Global Clean Energy Governance Mechanism Research - Based on power model

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Abstract. Since the 21st century, global clean energy governance has developed rapidly and gradually attracted the attention of scholars at home and abroad as an emerging field. The development and utilization of the global Clean energy Governance Network has greatly promoted the development of social productive forces, promoted economic globalization and scientific and technological progress, deepened the interdependence of energy and economy among countries around the world, and consolidated the foundation of cooperation among them. At present, the global clean energy governance presents a state of "disorder" with multiple mechanisms superimposed on each other, and is faced with many governance difficulties and dilemmas. By building a global clean energy governance network model, this paper tries to solve the stability and balance of multiple participants in the governance network. On the basis of win-win cooperation, countries should clarify their responsibilities and obligations and work together to promote clean energy governance. We should accelerate the transformation and upgrading of the global energy mix and explore a path of green, clean, low-carbon, environmentally friendly, healthy and sustainable energy cooperation.

1. Introduction
Since the 21st century, the development of clean energy represented by solar energy, wind energy, geothermal energy and biomass has been an important solution to the external problems such as climate change, energy crisis and environmental pollution in many countries of the world, which can realize the sustainable development and virtuous cycle of energy resources. The development of clean energy has become a global consensus. Here, clean energy refers to the energy that does not produce or produces few pollutants in the development and utilization process. The study of global clean energy governance mechanism has important theoretical and practical significance.

With the deepening of the globalization development degree, the countries of the world energy economy continues to deepen mutual dependence, strengthen cooperation between governments demand is increasing, in recent years, the international energy in the form of continuous adjustment and reform, the current system of global energy governance structure is increasingly complex and fragmented, difference of behavior of a variety of main management goals and superposition, and the functions of the government in the absence of international energy policy coordination disorder such as state, the existing energy management system in the face of increasingly complex international energy situation, gradually exposed the governance ability weakened, coordination mechanism of aging, obvious geographical limitations, correlation and the insufficient problems such as bearing capacity. The current global energy governance is faced with many governance difficulties and dilemmas. Therefore, to seek a new energy governance system that is more fair, just, low-carbon and
sustainable, and to accelerate the transformation and upgrading of the energy structure have become the urgent governance solutions that countries around the world need to explore in order to deal with the changes in the global energy environment.

2. Drivers of global clean energy governance

The essence of global governance is to overcome the dilemma of collective action so as to avoid "tragedy of the Commons", so as to realize joint action and consultation arrangement among actors in a certain field of public governance worldwide. Clean energy can be rapidly developed, innovative with government policy support, the improvement of technology, cost competitiveness, financing channels of continuous optimization, energy security and environmental protection consciousness of ascension are closely related, in its essence is from the transformation of energy structure, energy consumption is the main emerging from developed countries to developing countries, the high carbon energy characteristics of multiple energy transformation to low carbon change, marked the global energy structure has undergone great changes. In addition, the proportion of clean energy in the world's energy structure is gradually increasing. According to statistics from BP database, from 2007 to 2017, the proportion of clean energy in global primary energy consumption increased from 6.93% to 10.4%, and the current trend is steadily increasing. In addition, due to the decrease of total cost driven by technological innovation, the use of clean energy will certainly drive large-scale effect. Through the monitoring and calculation of big data, the predictability and efficiency of equipment operation will be enhanced, the operation cost and maintenance cost will be reduced, and the company has strong market competitiveness. China's energy consumption from 2008 to 2012 is shown in Table 1.

| Times | Total energy consumption | Total clean energy consumption |
|-------|--------------------------|-------------------------------|
| 2012  | 402 138                  | 34 003                        |
| 2011  | 387 043                  | 27 840                        |
| 2010  | 360 648                  | 27 945                        |
| 2009  | 336 126                  | 23 918                        |
| 2008  | 320 611                  | 22 442                        |

