A Study on Strategic Path Optimization Theory and Evaluation Method for High-quality Development of Power Enterprises from the Perspective of Global Energy Governance

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Abstract. Currently, the world is facing major changes that have not occurred in a century, and global energy governance has undergone significant new changes. In this paper, the author studies and judged the new requirements of China's economic and social development for the energy industry in the current context, and clarified the important role of power enterprises in driving the high-quality development of the industry and the whole society. On this basis, this paper puts forward a theoretical framework of strategic path optimization strategy for power enterprises, which covers three levels of "international-industry-enterprise" and three dimensions of "evaluation system of major powers competition under the new development paradigm-functional orientation of energy supporting major powers competition -evaluation system of 'six-in-one' high-quality development of power enterprises", and constructed the corresponding index evaluation system.
Keywords: Global energy governance, high-quality development of power enterprises.

1. Introduction

Facing the new changes in the global energy governance environment, China should still focus on the guarantee and promotion of global energy governance in energy security, insist on ensuring energy security within the framework of global governance, enhance China's right to speak, energy investment and trade, etc., and jointly build a human community with a shared future in the energy field by participating in, contributing to and leading global energy governance. With the acceleration of the "carbon peaking and carbon neutrality" process and the deepening of energy transformation, the traditional power system is evolving to a new type of power system that is clean, low-carbon, safe, controllable, flexible, efficient, open, interactive, intelligent and friendly. Its technical foundation, operation mechanism and functional form will undergo profound changes. The power industry is a key sector for the energy industry to play a supporting role in the major powers competition under the new situation. Therefore, it is necessary to study the strategic path optimization theory and evaluation method suitable for the high-quality development of power enterprises, so as to support the energy industry to play its role in the major powers competition.

2. Background and significance

2.1 Significant new changes in global energy governance

Currently, the world is facing major changes that have not occurred in a century, and global energy governance has undergone significant new changes. Due to the outbreak of COVID-19 epidemic, the fragile recovery process in most countries around the world is interrupted. Ultra-low growth or even negative growth in the medium term in most countries of the world will probably become the norm. Technological nationalism and market protectionism are intertwined and reinforce each other, becoming an important paradigm for political and economic competition among major powers. On the whole, the process of globalization and global governance has begun to deviate from its original track, and regionalism and multilateral cooperation mechanisms driven by politics among countries have gradually become main stream. The "local multi-point" social and economic turmoil will drag down the steady recovery of the world economy, while the world economy is gradually entering an era of uncertain growth. Technological nationalism and market

protectionism will become a set of twin mechanisms hindering the process of globalization. The process of globalization will undergo structural changes, and regionalism and multilateral cooperation mechanisms will surpass the traditional globalization paradigm.

As the global energy pattern is changed, global energy governance is facing challenges. The energy consumption market is shifting to emerging market countries and Asian countries, and the breakthrough of energy development technology and the exploitation of shale oil and gas resources have changed the power balance of energy supply side. As the issue of climate change has grown in importance, countries have introduced measures to reduce their dependence on traditional energy sources. However, what does not match this reality is that the current global energy governance system fails to fully reflect the rising trend of developing countries, and there is a huge gap between the progress of global energy governance and the requirements of the international community. At present, the challenges facing global energy governance include: inefficiency and even failure of traditional energy governance mechanisms caused by fragmented governance; absence of public goods in major powers; and new contradictions in the global energy pattern.

In the face of new changes in the global energy governance environment, global energy governance construction faces a new window of opportunity. The construction of new system is necessary to cover the function gap of global governance. All major powers hope to participate in, contribute to and lead the new development of global governance. Even if the national diplomatic game is in a stalemate, China should still focus on the guarantee and promotion of global energy governance in energy security, insist on ensuring energy security within the framework of global governance, enhance China's right to speak, energy investment and trade, etc., and jointly build a human community with a shared future in the energy field by participating in, contributing to and leading global energy governance. From a realistic perspective, global energy governance needs to restrain the disorderly development of the energy field from market supply and demand, energy dependence, energy politics, environmental governance, corporate system, social organization and international cooperation in technology. Therefore, it is necessary to clarify the evaluation system of major powers competition from the perspective of global energy governance, define the geopolitical, political, military, economic, and financial games among various entities on energy, as well as the coordination in the fields of resource technology, sustainable utilization and distribution of resources, and price stability.

