Research on Green Energy Management Mechanism from the perspective of social network

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Abstract. Energy is an important material basis for the survival and development of human society, which determines the quality of national economic development and people's quality of life. Energy shortage and environmental pollution have always been the two major problems that human beings face for a long time. Green energy management is extremely urgent. It is of great practical significance to develop green energy management from the perspective of social network. This paper finds that through the reform of energy system, strengthening the construction of system innovation, giving full play to the capacity of social collaborative governance, realizing network management through structural positioning and active role, and making full use of energy internet information technology to improve the capacity of technological innovation can significantly improve the capacity of green energy management reform in China.

1. Introduction

Since the reform and opening up, China's industrialization process has been accelerated, which has put great pressure on natural resources, ecological environment and economic growth. From the traditional economy to the circular economy, low-carbon economy and then to the green economy, China's green energy reform has never stopped. To develop green energy economy is to adapt to China's comprehensive deepening of reform, effectively implement the five development concepts of innovation, coordination, green, open and sharing, support the modernization of the economic construction, and promote the high-quality development of China's strategic objectives, which has important practical significance. The current social network research runs through the macroscopic functional performance from the micro network node interconnection to the overall formation of the network structure, and its theoretical achievements are suitable for the analysis of various problems encountered in the process of energy management in China. The green energy management model is constructed by using the social network theory, and the stakeholders in the management process are taken as nodes on the network. The overall goal is to coordinate and optimize the efficiency of resource allocation, improve the efficiency of energy use, and make overall arrangements in time, space, total amount and structure.

2. Significance of green energy management

The fifth plenary session of the 16th central committee of the communist party of China emphasized that we should speed up the construction of a resource-conserving and environment-friendly society, vigorously develop a circular economy and strengthen environmental protection. The 18th national congress of the communist party of China proposed to build a resource-conserving society and a
coordinated development system featuring harmonious coexistence between man and nature. Resources, population, environment and development are major socio-economic issues facing all countries in the world today. In order to cope with climate change and energy scarcity, green energy development has become the primary choice for all countries. According to the statistical data of BP, the development of green energy in developed countries has made great progress, while the development of green energy in China started late. China's green energy consumption accounts for a low proportion of primary energy consumption, accounting for only 0.7% in 2014. Figure 1 shows the change of green energy consumption in three countries from 1993 to 2014.

![Figure 1. the proportion of green energy consumption in the total primary energy consumption](image)

Figure 1. the proportion of green energy consumption in the total primary energy consumption. Note: the data source is BP, in which green energy includes solar energy, wind energy, geothermal energy, biological energy, garbage power generation, tidal energy, etc., excluding nuclear energy and water energy.

| Energy    | Demand by 2020          |
|-----------|-------------------------|
| coal      | 4.02 billion tons       |
| petroleum | 670 million tons        |
| natural gas | 350 billion cubic metres |
| A power   | 2.5 trillion kwh        |
| total energy consumed | 4.73 billion tons of standard coal |

Table 1. China's energy demand forecast in 2020.

Note: data source: China energy industry assessment report.

At present, China's economy has entered a new normal. The state encourages the development of green energy and further reduces the proportion of coal consumption. According to the energy production and consumption revolution strategy (2016-2030) published by the national development and reform commission and the national energy administration at the end of 2016, the growth rate of domestic oil consumption is expected to slow down to 17%-20% by 2030. Total coal consumption fell, and the share of the energy mix fell to 46%. In the future, energy efficiency is expected to continue to improve, and energy consumption will enter a medium-low speed growth period.

China's energy management mechanism is undergoing a change from government regulation to multi-governance model. In 1980, the National People's Congress (NPC) for the first time put equal emphasis on energy development and conservation into the macro-economic management system. In 1997, the National People's Congress passed the energy conservation law of the People's Republic of China to provide legal guarantee for energy management. In 2006, the energy utilization efficiency evaluation index system was put forward in the outline. Since 2010, measures have been released to reform the energy management mechanism. From the point of the government's concrete practice of energy management, emphasis of energy management in China has gradually enhanced, but also faces some challenges, energy-saving benefit and economic benefit goal conflict, part of the local government enforcement is not enough, policy tools using problems such as unreasonable, it provides the realistic demand for new management change, multiple governance model into a new system is created. Multiple governance model in the market mechanism and social mechanism is the core of the energy management mechanism, the adjustment of the market to maximize the optimal
configuration of the resources, social service and supervision mechanism to better implement the management mode, government policy mechanism can provide value guidance, and multiple governance mode of the implementation of the mechanism is under the background of certain social network.

As the development and application of information network technology in the 21st century provides a new opportunity for green energy management, it has become the focus of many scholars in recent years\cite{3}. Some domestic scholars have found that the application of data energy management can increase the number of relational network nodes and expand the scope of network application\cite{4}. The flattening of the network structure increases the density of connection between nodes, so as to realize effective communication and efficient operation among nodes. On the basis of reviewing the research work of energy management, this paper carries out social network research and combines it with green energy management to enrich its theoretical basis, so as to provide reference for China's energy management.

3. Overview of social network theory

Social network research has gradually emerged since the 1990s, becoming a new field of sociological research and attracting a large number of scholars to join the research team. Especially at the end of the 20th century, the discovery of small-world network and scale-free network provided theoretical and measurement tools for the complexity characteristics of social network. The points formed by members and the relationship between points are two basic elements of social network analysis. As a node on the network, the interest interaction among individuals, enterprises, industries, governments and even countries is carried out in a certain social network background. Therefore, the use of social network theory can provide a new perspective for China's green energy management.