*Note: Unit: 10,000 tons of standard coal

Global clean energy governance can be defined as the sum of activities aimed at improving the path of clean energy governance and energy transformation, with the core of participation of multiple subjects including government departments, Non-Governmental organizations, research institutions and industry organizations in the international clean energy rights and interests maintenance and governance order construction. With the rapid development of clean energy around the world, more and more government departments, together with other stakeholders, participate in clean energy governance, and promote the construction of global energy undertakings by building new networks for energy development and utilization and strengthening the networking of technologies, information and partnerships. The clean energy governance process involves the rights and interests of all parties, coordination and dynamic continuity through formal and informal relations. International intergovernmental networks to enhance efforts in the cooperation governance, from the simple with the center of a sovereign state governance to expand to include the government, market and society participation of multiple agents, polycentric governance, multinational government network formation of the social mechanism, market mechanism to solve the problem of global common to provide effective governance of global clean energy development path.

It can be found that the goal of clean energy governance is a global governance paradigm characterized by the formation of multiple network governance, which not only emphasizes the joint
participation and cooperation of multiple actors from the government, market and society, but also focuses on the network governance within and between the three sectors. Intersectoral cooperation is based on the distribution of common power, interests and responsibilities. The establishment of cooperative partnerships can help resolve conflicts and achieve win-win results. How to distribute the power, the benefit and the responsibility in the multi-center governance model; How to better coordinate the balance and stability of partnership and take into account the interests of all parties in the global energy market? This paper will then build a global clean energy network model by referring to the power model in the social network, in the hope of providing reference ideas for China's participation in global clean energy governance.

3. Global Clean Energy Governance Network Model

3.1. Construction of governance network model

Power is a central concept in sociology, which is studied in many forms. The general concept of "social value" on the web is realized through a particular kind of symbolic economic concept: value expressed in terms of money or interest, and people bluntly discuss how to allocate it. Distribution of the value of social relations, through the network exchange experiment, first observed some basic network diagram, and set a for each node in the graph can be exchanged the limitation of the number of neighbors, under this restriction, the experiment of each round of the exchange of collection can be regarded as a figure a match, that is, a node subset without overlapping edges, and each node in the interval \([0, 1]\) an assigned value to satisfy.

The definition is as follows:

If nodes X and Y correspond to an edge in a match, their sum of value is 1.

If node X does not involve any edges in the match, its value is 0, that is, it does not participate in any exchange.

Through a mathematical framework, it is possible to predict what will happen during the exchange in any network. Starting with the simple form of two-sector bargaining, we can better understand the phenomenon reflected by the model. Nash bargaining is described as follows: when two nodes A and B negotiate on how to divide A dollar, it is assumed that the external options of the two nodes in the network can be quantified as \(x\) and \(y\), \(1 \leq x + y \leq 1\). In terms of the result of dividing relation S, Nash's theoretical result is that the two parties are satisfied with the equal share. Nash's bargaining result is as follows:

For A:

\[
\frac{x + \frac{1}{2}s}{2} = \frac{x + 1 - y}{2}.
\]

For B:

\[
\frac{y + \frac{1}{2}s}{2} = \frac{y + 1 - x}{2}.
\]

Using the above definition, we hope to explain the following phenomena: the difference between equal and unequal distribution of value on the side; The difference between strong power (extremely unbalanced) and weak power (somewhat unbalanced); Results The difference between stable network and unstable network.

3.2. Stable results

One of the fundamental properties that the desired result should have is stability: there is no node X, and it can make a recommendation to node Y to divide the value so that both X and Y get more value. Network exchange the result is stable, if and only if it does not contain any instability, if there is an uncertainty factor in the results, is not the result an edge in the match, the sum of the value of its two endpoints X and Y is less than 1, the two nodes has both opportunities and incentives to destroy the existing exchange model, to find the better way than it currently is.

