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# The current state on China's marine energy industry policy

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**Abstract.** At present, China's marine energy industry is still in its infancy, but there is no doubt that the development of this industry will help China to achieve sustainable development. Therefore, effective policies are needed to promote the industrialization of the industry as soon as possible. This paper systematically consulted the relevant information on the research and development of marine renewable energy, focusing on China's marine energy industry policy, including the national energy strategy, the progress of China's marine energy policy, technology policy, market policy and other related content, emphasizing the importance of marine energy policy in promoting the development of marine energy industry. Finally, in view of the deficiencies in the development of marine energy industry in China, the corresponding improvement strategies are put forward.

## 1. Introduction

The Party's 18th National Congress relied on General Secretary Xi's new energy security strategy of "four revolutions and one cooperation" to point out the direction for China's high-quality energy development. More than twenty reports pointed out that "based on China's energy resource endowment, adhere to the first stand before breaking, the planned and systematic implementation of the carbon peak action", "strengthen the construction of energy production, supply, storage and marketing system to ensure energy security".

In recent years, the price of offshore wind power has fallen sharply, with the lowest price of £39.65/MWh in the third round of contracts for difference in the UK, the lowest price in history. As of 2022, four rounds of CfD allocations have been organized in the UK. The fourth CfD allocation round is the largest in history, with 12 GW of planned capacity, more than the previous three combined. In addition to offshore wind, a number of non-mature technology projects, such as tidal energy, also received subsidies. In the fourth round of CfD bidding, £51 million was allocated to niche frontier technologies such as tidal energy and independent island wind. In the end, three tidal energy projects won the tender, with a total capacity of 40.8 MW and a winning tariff of £178.54 (about RMB 1.433/kWh), with an estimated subsidy amount of £20 million per year.

Over the past four years, more countries have implemented market instruments for the marine energy industry to gradually commercialize, for example, Canada and China have introduced feed-in tariffs, Portugal and Ireland have conducted auctions and tenders, and Spain and Ireland have developed legally binding indicators to use marine energy technology to generate electricity in India, qualifying for renewable energy purchase obligations [1].



## 2. China's marine energy industry policy

### 2.1. National strategy

On December 21, 2020, the Chinese government issued the "National Energy Development White Paper". The document, entitled "China's Energy in a New Era," was released by the Information Office of the State Council and comprehensively introduced the country's achievements in energy development and major policies and measures for energy reform. China also advocates that the international community work together to achieve sustainable global energy development, address the challenges of climate change, and build a cleaner and more beautiful world. The "14th Five-Year Plan" was formulated. On October 29, the "Five-Year Plan for National Economic and Social Development (2021-2025) and the Outline of Vision Goals for 2035" were released. In March 2020, the National Development and Reform Commission and the Ministry of Justice issued the Opinions on Accelerating the Establishment of Laws and Policies on Green Production and Consumption [2].

In order to promote the development of renewable energy industry, the Development and Reform Commission, the Ministry of Land and Resources and other ministries released the 2019 edition of the Green Industry Guidance Catalogue in February 2019. The new version of the directory has two items of marine energy: (1) marine energy equipment manufacturing; (2) marine energy facility construction and operation. To further promote the development of renewable energy electricity market, China proposed to establish a renewable energy electricity guarantee mechanism to stimulate local market potential. National Development and Reform Commission, the State Environmental Protection Bureau issued a "notice on the 2020 provincial administrative areas of renewable energy power consumption target", put forward the 2020 renewable energy power consumption obligations of the provinces target [3].

### 2.2. Ocean energy policy

In 2006, the Ministry of Finance established a special fund for renewable energy development to support research, standard setting and project demonstration of renewable energy-related technologies. The funds come from the central budget arrangement, giving priority to supporting the development and utilization of land resources. In 2010, the Ministry of Finance established the Marine Renewable Energy Fund, which is dedicated to supporting domestic marine environmental protection projects and is jointly managed with the State Oceanic Administration [4].

In 2013, the State Oceanic Administration issued the "Outline for the Development of Marine Renewable Energy (2013-2016)". The "Outline" pointed out that the development of marine energy must be adapted to local conditions, and the development of marine energy must be scientifically arranged according to the distribution characteristics of marine resources and energy demand. In 2016, the State Oceanic Administration issued the "13th Five-Year Plan for the Development of Marine Renewable Energy", which determined the planning goals: by 2020, the level of development and utilization of marine energy will be significantly improved, the ability of scientific and technological innovation will be greatly improved, and the core technology and equipment will achieve stable power generation [5].

