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Policy Research on Promoting the Development of China's New Energy Industry from The Perspective of Policy Tools

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Abstract

As a new format and new model of economic development, the low-carbon economy has become an important starting point for promoting the construction of a new development pattern, and governments at all levels have also promulgated a series of targeted policies. Taking the policies related to the new energy industry in 2019-2021 as the research object, the two-dimensional analysis framework of the policy tool-innovation value chain is constructed. The study found that in recent years, the annual volume of relevant policies has been relatively stable and more inclined to the form of multi-subject joint issuance; it can comprehensively use three types of policy tools: supply-oriented, environmental-oriented and demand-oriented, but there is a problem of uncoordinated use; and it is possible to use policy tools in a targeted manner based on the development stage of the new energy industry, but it is still not perfect. The domestic academic community has rich research on the construction of new energy industry policy systems in other countries, but there are relatively few research on targeted analysis of China's new energy industry policies, especially what kind of new energy industry policies can maximize their effectiveness, and what deficiencies exist in the current support policies from the combination of effective markets and promising governments and how to improve them. Based on this, this paper proposes how China's new energy policy promotes the development of the new energy industry, and how to improve and perfect the corresponding policy system. This paper conducts a textual quantitative analysis of the relevant policies of China's new energy industry from 2019 to 2021, in order to provide reference for the construction and improvement of the overall policy system of the new energy industry. The theoretical contribution of this paper is to further expand the boundaries of application of policy tool theory. In view of China's new energy industry policies in recent years, this paper constructs a two-dimensional analysis framework of "policy tools - innovation value chain", and puts forward practical and effective suggestions for the construction and improvement of China's new energy industry policy system

Keywords

New energy; Low-carbon economy; Policy tools.

1. INTRODUCTION

Due to the high rate of industrialization, mainly traditional energy consumption, and extensive economic development mode, China has become a major carbon emitter. As a large

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energy consumer, China cannot achieve self-sufficiency due to the limited reserves of oil and coal, and the greenhouse gases generated by the use of traditional energy are increasingly serious threats to the environment, which has led to the attention of all sectors of China's political science, enterprises and communities to turn to new energy with low-carbon and environmental protection characteristics compared with traditional energy. At the same time, the development and utilization of new energy, the development of low-carbon economy, and the promotion of the formation and development of new energy industry have become the basic consensus of economic and industrial transformation in all countries.

New energy refers to solar energy, nuclear energy as the representative, based on new energy development technology, with low-carbon, clean, renewable and other environmental protection characteristics of new energy. Because the new energy industry is an emerging industry, it is small in scale and poor in profitability compared with mature industries. Therefore, some scholars pointed out that unclear development goals, backward technology, and imperfect policies are the main problems of China's new energy industry. Further, Peng Wenbing et al. (2018) proposed that policies play an important role in the new energy industry. Based on signal theory, the authors and others believe that government policies can help the new energy industry reduce development risks, improve financing levels, and stimulate innovation vitality. From the existing research, scholars mainly focus on the formulation and application of new energy industry policies in other countries to analyze and evaluate. Zhou Maorong and Zhu Jia (2007) analyzed the reasons for the EU's new energy policy, and pointed out that energy security, energy price and negative environmental externalities were the main reasons for the EU's new energy policy.The deficiency is that the study does not draw on the experience of other countries to put forward practical suggestions for the establishment of China's new energy policy system. Pei Yonggang (2009) pointed out that India is similar to China in terms of economic development stage and other aspects, so the analysis of its new energy industry policy has great reference significance for the establishment of China's new energy policy system. Based on the analysis of the policy content, motivation and problems of India's new energy industry, the authors and others put forward five suggestions, including centralizing the authority of new energy management, establishing supporting facilities, attaching importance to scientific and technological research, and improving cross-regional exchanges and cooperation. Li Renfang and Dan Dan (2013) analyzed the successful experience of the Brazilian government in formulating and implementing new energy policies, and proposed that it was necessary for the Chinese government to learn from the policy experience of Brazil, actively develop new energy, and realize the diversification of energy structure and low carbonization of energy utilization. Liu Xiaojia et al. (2013) studied the new energy policies of ten ASEAN countries and proposed that China is relatively backward in the utilization of new energy, and China should strengthen international cooperation in new energy technology, and attract foreign or other private capital through tax exemption policies in the development of new energy. Based on the analysis of Japan's new energy policy and legal system, Wu Zhizhong (2013) proposed that the national new energy policy was the main reason for Japan's great progress in the development and utilization of new energy. Feng Xuejiao et al. (2016) studied the new energy innovation industrial policy of the United States and proposed that China's new energy industrial policy has shortcomings such as industrial policy and legislation in the initial stage, resource integration, low technology level, low-end development model, and poor innovation ability. Wang Ting et al. (2019) put forward policy suggestions on improving relevant legislation, maintaining the integrity of policy system and strengthening development planning on the basis of systematic analysis of the progress of establishing new energy industry policy systems in countries or regions such as the United States, Japan, Germany and France.From this point of view, domestic academic circles are rich in research on the construction of new energy industrial policy systems in other countries, but there are relatively few researches on targeted