By determining the stability and instability of the results in the network structure diagram, we can approximate the behavior in the case of extreme power imbalance. The fact that there is no stable
outcome gives us a way to think about negotiation - whatever agreement is reached temporarily, there is always internal pressure in the system to undermine it. Explain ability of stability is also, however, there are obvious limitations, is that it often depends on the people not to make the result of the extreme assumption in practical activities, to have the function of the subtle difference of power network is limited, if there is a "external options", namely the influence of other departments in the network node, will produce different results of network exchange and value distribution.

3.3 Balance or satisfactory results

The equilibrium result is defined as: the best external option for each node provided by the rest of the given network. An exchange result is called equilibrium if, for each edge in the match, the partition of value reflects the Nash bargaining result of the two nodes. In fact, when we consider this bargaining process as a game, Nash bargaining is a natural equilibrium.

In order to better understand the concept of equilibrium result, 4-node path can be used to explain it. Departments A, B, C and D are connected by edges in the network structure, so network exchange can be regarded as A bargaining, in which "external options" are provided by other adjacent departments in the network, as shown in Figure 1.

Determine whether equilibrium or satisfactory results are met: given a result, external options for each node can be obtained, and then the exchange of each edge in the match can be calculated according to the assignment of nodes in the result to meet Nash bargaining solution. If a value distribution corresponds to a Nash bargain, both parties should be satisfied. By building A model of power, the global clean energy management department of multiple participants can be simplified as A, B, C, D, etc., on power, benefits and responsibilities between them for bargaining behavior, in order to maintain the stability of the network system or balance, behavior main body by A more fair and reasonable allocation of income, if the presence of external options, namely in the network influence on individual participants, the adjacent other departments will have great change to the transformation of the whole network structure.

4. Conclusion

Global energy governance is value-oriented based on the coordinated development of economy, environment and energy. It is the sum total of mechanisms and activities of multiple actors to jointly
deal with the issues of global energy security and sustainable development through equal interaction and collaborative guarantee. From the perspective of global governance effect, the relationship between energy producers and consumers, and the balanced relationship between transnational governments and industry organizations, global clean energy governance mechanism must be more inclusive and dynamic, and static network interaction cannot meet the requirements of energy governance in the new era. Equity is an urgent issue for all countries in global clean energy governance. Building a fair and reasonable energy governance system is the key to deepening cooperation and safeguarding energy security among countries. Therefore, guarantee the stability of energy supply and demand balance, to improve energy efficiency and climate change, etc., have a common interest between each behavior subject, on the basis of win-win cooperation, both the energy to pursue their own interests, and balancing the energy concerns of other countries, is seeking its own development and promote the common prosperity of all countries, open inclusive of new energy management system.

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References
[1] Li Xinlei. Transnational Paradigm of Global Clean Energy Governance--Characteristics, Motivations and Challenges of Multi-Network Development [J]. International Observer, 2017, 000(006):137-154.
[2] Wanke, Chen Zhiheng. Review of foreign studies on Global Energy Governance: Progress, Limitations and Prospects [J]. Foreign Social Sciences, 2019(6).
[3] Xiong Hua-wen, SU Ming. Promoting the Modernization of energy Governance System and Methods [J]. Journal of Macroeconomic Management, 2018, No.416(08):36-41.
[4] Su Shuhui, YUAN Guolin, LI Yulun, et al. International Clean Energy Development Report (2014) [M]. International Clean Energy Development Report (2014). Social Sciences Academic Press, 2014.
[5] Fan Fengchun, Li Xiaomei. Study on dynamic Collaborative Governance Model of Multiple Subjects in Rural Public Services [J]. Management World, 2014, 000(009):176-177.
[6] Wang Qiang, Xu Linglin, Li Na, et al. Evolution process of space-time pattern of world energy Security since the 1990s (English)[J]. Journal of Geographical Sciences, 2019 (8): 1.
[7] Qi Kai. Global Energy Security Governance: Risks and Challenges, International Cooperation and China's Role [J]. International Forum, 2017 (4): 13-18.
[8] Yan Shigang. Research on Energy Cooperation Between China's Energy Security and Neighboring Countries [J]. Reform and Strategy, 2016 (8): 31-34 135.