## 3. Ocean energy technology

### 3.1. Policy support

The "The People's Republic of China Energy Law (Draft for Comment)" comprehensively summarizes the practical experience of my country's energy development, and clearly states in Article 78 "Scientific and Technological Innovation" that "the state encourages and promotes energy technological innovation, and promotes the establishment of enterprises as the main body, market-oriented, and The energy technology innovation system that combines production, education and research takes measures to promote the research and development, demonstration, promotion and application of new energy technologies, new products and new equipment. The people's governments

at or above the county level and their relevant departments organize the promotion and application of the outstanding achievements of original innovation, integrated innovation, and introduction, digestion, absorption and re-innovation in the energy field." The future promulgation and implementation of this law will play a key role in the construction of my country's energy technology innovation system [6].

In 2016, the "Made in China 2025-Energy Equipment Implementation Plan" proposed to focus on the development of "10 MW offshore high-power wind turbines, offshore floating wind turbines and various infrastructure". In the same year, the "13th Five-Year Plan for Marine Renewable Energy" required the implementation of marine energy technological innovation and development, and clearly proposed "research and development of deep-sea floating wind turbines, explore the comprehensive utilization of offshore wind power, wave energy, and tidal current energy, and master long-distance deep-water large-scale offshore wind farms Key technologies such as design, construction, operation and maintenance, promote the development of deep-sea wind power, guide all kinds of innovative elements to gather in enterprises, encourage the construction of marine energy national engineering technology research and development center and enterprise technology center, comprehensively enhance the innovation power of enterprises, enhance the sustainable development ability of marine energy enterprises, and cultivate a number of leading marine energy enterprises and specialized small and medium-sized enterprises. Relying on universities, scientific research institutes and enterprises with innovative advantages, the State Key Laboratory of Marine Energy and the National Engineering Laboratory have been established".

At present, the core technological capability, technological innovation level and technological marketization degree of China's marine energy industry still need to be improved. Compared with the foreign policy framework for promoting new energy technology innovation, there are still obvious defects in the policy framework in related fields in China. (1) Pay attention to support and investment, while despise service and coordination. At present, the way my country encourages marine energy technology R & D investment is mainly to increase financial, financial and tax incentives for innovation entities such as enterprises. Although large-scale R & D investment is a necessary condition for industrial technological progress, if there is an innovation system "Structural defects" and lack of scientific and technological services for innovation entities, then the efficiency of related investment will be affected. (2) There are many guiding planning policies, but there is a lack of support guarantee, implementation rules and follow-up evaluation, resulting in some enterprises do not actually enjoy support and services, and have not yet formed a policy improvement mechanism.

Marine energy industry is a marine strategic emerging industry, which is the result of innovative development in the energy field. Its sustainable development depends to a large extent on technological innovation and policy guidance. We have always attached great importance to innovation and development. The development of the marine energy industry itself is an innovative measure to develop the blue economy. The construction of the marine energy technology innovation system not only contributes to the development of the marine energy industry, but also helps promote the development of the blue economy. At present, my country's marine energy technology is changing from introduction to output, but there is still a gap with the advanced level in terms of core technology, achievement transformation, innovation system and strategic layout. The position of enterprises as the main body of innovation is still not prominent enough. The role of the market in the allocation of technological innovation resources still needs to be further strengthened. In addition, the top-level design of my country's marine energy technology innovation still needs to improve its rationality and operability, and it is urgent to further improve resource exploration, basic research, and supervision and management, so as to form a more mature marine energy industry, so that marine energy technology can be in a niche market Give full play to its advantages.

## 4. Ocean energy market

### 4.1. Market incentives

In June 2019, the temporary feed-in tariff for the LHD trend energy project was approved by the National Development and Reform Commission. The LHD tidal current energy project is the first ocean energy project to implement a temporary on-grid tariff policy, with an electricity price of 2.58 yuan/kWh (about 0.33 euros/kWh). In order to promote the development of the renewable energy industry, the National Development and Reform Commission, the Ministry of Land and Resources and other ministries issued the 2019 edition of the "Green Industry Guidance Catalog" in February 2019. There are two items of ocean energy in the new catalogue: (1) manufacturing of ocean energy equipment; (2) construction and operation of ocean energy facilities [7].

In order to further promote the development of the renewable energy power market, my country proposes to establish a renewable energy power guarantee mechanism to stimulate the potential of the local market. On May 18, the National Development and Reform Commission and the State Environmental Protection Bureau issued the "Notice on the Consumption Targets of Renewable Energy Electricity in Provincial Administrative Regions in 2020", which put forward the target of renewable energy electricity consumption obligations in all provinces in 2020.

### 4.2. Public funding

In order to promote the development of marine energy, the Chinese government established a large-scale marine renewable energy special fund project (SMPMRE) in 2010. The focus is on the construction of remote island power generation systems and grid-connected power stations, the industrialization of key technologies, the research and development of new technologies and the construction of public service systems. As of 2020, the Marine Renewable Energy Fund has invested more than 1.3 billion yuan since 2010, with a total of 116 projects funded.