2.2 Higher requirements for the energy industry imposed by China's multiple strategic objectives

Energy is closely related to major variables in economy and society, such as economy and environment. At present, China's multiple strategic objectives put forward higher requirements for the energy industry. Energy interacts closely with economy via supply security, energy cost and industrial development. Energy development and utilization and environment influence each other, and environmental carrying capacity directly limits the space for economic development. Economy, energy and environment form a close relationship of mutual support, interaction and restriction. Under specific economic and social conditions, the energy system can reach a certain dynamic balance point in coordinating safety, economy and cleanliness. As the basic driving force of economic and social operation, the whole energy system has a mutual service and restriction relationship with economy and environment, thus making the economy and society reach a certain dynamic balance point under the action of the three. From the perspective of policy deployment, China's ecological civilization construction and "carbon peaking and carbon neutrality" goal has imposed higher requirements for the coordinated development of economy, energy and environment, and for energy security, economy and cleanliness on the whole.

To realize the multiple strategic objectives including the new development paradigm, the major new requirements and strategic objectives of building a new development paradigm, constructing a new power system and realizing "carbon peaking and carbon neutrality" goal should be considered

in the energy industry. Moreover, the functions and requirements of energy in serving the overall economy are expanded and upgraded.

2.3 More important role of power enterprises in driving the high-quality development of the industry and the whole society

The power industry is a key sector for the energy industry to play a supporting role in the major powers competition under the new situation. Electric energy is a clean, efficient and convenient secondary energy, which is the key field of clean and low-carbon energy transformation. Power generation is the main way to develop and utilize new energy resources. Electricity is a favorable choice to replace terminal fossil energy consumption, and it is also an advantageous field to promote energy science and technology innovation and industry cultivation. With the acceleration of the "carbon peaking and carbon neutrality" process and the deepening of energy transformation, the traditional power system is evolving to a new type of power system that is clean, low-carbon, safe, controllable, flexible, efficient, open, interactive, intelligent and friendly. Its technical foundation, operation mechanism and functional form will undergo profound changes and the power system is also facing unprecedented pressure of reform and upgrading. After the 18th National Congress of the Communist Party of China, facing the new changes in the pattern of energy supply and demand and the new trend of international energy development, General Secretary Xi Jinping put forward a new energy security strategy of "four revolutions and one cooperation" for the purpose of national energy security, and defined the general requirements and strategic policy of China's energy industry. From the law of economic development, the penetration rate of electricity in the process of economic development and production is constantly increasing, and the coupling relationship between electric power and economy is further deepened. As a necessary condition of digital infrastructure, electricity will become "infrastructure of infrastructure" in the future. The power industry will play a more important role in supporting the energy industry in the major powers competition.

China's power industry has the first-mover advantage in coping with the changes of international trade environment in the post-epidemic era. China's power industry is one of the few high-end industries with international first-mover advantage, and international cooperation in the field of energy opens new space for China's high-level opening up. China is leading in wind power, solar power generation, UHV, electric vehicles, energy storage and other industries, with a high degree of autonomy and a leading scale in the world, and has an obvious dominant position in international trade. At the same time, China's power technology and equipment have a broad market under the promotion of the green "The Belt and Road Initiative". The gap of global green investment is USD 28 trillion, of which 57% is located in the Asia-Pacific region. It is estimated that the investment demand in the energy sector in the Asia-Pacific region will be USD 12 trillion from 2016 to 2030. Countries along the Belt and Road have a great need to build high-quality, resilient, cost-effective and green power infrastructure.

3. Strategic path optimization theory and evaluation system for high-quality development of power enterprises

3.1 Theoretical framework of strategic path optimization strategy applicable to power enterprises

This paper puts forward a theoretical framework of strategic path optimization strategy for power enterprises, which covers three levels of "international-industry-enterprise" and three dimensions of "evaluation system of major powers competition under the new development paradigm-functional orientation of energy supporting major powers competition -evaluation system of 'six-in-one' high-quality development of power enterprises".

