Textual and Quantitative Research on Ocean Energy Policy System of Local Government in China (2005-2015)

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Abstract: Ocean energy is an important marine resource, the development and utilization of ocean energy can be one of the important ways to improve and optimize energy structure and reduce environmental pollution. Currently, the technology of ocean energy is immature and costly, and does not have large-scale commercial application. In this situation, this technology needs to be supported by strong policies. The policies of local governments in China are individual and operable, which can provide necessary cooperation and supplement to the policy of the central government. Based on the classification standard of policy tools, the study adopts the content quantitative analysis method to analyse the 242 policies issued by 11 coastal provinces and cities of China between 2005 and 2015. The study is based on three dimensions which are the policy number, issued form and policy content. The research shows that: (1) During 2005 and 2015, regions with relatively developed marine economy, such as Shandon, Guangdong and Zhejiang province, issued the largest number of policies, showing a positively relationship between the attention to ocean energy policy and the level of marine economy development; (2) The policy format increasingly diversified, especially from 2011 to 2015, the local government enacted a large number of practical and operational policies, ocean energy policies changed from a form of "opinion" to "planning"; (3) The unbalanced policy tools structure, the overflowed environmental policy tools and the insufficiently utilized demand type policy tools are the reasons why incentive mechanism of the ocean energy market has not yet been formed.

1 INTRODUCTION

Many countries or governments have initiated and encouraged to use renewable clean energy in response to environment and climate change challenges. The countries, such as UK, Germany, Denmark and others, have implemented a series of policies to support the development of ocean energy industry. Since 2010, China has set up a Special Funding Plan for Marine Renewable Energy (SFPMRE) to support research and development of ocean energy technology and equipment. The development of ocean energy will be guaranteed by the corresponding policies from central and local government. Specifically, central government will guide and support in macro level, while local governments makes micro operational policies.

In recent year, researches on ocean energy in China mainly have focused on the role of ocean energy policies, legal regime and development trends. For instance, Xu et al reviewed the strategic planning of ocean energy policies in China from 1990 to 2010 (Xu et al., 2015). Ding et al reviewed the policies of UK government to promote the ocean energy industry (Ding and Liu, 2013). Chang et al discussed the legal regime to explore the ocean energy in China (Chang, 2014). Wang et al discussed how to make policy route of ocean energy in China (Wang et al., 2016).Although previous studies have made great progress, they have some limitations: First, these studies pay more attention to the relevant ocean energy policy of the central government, the lack of research local government policy of specific characteristics. Second, these studies rely mainly on logical research and lack of quantitative analysis. In order to fill the gap, this article adopts content analysis method, which study of ocean energy policy in 11 coastal provinces and cities of China, a quantitative analysis based on the classification standard of policy tools, to reveal the

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local government in the ocean energy development evolution process of policy making.

2 DATA USED AND METHODOLOGY

2.1 Data Used

The article collects the ocean energy policy issued by 11 coastal provinces and cities of China from 2005 to 2015, establishes a policy database of 242 policies.

Based on the key words "ocean energy" and "marine renewable energy", the policy text is collected in the database of the "Beida Fabao- Laws & Regulations Chinese Database", 'http://www.pkulaw.cn/'. Ensuring the effectiveness and correctness of the collection policy, this paper selects policy text based on the following principles: First, policies promulgated must by 11 coastal provinces and cities of China, Shandong, Zhejiang, Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Liaoning, Hebei, Shanghai and Tianjin, not including national level issued by the relevant local policies promulgated and other provinces. Second, policies closely related to ocean energy, including ocean waves, tidal range, tidal currents, ocean current, ocean thermal energy conversion and salinity gradients, offshore wind, marine biomass which occupy sea space but do not directly utilize the properties of seawater, are not included in this paper. Third, the policy form must be in accordance with laws and regulations, opinion, plan, notice or other documents, reply are not included.

2.2 Textual and Quantitative Methodology

First, this paper adopts the content analysis method to code 242 ocean energy policy texts released by 11 coastal provinces and cities of China, according to "policy number-specific terms/chapters". Second, based on the classification method of Rothwell and Zegevld (1985), Liao (2016), it is divided into three types of policy tools: supply, environment and demand, and subdivided into five sub-categories under each category according to the characteristics of ocean energy policy, the formation of ocean energy policy text content analysis unit code table. Third, classify and summarize the frequency of text content.

