic growth depends on energy, that is, the use of energy promotes economic growth. Some large and medium-sized coal enterprises also began to strengthen the assessment and evaluation of corporate social responsibility by setting up dynamic assessment and analysis of some comprehensive indicators in enterprise management, and began to attach importance to the construction of early warning and prevention mechanism of social responsibility. The impact of the coordinated development mode of energy and environment on coal enterprises is not only the capital circulation and labor circulation, but also the resource circulation mode. Social labor for the purpose of production should not only create new value, but also play a certain role in protecting the social resources and environment that may be destroyed in the past to ensure the stability of ecology and environment. Because of the scarcity of energy and the increasing demand for energy, energy has become a restrictive factor of economic growth [11]. It is necessary for social and economic development to correctly handle the relationship between energy consumption and economic growth. Therefore, it is of practical significance to study the equilibrium relationship between energy consumption and economic growth.

From the actual situation of the current development of China's coal industry, both in terms of resource utilization and mining are facing a severe situation, so it is necessary to promote the innovation of the development mechanism of coal enterprises through the development of circular economy. Enterprise culture is the foundation of enterprise development and the internal support of enterprise development goal. To build and develop the ecological competitiveness of enterprises, we must first establish a correct corporate culture in line with social development. As the leader of enterprise development, the upper-level decision-makers of enterprises should change their thinking, abandon the wrong idea of focusing only on enterprise development and ignoring the surrounding environment, and improve their ecological awareness, starting from the perspective of sustainable development of enterprises. Restricted by the current industry management system, management level and different development stages of coal enterprises, most coal enterprise groups still have many practical problems in social responsibility category, and have not yet established a comprehensive evaluation system of social responsibility of coal enterprises recognized by society. To build ecological competitiveness, enterprises must start from the enterprise management system. First of all, it is necessary to adjust the development strategy of enterprises in time according to the actual development requirements, change the original investment structure, actively increase investment in ecological construction and take it as the key point, and develop green economy to enhance the new competitiveness of enterprises.

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3. Evaluation of coordinated development of energy and environment

From the current situation of China's market economy development, circular economy has also been widely valued, especially in the coal industry. From the perspective of large-scale social production, the process of social production can be regarded as a big cycle, while the production process of coal enterprises is a small cycle. The continuous improvement and development of this small cycle of coal production will inevitably have an important impact on the big cycle of social production activities. To comprehensively evaluate the social responsibility of coal enterprises, we must first determine the evaluation index system, which is the basis of comprehensive evaluation. Evaluation index system is not only the link between evaluation experts and evaluation objects, but also the bridge between evaluation methods and evaluation objects. Coal resources occupy a large proportion in China's resource structure, but the development efficiency of coal resources is still very limited [12]. Therefore, the coal industry must pay full attention to the continuous adjustment and optimization of its own industrial structure, pay attention to the development of changeable industries, and organically combine industry development with product value, so as to promote the sustainable development of the coal industry. Corporate social responsibility refers to the social responsibility of enterprises to employees, consumers, communities and the natural environment while creating profits and being responsible for shareholders' interests.

Coal enterprises shall, according to the relevant requirements of the State Administration of Work Safety on the safety production input of coal enterprises, truthfully disclose the social responsibility information on the safety production input. The data mining process in energy economic analysis is shown in Figure 1.

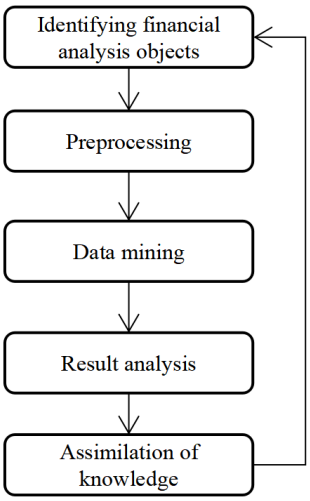

Figure 1 Data mining process in energy economic analysis and management

A regional energy consumption model is established

$$\lambda_{t-cf}=\frac{\sum_{i=1}^{n}C_i\times h_{it}\times\lambda_{it}}{\sum_{i=1}^{n}C_i\times h_{it}}=\frac{\sum_{i=1}^{n}C_i\times h_{it}\times\lambda_{it}}{Q_{t-cf}} \tag{1}$$

Where: λ_{t-cf} is the average coal consumption rate of coal-fired power generation in year t; C_i is the assembled capacity of coal-fired power generation unit i; h_{it} is the average power generation hours of the i-th unit in the t year; λ_{it} is the average coal consumption rate of the i-th unit in the t year coal consumption rate; Q_{t-cf} is the total amount of coal power generation in year t. Establish a coal power generation emission model:

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$$e_{tk-cf}=\frac{\sum_{i=1}^{n}C_i\times h_{it}\times e_{itk}}{\sum_{i=1}^{n}C_i\times h_{it}}=\frac{\sum_{i=1}^{n}C_i\times h_{it}\times e_{itk}}{Q_{t-cf}} \tag{2}$$

In the formula: e_{tk-cf} is the emission of pollutant gas per kilowatt-hour of coal in the t year; e_{itk} is the emission of pollutant gas per kilowatt of electricity of the i-th unit in year t.