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analysis of China's new energy industrial policies, especially what kind of new energy industrial policies can maximize their effectiveness. There are very few studies on the shortcomings of the existing support policies based on the combination of effective market and active government and how to improve them. Based on this, this paper puts forward research questions on how China's new energy policy promotes the development of new energy industry and how to improve and perfect the corresponding policy system. This paper makes a textual quantitative analysis of the relevant policies of China's new energy industry from 2019 to 2021, in order to provide reference for the construction and improvement of the overall policy system of the new energy industry.

The theoretical contribution of this paper is to further expand the application boundary of the policy instrument theory. Few existing studies have made comprehensive and dynamic quantitative studies on new energy industrial policies from the perspective of policy tools. Aiming at China's new energy industrial policies in recent years, this paper constructs a two-dimensional analysis framework of "policy tools - innovation value chain", and puts forward practical and effective suggestions for constructing and improving China's new energy industrial policy system.

2. POLICY ANALYSIS FRAMEWORK AND RESEARCH DESIGN

2.1. Analysis framework from the perspective of policy tools

The last decade has seen a resurgence of academic interest in political tools. Some scholars have pointed out that the choice of policy tools is crucial to policy formulation (Borras and Edquist, 2013), and the combination of policy tools can affect the effect of policy implementation. Based on their own understanding of policy tools, different researchers classify different types of policy tools. Vesely (2021) proposes the autonomy of policy tool selection by summarizing existing experience, that is, people's judgment of policy tools plays an important role in the choice of policy tools. According to the current research, there are many categories of policy instruments with high selectivity . As the object of influence of policy instruments, the new energy industry is more suitable for the analysis framework of supply-oriented, demand-oriented and environment-oriented policy instruments proposed by Roswell and Zegveld (1988).

2.1.1 X Dimension: Policy tools

According to the network analysis framework proposed by Roswell and Zegveld based on the system of objects affected by policy tools, this paper divides policy tools into three categories: supply, demand and environment (see Figure 1). Among them: supply-oriented policy tools have a role in promoting the development of new energy industry. It refers to the government through capital investment, personnel training and supporting facilities construction and other measures to increase support for new energy enterprises, support enterprises to improve management level, and then create more value; Demand-oriented policy tools play a driving role in the development of new energy industry. It means that the government promotes the application of new energy products in various industries by purchasing technology or services from new energy enterprises; Environmental policy tools can guarantee the development of new energy industry. It means that the government creates a favorable environment for the development of the new energy industry through financial support, tax incentives and other policies, thereby indirectly promoting and guaranteeing the development of the new energy industry.