3 RESULTS AND ANALYSIS

3.1 Overall Analysis

This part would be divided into a count of the number of policies and secondly the form of the policy.

3.1.1 Policy Number

Chinese government usually follows five years as a planning period. This paper divides the period from 2005 to 2015 into two equal periods, which conducts a comparative analysis of the evolution characteristics of the ocean energy policy in local governments. Figure 1 shows the number of policies released by 11 coastal provinces and cites of China in two periods.

From 2005 to 2015, local government issued 242 ocean energy policies, the most widely publicized provinces and cities are Shandong, Guangdong, Zhejiang and Fujian, and the least is Hebei and Tianjin. In the period of 2005 to 2010 and 2011 to 2015, there were 105 and 137 policies were issued respectively. It increased 30 percent compared these two periods, and all provinces and cities issued policies related to the development and utilization of ocean energy. Policy sharply increased since 2011, was the cause of the central government attaches great importance to renewable energy, local governments have to implement the central government of ocean energy policy, especially in the southeast coastal area, ocean energy is rich in resources, and the overall policy number is higher than the northern coastal areas.

It is worth noting that the developed areas of the marine economy pay more attention to the development and utilization of ocean energy, and more policies are issued. The development and utilization of ocean energy technology is still in the embryonic stage, the period of industrialization process and investment return are longer. A large number of policies will enhance investors' enthusiasm to investment and promote the healthy development of ocean energy industry.

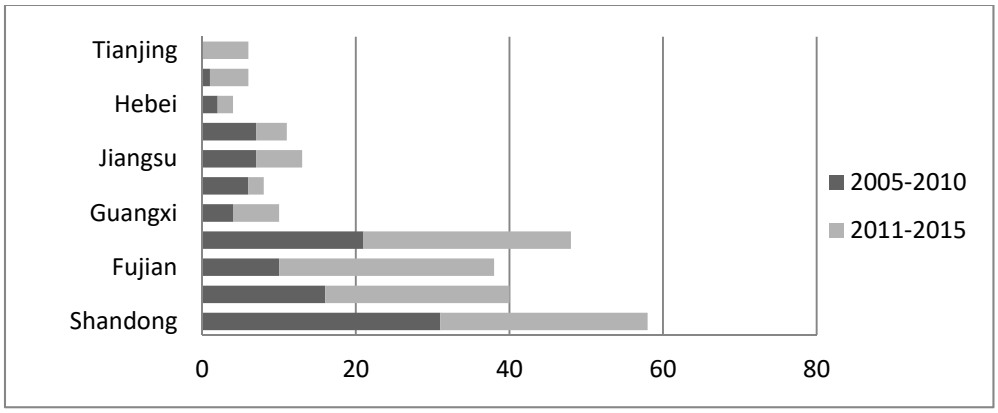

Figure 1: The number of ocean energy policies in 11 coastal provinces and cities of China.

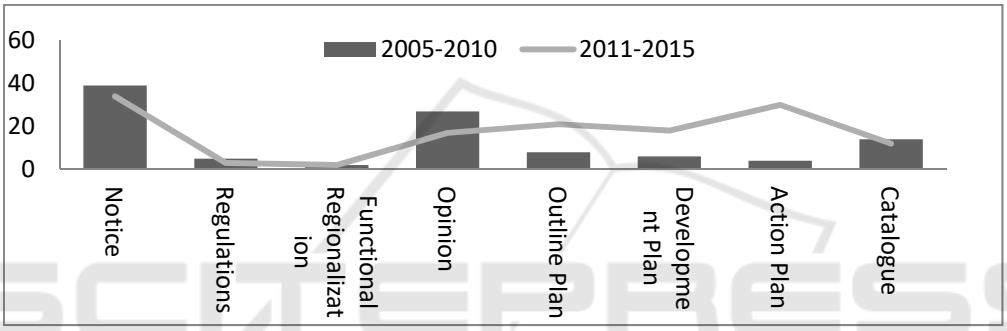

Figure 2: The number of ocean energy policy issuing format.

3.1.2 Policy-Issuing Forms

From 2005 to 2015, the policy forms include: the "notice", "opinion", " action plan", "catalogue", "outline plan", "development plan", "functional regionalization" and "regulations" of eight different policies, reflects the diversification forms of Chinese local government to support the central government ocean energy industry policy. Figure 2 shows the comparing number of ocean energy policy issuing format in two periods.