In the future development of coal enterprises, it is necessary to pay attention to the efficient, full and reasonable utilization of coal resources, to rationally allocate existing resources, and continuously improve the effective utilization of resources. The development of circular economy is inseparable from the reasonable guidance of national policies. Only under the guidance of policies can we ensure that coal companies maintain the right direction in the process of sustainable recycling. With the guidance of policies, strengthen the fair and reasonable allocation of internal efficiency and resources of the enterprise, and further promote the coordinated development of energy and environment. In the determination of the energy and environment coordinated development goals of coal enterprises, comprehensive planning should be done, and the strategic development goals should be properly decomposed and detailed, so as to improve the operability and pertinence of the goals, and to integrate the key items and key items. To give full attention to technology can we ensure the realization of circular economy management goals. Whether it is a coal mining company in the open pit or a coal mining company in a roadway, there is damage to the environment, so they have the obligation to protect the environment and restore.

The government conducts carbon verification on companies participating in the carbon trading mechanism. In period t, the calculation formula for the CO_2 emissions of enterprise j in sector i is:

$$E_{i,j,t}^{c}=\frac{11}{3}\sum_{n=1}^{6}a_n b_n c_n F_{n,i,j,t} \tag{3}$$

Among them, $E_{i,j,t}^{c}$ is the carbon emission of enterprise j in the production sector i in the period t, and a_n, b_n, c_n and $F_{n,i,j,t}$ are the conversion factor of energy n used by the enterprise, the oxidation rate of carbon emission factor and the consumption.

The environmental responsibility of enterprises requires coal enterprises to make rational use of resources and reduce the degree of environmental pollution in accordance with the provisions of relevant laws, and on the other hand, coal enterprises should bear the related costs of managing the waste of resources and environmental pollution caused by enterprises. Making a reasonable plan for the establishment of coal preparation plant and coal preparation plant can promote the continuous improvement of coal added value and avoid the impact on coal industry chain caused by paying too much attention to the development of related projects. In terms of economic relations, enterprises should not only correctly handle the relationship with shareholders or investors, but also be legal and honest in the process of business activities, commit themselves to the long-term sustainable operation of enterprises, provide more equal jobs, and create more wealth for the society. In order to establish a good corporate image, we should pay attention to the mining and cultivation of enterprise talents and the development and reserve of excellent human resources [13]. In terms of environmental relations, enterprises should correctly handle the relationship between enterprise activities and the environment in order to pursue sustainable and coordinated development with the environment. It mainly includes abiding by national and local laws and regulations on environmental protection, establishing a sound environmental management system, continuously improving environmental protection work, actively responding to and avoiding environmental risks, and continuously improving the use efficiency of energy and raw materials.

The factors affecting carbon emissions are divided into four categories: energy structure, energy intensity, industrial structure and economic scale. The LMDI decomposition method is used to analyze the effects caused by their respective changes on carbon emissions. Its decomposition model can be expressed as:

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$$C^t = \sum_{i=1}^{7} ES_i^t \times EE^n \times TG^t \times GDP^t \quad (4)$$

Among them, ES represents the consumption share of various types of energy in each year; EE represents the amount of energy consumed per unit output value in each year; YG indicates the proportion of GDP to GDP in each year; GDP represents the regional gross domestic product.

Under the guidance of circular economy theory, enterprises should make full use of renewable resources formed in coal production, vigorously develop clean technologies to achieve the goal of saving energy and reducing consumption, and provide basic technical support for coal industry-related projects. This will also help the coal industry to achieve industrial extension and promote the continuous expansion of the coordinated development of energy and environment. If coal enterprises want to take the route of coordinated development of energy and environment, they must take sustainable development as an important guiding ideology. On the basis of determining strategic objectives and strategic directions, they should do a good job in overall planning, decompose strategic objectives in detail, and further improve the pertinence and operability of target formulation. Under the guidance of circular economy theory, we must make full use of renewable resources in the process of coal mining, and further introduce clean development technology, so as to achieve the goal of energy saving in an all-round way, better promote the development of coal enterprises and expand the scale of shield-ring economy.

4. Conclusions

Energy is an indispensable power for human survival, economic development and social progress, while coal is the basic energy and important raw material in China. From the current situation of China's coal industry development, there are big problems in resource exploitation and utilization, so it is an inevitable trend for modern coal enterprises to develop circular economy mode. For a long time, influenced by the traditional thinking mode of economic development, the development of coal enterprises has followed an extensive growth path, unilaterally pursuing output and economic benefits, ignoring the comprehensive and efficient utilization of resources and ecological environment protection, and a series of environmental and social problems caused by it have become bottlenecks that seriously restrict the sustainable development of coal enterprises. Establishing an evaluation index system for coordinated development of energy and environment can help coal enterprises to define their social responsibilities scientifically and reasonably, and play a scientific guiding role for coal enterprises to actively undertake social responsibilities. Under the guidance of circular economy theory, we must make full use of renewable resources in the process of coal mining and further introduce clean development technologies. Only through the circular economy model can we effectively promote the improvement of coal mining efficiency and the recycling of coal resources, thus promoting the sustainable development of coal enterprises and improving the ecological environment.

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