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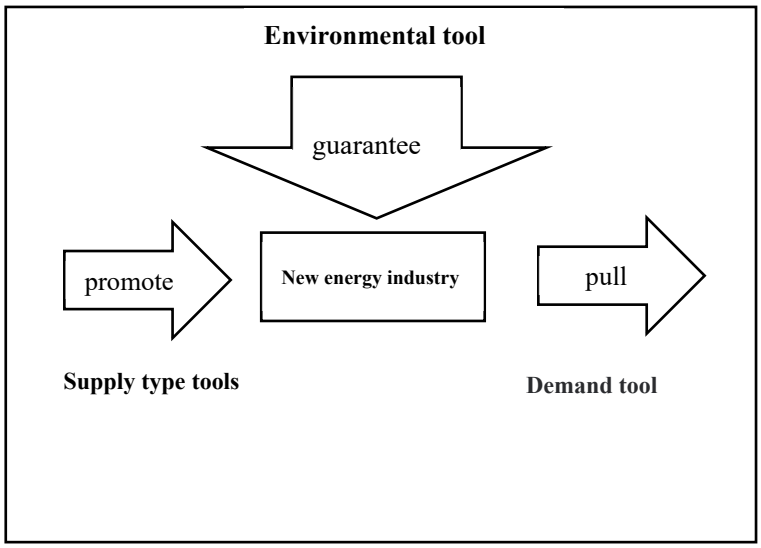

Figure 1. The role of policy tools in the new energy industry

2.1.1 Y dimension: Innovation value chain

Research on innovation value chain is still in its infancy. Existing literature has introduced the meaning and structure of innovation value chain from different perspectives, but there are few studies on innovation value chain of emerging industries. In fact, the growth of emerging industries and the value realization process of innovation value chain are relatively consistent in connotation and structure. At present, there are many types of stages of innovation value chain. Based on the analysis of the dynamic process of the development of the new energy industry and the views of Liu Jiashu et al., this paper divides the innovation value chain into three stages: R&D, industrialization and marketization.

The new energy industry has different policy needs at different stages of development, so the corresponding types of policy tools are different. In the research and development stage, the lack of funds, talents and supporting facilities often delays the research and development process, resulting in the loss of opportunities and waste of resources. Therefore, in the research and development stage, supply-oriented policy tools are more useful; In the industrialization stage, environmental policy tools such as tax incentives and financial support are more useful; In the marketization stage, in addition to the preferential policies given by the government, the cooperation between new energy enterprises and government functional departments such as government promotion and other demand-oriented policy tools are more useful.

2.2. New energy industry policy text selection and coding

2.2.1 Selection of policy text

In 2015, The State Council issued the Guiding Opinions on Actively promoting the "Internet +" action, which clearly put forward the construction of "Internet +" smart energy and the construction of multi-energy coordinated and complementary energy Internet with solar energy, wind energy and other renewable energy as the main body. Subsequently, more and more new energy enterprises began to emerge, and formed a unique Chinese characteristics of the new energy industry development model. Considering the time proximity, the validity of policy text and the availability of data, this paper selects three complete annual new energy policies from January 2019 to December 2021 as the research object for text quantitative analysis. The text data mainly comes from the law and regulation retrieval system in the database of France, Italy and Talisman of Peking University. The normative documents on new energy, low-carbon economy and new business forms issued by various central ministries and

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commissions, such as The State Council, the Ministry of Transport, the Ministry of Science and Technology, and the Ministry of Industry and Information Technology, etc. are retrieved, supplemented by the normative documents issued by some provinces and municipalities. Relevant documents issued by provinces and municipalities also play a role in testing coding saturation. In the selection of policy texts, the following criteria are mainly considered: first, strictly comply with the standard of normative documents, that is, unified registration, unified numbering, unified publication of the "three unified" standards; Second, the document is still valid at the current stage, and whether it is valid is indicated in the retrieval system; The third is closely related to the new energy industry, and a certain amount of text is given in the document.

2.2.2 Policy text coding

According to the selected policy text, based on the rooted theory coding technique, the relevant clauses in each policy are taken as a content analysis unit. Sort according to the time of publication, the number of the latest issue is 1, and so on. The contents in the policy text are numbered according to the "Policy serial number - clause serial number", and the numbering table of the analysis unit of the policy text content is generated.