There is a general conflict between energy efficiency and economic efficiency\cite{5}. Enterprise behavior motivation is the pursuit of self-interest maximization of economic benefits are often able to determine whether an enterprise operating for a long time, the government came under pressure from the environmental regulation and limited resources, saving energy and reducing consumption, reduce pollution and protect the environment is the basic requirement of the society of the government, in the process of energy management form, there is a transformation mechanism: allows network formation game between participants in the negotiations, transfer agreement\cite{6}. This transfer payment mechanism can effectively solve the conflict of interests, which is shown as follows: if the network connection has positive externality, the participant must be allowed to subsidize any participant in the whole network to promote the connection generation; If the network connection has a negative externality, the participant must be allowed to tax any participant in the entire network to prevent connection generation.

A transfer payment rule is the function \( t:G\rightarrow \mathbb{R}^n \) such that for all \( G \) there is a sum of \( \sum t_j(g) = 0 \). A transfer payment rule can then reflect any redistribution of earnings in a given network. These payments can subsidize or tax a particular link or group of links, and it is appropriate for an outside agency to intervene or for individual participants to negotiate. It meets the

\[
 u_i(g) + t^e_i(g) = \frac{\sum_j u_j(g)}{n}
\]

or

\[
 t^e_i(g) = \frac{\sum_j u_j(g)}{n} - u_i(g)
\]

This transfer payment rule fully equalizes the earnings of all participants on any given network.

In order to realize the goal of green energy management modernization, the government should attach importance to do a good job interest coordination, promote the different main body play together on the energy development strategy, unified various energy industry of industrial policy,
management system and market pattern, realize benefit fair between industries, to promote the sustainable development of energy and the service target.

4. Conclusions and Suggestions
We will promote energy technology innovation by promoting energy production and consumption revolution, build a clean, low-carbon, safe and efficient energy system, improve energy utilization efficiency, and enhance energy conservation and emission reduction in all areas of consumption, so as to provide policy suggestions for energy sustainability, clean utilization and social sustainable development in the new normal of China's economy. To this end, developing green energy management should focus on the following measures:

One is to ensure green growth through energy system reform and strengthen energy economy and policy research. The innovation and construction of the system is a necessary condition to promote the development of energy management. As a rational economic person, a positive and effective incentive mechanism will inevitably promote the whole society to invest human and material resources to create actively, so as to drive the positive network utility, realize the energy technology innovation and industrial optimization, and improve the overall energy management efficiency of our country. Relying on policy support and supporting measures, effectively integrate all stakeholders in green energy management, coordinate operation and information sharing data, and make overall arrangements for various energy management networks, so as to effectively solve the problems of energy supply and demand mismatch and unreasonable resource allocation.

Second, the use of energy Internet, sensors and other information technology, to build a big data engine to promote high-quality development of energy economy, especially the large-scale application of 5G network, green energy management must be data energy management. At present, the great energy development is still in the initial stage of exploration data need to be further clear big data platform as a whole management, carry out a variety of ways to drive data accumulation, excavates its deep value, pay attention to cultivate green values, leading the green consumption, in the process of network marketing, reduce the risk of user information, using social networking tools model ability of ethnic knowledge sharing and trust level, reasonable and efficient allocation of energy resources.

Third, give play to the capacity of social collaborative governance, realize network management through the role of structural location and initiative, and establish a sound green energy management system. As each node in the energy management network, the government, operators, consumers and other stakeholders can only solve some irreconcilable contradictions in energy management effectively through joint cooperation and collaborative governance. Green energy saving and economic efficiency are sometimes difficult to achieve balance, The instability of government supervision and management may allocate more energy resources to enterprises or individuals with good short-term economic benefits but poor green environmental benefits, which often leads to low long-term economic efficiency and environmental regulation efficiency. Multiple governance model can effectively solve the conflict and management efficiency, the government, market and social organizations, including multiple related interest subjects through market mechanism and social mechanism, and the third party supervision mechanism, comprehensive coordination of the energy resources using policy tools, such as the green energy subsidies and realize the maximum social benefit maximization.

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References
[1] Liu xianfeng. From government regulation to multi-governance: development and reform of energy-saving management model [J]. Quest, 2019, 312 (02) : 83-90.
[2] Tian lifang, li yunpeng. Obstacles and path choices for energy efficiency improvement in China -- based on the concept of green growth [J]. Technology economy and management research,
[3] Lin boqiang. The Period of Carrying out Energy Revolution to Promote Low Carbon Clean Development in China [J]. China industrial economy, 000 (6) : 15-23.

[4] Wang jingyu, liu yingqi, Kokko a. technological Innovation of industrial Alliance from the Perspective of Social Network -- an empirical study of China's new energy automobile Industry AllianceEmpirical Study on China's NEV Industry Alliance [J]. China science and technology forum, 2017, 000 (005) : 186-192.

[5] Zhao xingshu, zhuang guiyang. Summary of international symposium on "promoting low-carbon development through incentive mechanism" [J]. Academic dynamics: Beijing (8) : 8-11.

[6] Chen xinxin. Energy monitoring and control system -- Siemens network-based cost-effective energy management solution [J]. Intelligent building and urban information (11) : 51-52.