Most policy form is the "notice", "opinion", "action plan", accounted for 70% of the total, followed by "outline plan" and "development plan" accounted for 12% and 10%, initially formed ocean industrial linkage effects between the energy industry and other industries. The "catalogue" accounts for 11%, reflecting the lack of attention of local governments to industry information. The relatively small number of "regulations" and "functional zoning" policies with legal effect, accounting for just 5%, indicates that the policies issued by local governments in China are generally lack of authority and compulsion. During 2005 and 2010, policy form mainly in "notice " and "opinion" is given priority to; during the period of 2011 and 2015, "outline", "development plan" and " action plan " increased significantly, the proportion of the local government attaches great importance to the information of ocean energy development and the planning of the concrete implementation plan, the policy more practical and execution.

3.2 Analysis Three Types Of Policy Tools

Based on Content Analysis Methodology (method of policy text quantitative), the author has classified 242 policies into 270 articles in accordance with policy tools and summarizes them. The imbalanced structure of policy tools is the main feature of the ocean energy policy of local governments in China.

From 2005 to 2015, the ratio in environment, supply and demand is 38:50:12. It reflects that local government take priority to develop ocean energy, especially development plan and supporting, such as investment of technology, financing, information

support and infrastructure construction, etc. However, it is necessary to make more demanding policies in ocean energy. In the 11 coastal provinces and cities of China, the more balanced regions are Zhejiang, Shandong, Guangdong and Fujian, Tianjin, and the rest six provinces lack of demand policies tool. The situation reflects the local government although the build ocean energy development gave attaches great importance to environmental policy, also pay attention to support direct factors, but realized consumption link of ocean energy support is insufficient, failed to form a good mechanism of ocean energy utilization development market-oriented operation.

3.2.1 Supply Types of Policies

Results in Table 1 imply that, from 2005 to 2010, local governments chose four policy tools, information services (58%), technology input (31%), infrastructure (8%), talent cultivation (3%), and financing support tools were not selected. From 2011 to 2015, the number of policy tools for science and technology input and infrastructure construction increased substantially, and the information service continued to grow steadily, reflect the efforts of local governments to realize the transformation of the ocean energy technology.

However, local governments are not fully aware of the important role of talents in ocean energy technology innovation, and the use of financing support tools is insufficient, which is extremely unfavorable to the sustainable development of ocean energy industry. From perspective of the top four provinces, Fujian province has significant increase in supply policy tools, Shandong, Guangdong and Zhejiang province has maintained steady growth, Jiangsu province has experienced a significant decline.

3.2.2 Environmental Types of Policies

During the period of 2005-2015, the local government chose 135 policies of environmental tools, mainly choosing goal formulating (75%),institution setting (13%) and regulations (10%) take second place, the least are intellectual property protection (3%) and preferential tax (1%). Results in Table 2 imply that, comparing two periods, the goal formulating increased significant. The situation reflected the local government began to pay highly attention to ocean energy industry development planning, set up a corresponding mechanism of ocean energy management, also in a certain extent regulate ocean energy development and utilization, but lack of the system of intellectual property protection and preferential tax support of ocean energy enterprises, may cause negative effect in the technical innovation and attract talent.

Table 1: The number of supply policy types [a].

Year	2005-2010		2011-2015	
Instrument	Number	Top 4 province [b]	Number	Top 4 province
Talent cultivation	1	FJ	1	FJ
Technology input	11	SD,ZJ,GD,JS	21	GD,FJ,ZJ,SD
Information services	21	SD,ZJ, GD, JS	25	SD,FJ,ZJ,JS
Financing support	0	-	5	FJ,ZJ,JS,TJ
Infrastructure	3	FJ,SD, HN,	15	SD,GD,FJ,ZJ
Total	36	SD,ZJ,GD,JS	67	FJ,SD,GD,ZJ

[a] The top four provinces are sorted by number descending order. When the number of clauses appears is same, the policy form is prioritized. If is still impossible to tell whether the number of specific types of ocean energy is prioritized. Table 2 and Table 3 are compiled according to the above principles.

[b] Full name of top 4 provinces : SD-Shandong, ZJ-Zhejiang, GD-Guangdong, FJ-Fujian, JS-Jiangsu, HN-Hainan, TJ-Tianjin.

Table 2: The number of environmental policy types [a].