2.3. Statistical results of the application of new energy industry policy tools

By conceptualizing and abstracting the specific clauses in the policy text, three kinds of supply policy tools are obtained, namely, capital investment, personnel training and supporting facilities construction. There are three kinds of environmental policy tools, namely monitoring and control, financial support and tax incentives. A demand-type policy tool, specifically government promotion, is obtained. Then, the two-dimensional analysis framework as shown in Figure 2 was constructed, and the statistical table of the frequency of policy instruments was drawn based on frequency statistics (see Table 1). It can be seen from the frequency statistics that the three policy tools of supply, environment and demand are used in many policy clauses at the same time, which indicates that the government's support for the new energy industry is multi-channel and parallel, and then guides and regulates the healthy development of the new energy industry from the top design.

Table 1. Statistical table of the frequency of Internet platform policy tools

Type	Name	Policy unit coding	Frequency	Frequency2	Total
Supply type	Capital investment	2-4、21-1、26-1、31-1、33-1	5	11%	48%
	talent cultivation	1-1、2-3、5-2	3	6%	
	Construction of supporting facilities	2-1、2-2、3-1、4-1、5-1、9-1、10-1、12-1 13-1、16-1、23-1、31-2、33-3、34-2、35-1	15	31%	
Environmental type	Monitoring control	11-1、14-1、18-1、20-1、22-1	5	11%	30%
	Financial support	3-2、28-1、36-1	3	6%	
	Tax incentives	2-5、8-1、15-1、29-1、33-2、34-1	6	13%	
demand-oriented	Government promotion	1-2、6-1、7-1、17-1、19-1 24-1、25-1、27-1、30-1、31-1	10	22%	22%
total			47		100%

Data source: The author compiled the data based on two-dimensional distribution, and the results were approximate

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3. POLICY ANALYSIS OF NEW ENERGY INDUSTRY BASED ON POLICY TOOLS

3.1. Overall Analysis

3.1.1 The annual number of policy texts published is relatively stable

The key to the development of new energy enterprises lies in the state's support and preferential policies, and all countries in the world have formulated relevant policies as a way to promote the growth and expansion of the new energy industry. The problem is that the new energy industry is an emerging industry, and its development and growth will take a long time, so the continuity of the policy is crucial. Since 2019, although the number of new energy industry policy documents has fluctuated, the overall stability is relatively stable . Stable policy promulgation and implementation have given new energy enterprises and entrepreneurs the confidence and confidence to struggle, build platforms and research and development based on specific policies, and carry out industrialization and market promotion under the support of government financial support and tax incentives. Under the dual guarantee of cost saving and risk reduction, the economic value and social value of new energy enterprises are created.

3.1.2 The issuing units of policy texts show the characteristics of multiple subjects

There are many new energy industry policy publishing bodies and more joint publishing methods. The necessity of joint publication lies in the diversity of fields involved in the new energy industry, such as infrastructure construction issues involving the National Development and Reform Commission, the Ministry of Industry and Information Technology and the People's Bank of China, and tax refund issues involving the Ministry of Finance, tax bureau, etc., multi-subject joint publication also reflects the new energy industry as a high-tech industry, the promotion of the overall development of the country. The State Council is the government organ with the highest number of new energy policy issuing bodies, providing the most policy support for the development of the new energy industry. From the point of view of other document subjects, the Ministry of Transport, the Ministry of Science and Technology, the Ministry of Finance and the Ministry of Ecology and Environment and other departments are actively trying to conduct two-way linkage with the new energy industry to achieve the green transformation of the traditional energy industry. This trend has greatly promoted the application scope of new energy, and promoted the new energy industry to create greater social value and provide better and more convenient services.

3.2. Two-dimensional analysis of new energy industry policy

3.2.1 Dimensions of policy tools

As can be seen from Table 1, the policies issued by the government for the new energy industry comprehensively apply three types of policy tools: supply, environment and demand. Among them, supply policy instruments accounted for the largest proportion, and the frequency of use was 48%; Environmental policy tools came in second, with a frequency of 30%. Demand-based policy tools accounted for the least, with a frequency of 22%. It can be seen that the government mainly promotes the development of the new energy industry through supply-oriented policy tools, but on the whole, the utilization rate of the three policy tools is high, reflecting the support concept of the government driven by multiple forces.