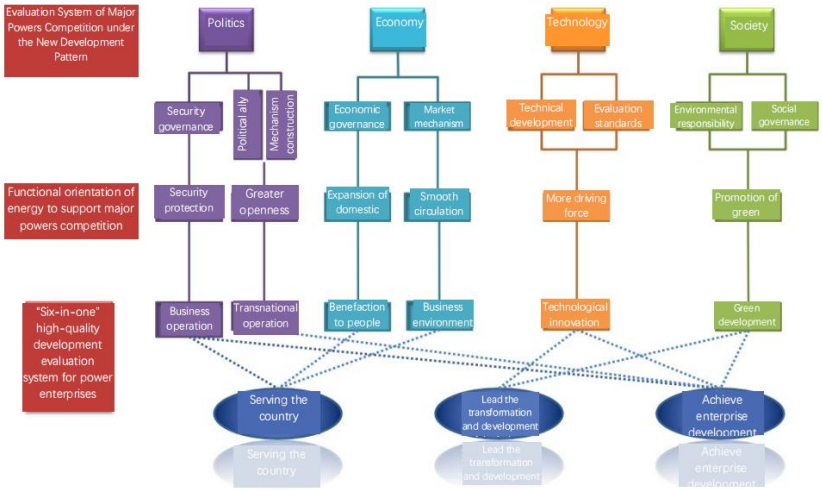

Fig. 1. Theoretical Framework of Strategic Path Optimization Strategy Applicable to Power Enterprises

3.2 Evaluation and analysis of major powers competition under the new development paradigm

The Evaluation System of Major Powers Competition under the New development paradigm (Figure 2) is constructed in this paper. The actual international leadership and future leadership performance of countries in the process of global ecological civilization transformation are comprehensively evaluated by means of questionnaire and data index evaluation.

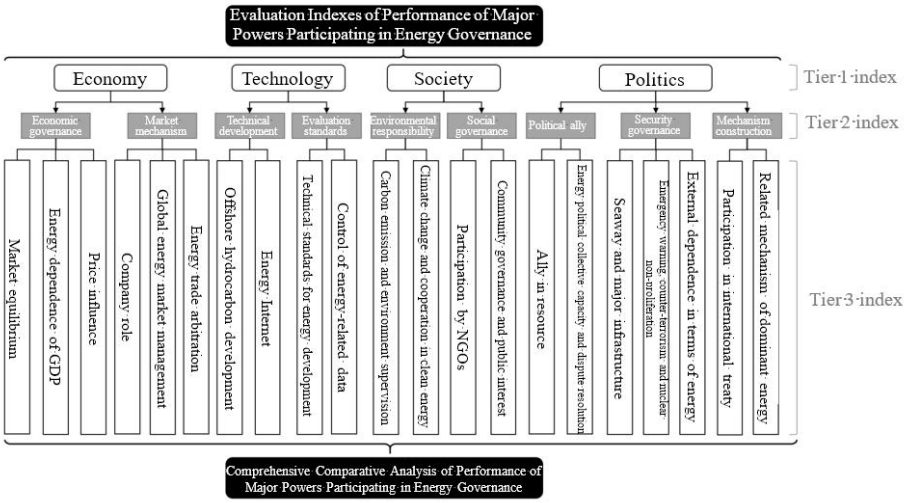

Fig. 2. Evaluation System of Big Country Competition under the New development paradigm

The index system is mainly divided into three levels. The first level is the dimensional level, that is, the four dimensions of economy, technology, society, and politics. The second level is the main fields under each evaluation dimension. The political dimension includes political allies and mechanism building; the economic dimension mainly includes economic governance and market mechanisms; the technical dimension mainly includes technology development and evaluation standards; and the social dimension mainly includes environmental responsibility and social governance. The respondents of the questionnaire mainly include experts from the Ministry of Ecology and Environment, the Institutes of Science and Development, Chinese Academy of Sciences, the National Center for Climate Change Strategy and International Cooperation, the State Grid Energy Research Institute, the All-China Environment Federation, the Shanghai Academy of Social Sciences, the Shanghai Petroleum and Gas Trading Center, and the Agora Energiewende, the

Greenpeace and the energy research departments of the international non-governmental organizations. The performance of eight countries, including China, the United States, Japan, the United Kingdom, Germany, France, Russia, and India, in participating in global energy governance is evaluated by them. The specific evaluation results are given in Table 2.