*4.2.1. Special funds.* The Ministry of Finance established a special fund project for marine renewable energy in June 2010. By the end of June 2019, the "special funds" had actually supported more than 110 projects, with a state allocation of about 1.3 billion yuan. At present, nearly 100 ocean energy projects have passed the acceptance. The establishment of this special project has laid a solid foundation for the development of China's ocean energy.

*4.2.2. Subsidy policy.* In 2013, the National Development and Reform Commission promulgated the Interim Measures for the Administration of Distributed Generation, which clearly stipulates the provision of construction fund subsidies or unit power generation subsidies for new energy power generation projects such as ocean energy that enjoy subsidies. In addition, the newly-built marine tidal energy, tidal energy and island marine energy power stations receive a subsidy of 50,000 yuan per 1 kW installed capacity, which can reach up to 40% of the total project investment [8].

*4.2.3. Loan policy.* Article 25 of the Renewable Energy Law clearly stipulates that marine energy utilization projects that are included in the national renewable energy industry development catalog and meet the credit conditions can obtain preferential policies with financial discounts provided by financial institutions, and are more than fossil fuel Power generation projects give priority to capital construction loans provided by the National Development Bank; the financial discount of the loan is 2%, and the central project will be discounted by the Ministry of Finance. If the construction scale of the ocean energy power generation project exceeds 3000 kW, the State Planning Commission shall assist in the implementation of bank loans.

*4.2.4. Tax policy.* China exempts import duties on key equipment or complete sets of equipment for tidal energy and wave energy power generation; exempts 15% income tax for enterprises engaged in marine energy high-tech; enterprises that provide venture capital for marine renewable energy projects

supported by the state have the right to offset part of the enterprise income tax payable with a certain proportion of the amount of investment.

In addition to raising the current feed-in tariff to an appropriate level to enable the marine energy power plants that are in operation to generate profits, the Government is also considering the adoption of a diminishing feed-in tariff system for projects under design, especially those operating in a build-operate-handover mode. This is the system that was first implemented in the German offshore wind power industry, that is, power stations can enjoy higher on-grid electricity prices for a period of time, and the sales price gradually decreases until it reaches a certain level. This mechanism can encourage developers to improve their technical level and reduce the cost of power generation in the field of ocean energy power generation.

*4.2.5. Investment and financing policies.* In 2020, the five national departments "Guiding Opinions on Promoting Investment and Financing to Address Climate Change" support the implementation of pilot demonstration projects for carbon capture, utilization and storage.

## 5. Discussion

Our country is rich in Marine environmental resources, the development and utilization of Marine environmental resources can help to realize our sustainable development goals. The Chinese government attaches more importance to this emerging industry and is faced with significant development opportunities. Because the industry is still in the beginning stage in our country, there are no special laws for the renewable energy industry, and a comprehensive and effective policy system is needed to guide the industry to mature. The renewable energy industry is currently regulated mainly under the Renewable Energy Act. However, the law is only a legal framework and lacks operability. Because the ocean energy market is not mature in our country, most participants are state-owned enterprises, so the government must intervene in the market and regulate the stakeholders directly. In addition, market incentive policies are mainly aimed at state-owned enterprises with relatively low profits and financial support from the government. As a result, many market incentives - such as feed-in tariffs and subsidies - are incomplete or inefficient.

## 6. Conclusions

### *6.1. Optimizing the policy environment for ocean energy incentives*

Increase financial investment in the development and utilization of ocean energy and support the construction of demonstration projects. Support the development of marine energy power generation engineering design, materials, equipment, systems, construction and other related industries.

### *6.2. Improve the innovation system of ocean energy technology*

Establish and improve a multi-level technological innovation system, establish and improve a national-level marine energy research and development test platform, encourage enterprises to build marine energy power generation technology research and development institutions, integrate the technical forces of relevant scientific research institutes and universities, and carry out marine energy basic theories and cutting-edge technology, Core technology and applicable technology research.

### *6.3. Strengthening the management of ocean energy development and utilization*

Establish the priority development position of ocean energy development and utilization in my country's offshore and island areas, and coordinate the relationship between ocean energy development and utilization and sea use in other fields.

### *6.4. Establishment of marine energy technology management system*

Strengthen the technical centralized management of marine energy development planning, project preliminary stage, project approval, completion acceptance, operation supervision and other links,

establish marine energy technology and engineering specifications, and strengthen technical supervision and project quality management.

*6.5. Formation of a mechanism for promoting cooperation and exchanges at home and abroad*

Make full use of foreign ocean energy to develop scientific and technological resources and accelerate the process of China's ocean energy development and utilization.

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