First of all, in the supply policy tools, the use frequency of capital investment and supporting facilities construction is higher, 31% and 11% respectively. This shows that in promoting the development of the new energy industry, the government is more inclined to provide support by strengthening infrastructure construction and allocating special funds. Supporting facilities construction support mainly includes accelerating the construction of new energy vehicle charging/changing power stations, and improving the coverage rate of fast charging/changing power stations in highway service areas and public parking Spaces; Capital investment support

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mainly includes the overall use of existing financial special funds to support the construction of new energy industry-related platforms and application demonstrations. The government's wide expansion of authority reflects the concept of diligent and pragmatic governance, and creates a harmonious policy environment for the Internet platform.

Secondly, among environmental policy instruments, tax incentives and monitoring controls are used more frequently, at 13% and 11% respectively. This shows that in terms of guaranteeing the development of the new energy industry, the government tends to adopt a "carrot + stick" incentive policy. "Carrot" refers to the tax reduction and tax exemption policies introduced by the government for the new energy industry, to reduce the unreasonable burden of new energy development and construction, and to mobilize the enthusiasm of various market players for investment. The "big stick" refers to the government's monitoring and control of the development of the new energy industry, such as investigating and dealing with illegal acts according to law, improving the monitoring and traceability mechanism, so as to ensure the legitimate development of the new energy industry, shaping a good business environment from the legal and regulatory level through disciplinary measures, and improving the quality and level of industry development.

Finally, in the demand-oriented policy tools, the government promotion performance is outstanding, with a utilization rate of 17%. The high usage rate indicates that the government tends to contribute in a proactive and participatory way in driving the development of the new energy industry. Government promotion means that the government expands the audience and scope of use of new energy products by encouraging other industries to build or use new energy products.

3.2.2 Dimension of innovation value chain

Based on the starting point of innovation research, this paper takes the development stage of innovation value chain as the Y dimension, and adopts the three-link method of R&D, industrialization and marketization. The statistical analysis shows that there are 17 policy unit codes in the research and development stage, accounting for 26% of the total policy. There are 23 policy unit codes in the industrialization stage, accounting for 35%. There are 26 policy unit codes in the marketization stage, accounting for 39% (see Figure 2). It can also be seen from Figure 3 that the demand for supply-oriented policy tools is higher in the research and development stage, that for environment-oriented policy tools in the industrialization stage, and that for demand-oriented policy tools in the marketization stage.

First of all, there are three basic needs in the research and development stage: considering the cost of research and development, you need money; Consider the need for talent for R&D capabilities; Consider that the R&D platform needs supporting facilities. From the perspective of supply-oriented policy tools, the three tools of capital investment, personnel training and supporting facilities construction effectively make up for the three shortcomings of capital, personnel and supporting facilities in the research and development stage of the new energy industry, so as to promote the development of the new energy industry. Secondly, in the industrialization stage, from the perspective of environmental policy tools, tax incentives are helpful to save promotion costs; Financial support helps to solve the financing needs of the platform. Financial support is mainly to encourage financial institutions to innovate and develop financial products and services that meet the financing needs of enterprises related to the new energy industry. The most important thing is monitoring and control, which helps to protect the basic rights and interests of consumers and standardize the development means of enterprises, so as to ensure the healthy development of the new energy industry in the industrialization stage. Finally, in the marketization stage, from the perspective of demand-oriented policy tools, government promotion helps to increase the customer base of the new energy industry and expand the scope of use of new energy.