Year	2005-2010		2011-2015	
Instrument	Number	Top 4 province [b]	Number	Top 4 province
Preferential tax	1	FJ	1	GD
Intellectual property Protection	2	SD,ZJ	2	SD
Regulations	5	SD,ZJ,GD,GX	8	SD,GX,ZJ,GD
Institution setting	12	GD,GX,LN,FJ	6	GX,GD
Goal formulating	43	SD,ZJ,GD,LN	55	SD,ZJ,GD,FJ
Total	63	SD,GD,ZJ,LN	72	SD,ZJ,GD,FJ

[a] In accordance with the principles of Table 1
[b] Full name of top 4 provinces : SD-Shandong, ZJ-Zhejiang, GD-Guangdong, FJ-Fujian, JS-Jiangsu, GX-Guangxi, LN-Liaoning

Table 3: The number of environmental policy types [a].

Year	2005-2010		2011-2015	
Instrument	Number	Top 4 province [b]	Number	Top 4 province
Government procurement	0	-	1	GD
Price subsidy	2	SD,ZJ	1	GD
Trade control	0	-	0	-
Demonstration project	2	SD,GD	18	SD,ZJ,GD,FJ
International cooperation	3	SD	5	TJ,SD,ZJ,GD
Total	7	SD,GD,ZJ	25	SD,ZJ,GD,FJ

[a] In accordance with the principles of Table 1
[b] Full name of top 4 provinces: SD-Shandong, ZJ-Zhejiang, GD-Guangdong, FJ-Fujian, TJ-Tianjin

It is worth noting that from the perspective of the specific content of goal programming, only Shandong province, Guangdong province and Zhejiang province made practical operational planning, which is according to the local natural resources endowment, the rest eight local governments lack of individuality to plan development of ocean energy industry, the homogenization tendency of development planning. At the same time, some local governments' ocean energy policy objectives have the stealing concept of and pursuing short-term interests, such as Fujian province which instead of developing ocean energy developed wind energy. The reason is that wind energy development profits in short period. In this case, it will waste limited resources.

3.2.3 Demand Types of Policies

The lack of demand policy is an important bottleneck restricting the sustainable development of ocean energy. Results in Table 3 imply that, from 2005 to 2010, Chinese local governments selected three policy tools, international cooperation (43%), price subsidy (29%), and demonstration project (29%). It reflects that the local government mainly introduces foreign investment and foreign advanced technology in the period, and also preliminarily reserves and accumulates experience for Marine energy grid power generation. From 2011 to 2015, local governments selected all demand types of policies except trade control, especially demonstration project which accounts for 72 percent. From the perspective of 11 provinces and cities during 2005 to 2010, Shandong province chose three types of demand policy tools, Zhejiang and Guangdong also chose the policy tools of price subsidy and demonstration project respectively. From 2011 to 2015, provinces in Shandong, Guangdong and Zhejiang have strengthened the policy of demonstration projects and international cooperation. Especially Guangdong province has a strong policy of government procurement and price subsidies.

The three provinces positive ocean energy policy has gained the support of the central government, the "Outline for the Development of Marine Renewable Energy (2013-2016)" was release by the State Oceanic Administration of China in December 2013, which deployed three test sites, the national small-scale test site in Shandong, the national tidal energy full scale test site in Zhejiang, and the national wave energy full scale test site in Guangdong (OES 2015). Especially Guangdong owned operational project, the Sharp-Eagle Wanshan, the amount of electricity accumulated was more than 50 MWh until December 2017 (OES 2017).

4 CONCLUSIONS

After analyzing the ocean energy policies launched by 11 coastal provinces and cities of China's governments from 2005 to 2015, the results showed that compared between two periods, these launched more policies, paid much attention on development plan of ocean energy and proposed some specific practical programs. Especially, the regions with developed marine economy, such as Shandong, Guangdong and Zhejiang, are more concerned with the development of ocean energy. However, there still exist unbalanced policy tools, over using environmental policy, lacking supply and demand policy and restricting development and use of ocean energy. Those provinces, such as Shandong, Zhejiang and Guangdong, applied comprehensive policy tools, while other provinces only took one or some of policy tools.

In conclusion, the author proposed that central government will need to strengthen supervision of ocean energy to local governments to avoid short-term profit pursuit and homogenization. Second, local governments could apply government procurement, price subsidy and trade control to decrease the frequency of environmental policy and increase the choice of supply and demand policy, which will help to develop and use ocean energy reasonably. The paper is based on textual and quantitative method to analyze the characteristics policy of 11 coastal provinces and cities in China. It will help central and local government to connect their ocean energy policy and do further research.

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