Table 1. Competitive Evaluation Scores of Major Powers Participating in Global Energy Governance

	USA	China	Britain	France	Japan	Russia	India	Germany
Economic dimension	19.04	15.46	15.63	15.54	15.21	15.75	12.79	16.29
Technological dimension	20.19	17.50	16.31	15.06	15.19	14.00	11.25	15.06
Social dimension	17.13	15.19	17.81	17.31	15.94	11.38	10.88	18.19
Political dimension	20.39	15.96	16.14	15.93	14.71	14.57	10.96	16.39
Total scores	76.75	64.11	65.89	63.85	61.05	55.70	45.88	65.93

3.3 Analysis on changes in the functional orientation of energy supporting major powers competition

Under the new development paradigm and the “carbon peaking and carbon neutrality” goal, the role and importance of energy in serving the overall economy have been greatly enhanced, which is mainly reflected in the six aspects: security protection, expansion of domestic demand, more driving force, smooth circulation, greater openness and promotion of green development.

First, energy is the core support for security protection. As the basic factor of production, infrastructure and upstream of industry chain, energy provides basic supply guarantee and resource security guarantee for economic development.

Second, energy is a key sector for expanding domestic demand. The long energy industry chain covers many economic sectors, which can effectively drive investment and expand domestic demand.

Third, energy is one of the key drivers of economic “transition”. Energy is the carrier of new models and new formats. Clean and low-carbon development of energy leads the green transformation of economy and society, and integration with digital production factors leads the two basic trends of economic transition, providing new impetus for economic upgrading.

Fourth, energy is one of the basic force points for smooth circulation. Energy has extensive ties with various economic sectors and regions, and is one of the governance powers to coordinate the relationship between the central and local governments. It can coordinate energy resources with agriculture, manufacturing and service industries by building a national energy market.

Fifth, energy is an important stage for international competition and cooperation. As the urgency of global response to climate change continues to rise, energy is a key strategic tool for geopolitical game among major powers, interconnection of “The Belt and Road Initiative”, global cooperation on climate change, and an important field for reshaping global governance order.

Sixth, energy is the main battlefield to promote green transformation. To achieve the “carbon peaking and carbon neutrality” goal, the sustainable development of economy and society puts forward higher requirements on energy security, cleanliness and economy. The energy and power industry is the main battlefield and main force to promote green transformation, and is an important carrier of innovation elements, new models and new formats. The comprehensive green and low-carbon economic and social transformation will create great development opportunities and space.

3.4 Optimization theory and evaluation system of "six-in-one" high-quality development strategic path of power enterprises

Based on the new situation of global energy governance and the more important role of electricity in driving the high-quality development of the industry and the whole society, the high-quality development of power enterprises should be guided by the new development concept of "innovation, coordination, green, openness and sharing" on the basis of becoming stronger and better. Power enterprises should become the backbone of implementing the decision-making arrangements of the CPC Central Committee and fulfilling political and economic responsibilities, and fully involve in the major national development strategies. Therefore, from the perspective of evaluation methods, it is necessary to study and determine specific evaluation indexes from three levels of "serving the overall development of the country - leading the industrial transformation and development -realizing enterprise development", and from six aspects of business operation ability, benefaction to people, business environment, green development, scientific and technological innovation and transnational operation, as shown in Table 2.