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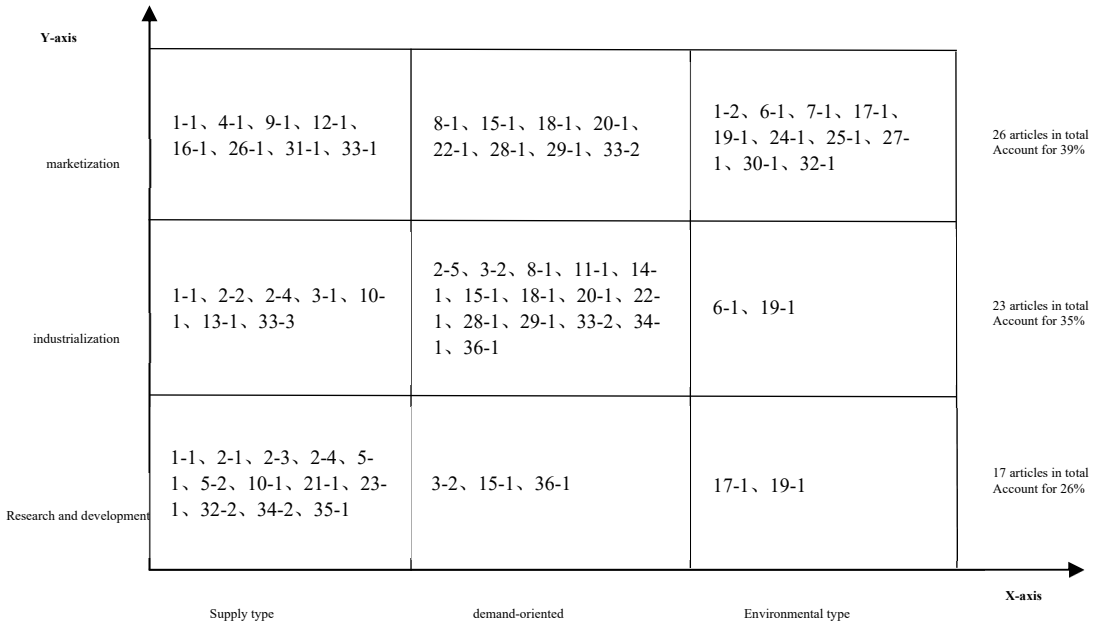

Figure 2. Two-dimensional analysis of new energy industry policy tools

4. CONCLUSIONS AND SUGGESTIONS

4.1. Research Conclusion

After quantitative analysis of the relevant policies of the new energy industry, this paper draws the following conclusions:

From the perspective of policy tools, the government's policy support for the new energy industry comprehensively uses three types of policy tools: supply-oriented, demand-oriented and environment-oriented. The use of a variety of policy tools to cross the use of support means, reflects the government decision-making has a high degree of science and empathy. At the same time, the study found that the government has different emphasis on the choice and use of policy tools. From the text analysis and the data on the statistical table, it is more inclined to use government promotion to promote development, tax incentives to guarantee development, and supporting facilities to promote development.

(2) From the perspective of innovation value chain, the government's policy support for the new energy industry comprehensively considers the policy needs of the three stages of research and development, industrialization and marketization. The new energy industry has different needs for policy support at different stages of development, and the government's different considerations for the development stage of the industry when promulgation policies help to improve the pertinence and effectiveness of policy support. Research and development stage is in the initial link of industrial development, is an important part of achieving from 0 to 1, but also the foundation of industrial development must be firmly consolidated. China's new energy industry started late, the starting point is low, the number of new energy enterprises in the research and development stage is relatively large, and supply policy tools are the highest use rate in policy support.

(3) From the perspective of promoting sustainable development of the new energy industry, the government's policy support for the new energy industry still needs to be improved. In terms of quantity, although the number of policies issued in each year is relatively average, the overall number is small. From the perspective of legal effect, the opinion policy texts issued by the government are mostly, but the legal effect of opinions is lower than that of laws, regulations

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and regulations, so the scope of application is relatively small. From the perspective of sustainability, the use of policy tools such as talent introduction, technical support and information support has not been continuously promoted, and these aspects are of great value to the development of new energy industry; From the specific implementation level, the comprehensive embodiment of the policy from the top-level design to the real situation is not enough.

4.2. Policy Recommendations

(1) Expand the use of demand-oriented policy tools and give full play to their driving role. In terms of the use of demand-based policy tools, government promotion has the highest use rate, but the use rate of policy tools such as talent introduction, service expansion, government procurement and policy coordination has been low or unused in the past three years. The importance of government outreach should not overshadow the advantages of other policy tools. Such as policy coordination, in today's economic globalization, the issue of how to go global should be put in the first place. For the new energy industry, going out is to go decent, high quality and high standards to enter foreign markets, but also to go safe, can not enter the policy forbidden area. Policy coordination helps to achieve the consistency of domestic and foreign market policy environment, encourages new energy enterprises to develop international operations, and provides services to users in more regions, thus further enhancing their influence.

(2) Improve the optimal mix of environmental policy tools and give full play to their safeguarding role. Environmental policy tools have the dual attributes of encouragement and regulation. Only encouragement without regulation will lead to disorderly development, and conversely, it will lead to development suppression. The development of things has two sides, and the government needs to see clearly this essence, so while strengthening monitoring and control, it also needs to give tax incentives and other policy support as a comfort. The use of environmental policy instruments needs to be optimized so as to give full play to the dual effectiveness of safeguards and regulations. To be specific, the scope of tax incentives should be expanded, the intensity of incentives should be deepened, and the development plan should be more detailed and more in line with the reality of development, that is, it should not be ambitious and set high targets, nor should it encourage slack.

(3) The structural characteristics of balanced supply policy tools to give full play to the driving role. The promotion effect of supply-oriented policy tools is more direct for the research and development stage. Although some new energy enterprises in China are in the industrialization and marketization stage, there are still more emerging new energy enterprises. Such as new energy vehicles, although it has initially shown the advantages of clean energy, but the high cost of investment, long return cycle and lack of core technology constraints make many enterprises are still in the research and development stage. In order to promote its development, it is necessary to increase the policy support for such enterprises such as capital and talents. At the same time, in the period of industrialization and marketization, it is also inseparable from the promotion of supply policy tools such as talent training and capital investment. In particular, talent is the first productive force, and the support for talent training must be put in the first place.

REFERENCES

[1] Borrás S, Edquist C. The choice of innovation policy instruments[J].Technological forecasting and social change,2013,80(8):1513-1522.

[2] Veselý A. Autonomy of policy instrument attitudes: concept, theory and evidence[J]. Policy Sciences, 2021: 1-15.

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202309_9(9).0013

[3] Howlett M, Ramesh M. Policy subsystem configurations and policy change: Operationalizing the postpositivist analysis of the politics of the policy process[J]. Policy studies journal, 1998, 26(3): 466-481.

[4] Schneider A, Ingram H. Behavioral assumptions of policy tools[J]. The journal of politics, 1990, 52(2): 510-529.

[5] Rothwell R O Y, Zegveld W. An assessment of government innovation policies[M].Government Innovation Policy. Palgrave Macmillan, London, 1988: 19-35.

[6] Turkenburg W C. The Innovation Chain: Policies to Promote Energy Innovation, Energy for Sustainable Development[M]. New York: The UN Publication, 2002.

[7] Bamfield P . The Innovation Chain[M]. Wiley-VCH Verlag GmbH & Co. KGaA, 2004.

[8] Decomposition of the factors influencing export fluctuation in China\"s new energy industry based on a constant market share modelWang, Zheng-Xin; Zheng, Hong-Hao; Pei, Ling-Ling; Jin, Tong -《Energy Policy》- 2017

[9] The Review of Technology Industry Policy about New Energy Vehicle in China since the New CenturyYimiao Huang; Yanyu Chen -《2017 International Conference on Advances in Materials, Machinery, Electrical Engineering (AMMEE 2017)》-

[10] Research on the Effect Evaluation of Protected Space Driving New Technologies Industrialization from the Perspective of STLiu, Yixin; Ou, Chunyao; Zhang, Guangyu; Liang, Xiao -《JOURNAL OF SYSTEMS SCIENCE & COMPLEXITY》- 2020