Table 2. International Benchmarking Index System of Power Industry

Dimension	S/N	Index	Unit
1. Business operation ability			
Enterprise scale	1	Total assets	RMB 100 million
	2	Market share	%
	3	Operating income	RMB 100 million
Profitability	4	Profit margin of operating income	%
	5	Return on equity	%
Safety and quality	6	Intrinsic safety level	%
	7	Compliance and risk management and control level	%
Operational efficiency	8	Overall labor productivity	%
	9	Main business operation guarantee level	%
	10	Operating cost per kWh	Yuan/kWh
2. Benefaction to people			
Economic gain	11	GDP and tax contribution	%
	12	Jobs created	10,000
	13	Wage level	RMB
Service quality	14	Resident satisfaction	%
	15	Government satisfaction	%
	16	Rural per capita domestic consumption	kWh
	17	Investment in helping poverty-stricken areas	RMB 10,000
3. Business environment			
Access to electricity	18	Contribution to "access to electricity" index	%
Fair service	19	Degree of service difference between urban and rural areas	%
	20	Degree of regional investment disparity	%
	21	Small and medium-sized enterprises being promoted	Enterprise
4. Green development			
Clean power	22	Proportion of clean energy installed capacity	%

	23	Grid-connected capacity of clean energy	10,000 kW
	24	Pollutant discharge per kWh	g
Low-carbon power	25	Carbon emission per kWh	g
	26	Total carbon treatment	Tons
5. Scientific and technological innovation			
R&D investment	27	Scale of R&D investment	RMB 10,000
	28	Proportion of R&D investment to operating income	%
	29	Proportion of scientific research personnel to total employees	%
Industry influence	30	Industry comprehensive impact index	%
	31	Talent equivalent density	%
	32	Ranking of enterprise think tank	Place
	33	Transnational technology trade surplus	RMB 10,000
Application of advanced technology	34	Digital development index	%
	35	Intelligent information processing rate	%
	36	Utilization rate of intelligent equipment	%
6. Transnational operation			
Brand value	37	Ranking of World Brand Lab	Place
	38	Ranking of Fortune Global 500	Place
Overseas business	39	Total overseas equity assets	USD 100 million
	40	Total overseas income	USD 100 million
International influence	41	International standards	Pcs
	42	Representation of key international institutions	Person
	43	Coverage of international business along “The Belt and Road”	%

Conclusion

With the acceleration of the “carbon peaking and carbon neutrality” process and the deepening of energy transformation, the traditional power system is evolving to a new type of power system that is clean, low-carbon, safe, controllable, flexible, efficient, open, interactive, intelligent and friendly. Its technical foundation, operation mechanism and functional form will undergo profound changes and the power system is also facing unprecedented pressure of reform and upgrading. The power industry is a key sector for the energy industry to play a supporting role in the major powers competition under the new situation. Under the theoretical framework of strategic path optimization strategy for power enterprises covering three levels of “international-industry-enterprise” and three dimensions of “evaluation system of major powers competition under the new development paradigm-functional orientation of energy supporting major powers competition -evaluation system of ‘six-in-one’ high-quality development of power enterprises”, the strategic path optimization theory and evaluation system for high-quality development of power enterprises is constructed, which offers a reference method to evaluate the high-quality development of power enterprises from the perspective of global energy governance.

Acknowledgments

This work was supported by State Grid Energy Research Institute’s Self-initiated Technological Project (Research on the Evaluation system of China and Major countries participating in Global Energy Governance based on the New Development Paradigm)

References

[1] State Council Information Office, Party Documents Research Office of the CPC Central Committee, China International Publishing Group. Xi Jinping: The Governance of China (Volume I). Beijing: Foreign Languages Press, 2014.

[2] State Council Information Office, Party Documents Research Office of the CPC Central Committee, China International Publishing Group. Xi Jinping: The Governance of China (Volume II). Beijing: Foreign Languages Press, 2017.

[3] State Council Information Office, Party Documents Research Office of the CPC Central Committee, China International Publishing Group. Xi Jinping: The Governance of China (Volume III). Beijing: Foreign Languages Press, 2020.

[4] Sun Yangzhao and Lan Hong: Framework, New Challenges and Reform Trends of Global Energy Governance, Exploration of Economic Issues, No.11, 2013, p. 79.

[5] Yu Hongyuan, G20 and the Reconstruction of Global Energy Governance, International Review, No.4, 2017, p. 129.