

Research on the Comparison of Offshore Wind Power Management between China and UK

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Abstract: Offshore wind power is a frontier field of wind power technology, which is actively promoted by the countries all over the world. At present, UK offshore wind power takes the lead in the world, establishing mature offshore wind power management systems and procedures, and then provides references for China's offshore wind power management. Through the comparative analysis of the UK and China's offshore wind developing situations, policies and regulations, project case and offshore wind farm planning, decision making report and so on, this article summarized the differences and similarities between the UK and China's offshore wind management policies, procedures, site requirements, environmental impact assessment and public participation ways. And connecting with the differences between the two countries to offers a few suggestions for China's offshore wind management: a. Offshore wind application should be pay more attention to public participation. b. Establishing offshore wind communication and research platform. c. Developing specialized, perfect, definite standards. d. Strengthening human environmental impact study in the early stage of the plan. e. Simplifying the application process.

Introduction

Offshore wind power is a newly emerging renewable energy industry in China. With the environmental problems caused by coal, oil and other traditional energy getting increasingly serious, it is of great significance that offshore wind power to maintain a good ecological environment and promote the optimization of energy structure and the transformation of economic development pattern in coastal areas. Currently, all countries in the world are actively developing offshore wind power. On the one hand, offshore wind power resources are abundant. On the other hand, offshore wind power has less impact on spatial resources compared with onshore wind power. According to the Global Wind Energy Council (GWEC) ^[1], the global installed capacity is 8759 MW by the end of 2014. However, compared with onshore wind power, offshore wind power run a higher risk of management, nature and technology, a higher requirement of environmental protection. What's more, offshore wind technology still belongs to the new field, its environmental impacts are uncertain. Therefore, we must further standardize the management of the offshore wind power.

At present, UK is the fastest growing country in the field of offshore wind power. Not only makes the perfect laws and regulations, but also it has rich practical experiences in wind power project management. The analysis of the British management and experiences can improve the efficiency of China's offshore wind management and reduce impacts on the environment.

The developing situations of offshore wind power in UK

Europe is the leader in the field of offshore wind power construction, Denmark has established the first offshore wind farm in 1991. According to the Global Wind Energy Council (GWEC)^[1] and the European Wind Energy Association (EWEA)^[2], by the end of 2014, the British offshore wind accumulative installed capacity is 4494.3 MW, accounting for 51.3% of the global installed capacity. In addition, Seven British offshore wind farms occupy global top 10. They are London Array (630MW), Gwynty Môr (576MW), Greater Gabbard (504MW), West of Duddon Sands (389MW), Walney (367MW), Sheringham Shoal (317), Thanet (300W). On October 29, 2015, the application of a 660 MW offshore wind farm has been approved by the British government, which will be the world's largest offshore wind farm. To February, 2015, UK has 25 offshore wind farms, the installed capacity distribution as shown in Fig. 1.

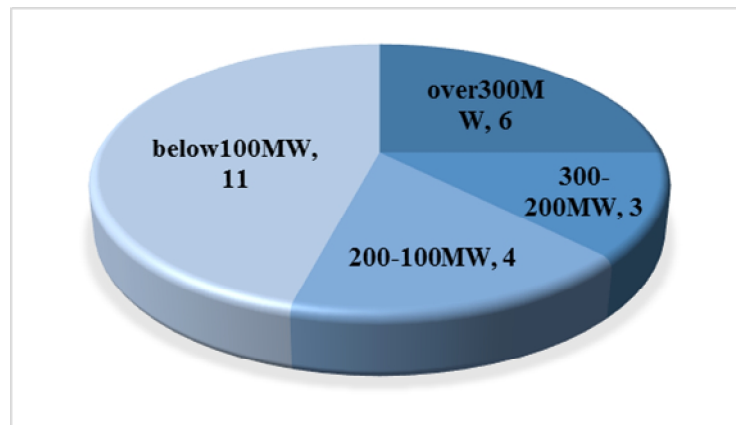


Fig. 1 The offshore wind farm installed capacity distribution in UK

The British government makes great efforts to promote the development of offshore wind power and has high hopes for the future prospects. Now the British government plans to develop offshore wind power system and research platform, which will facilitate the wind power developers and academia making more in-depth understanding and researches.

The developing situations of offshore wind power in China

According to *The statistics of China wind power installed capacity in 2014*^[3], released by the Chinese Wind Energy Association (CWEA), Chinese total installed capacity is 657.88 MW by the end of 2014, project types as shown in table 1.

Table 1 Types of the completed offshore wind farms in China

Types	Installed Quantity	Installed Capacity (MW)
Intertidal zone	156	430.48
Offshore	70	227.4
Total	226	657.88

In December 2014, the National Energy Administration issued *Notice about development plan of offshore wind power* (2014-2016), all regions are actively carry out preliminary work. The installed condition of offshore wind power in China as shown in Fig. 2.

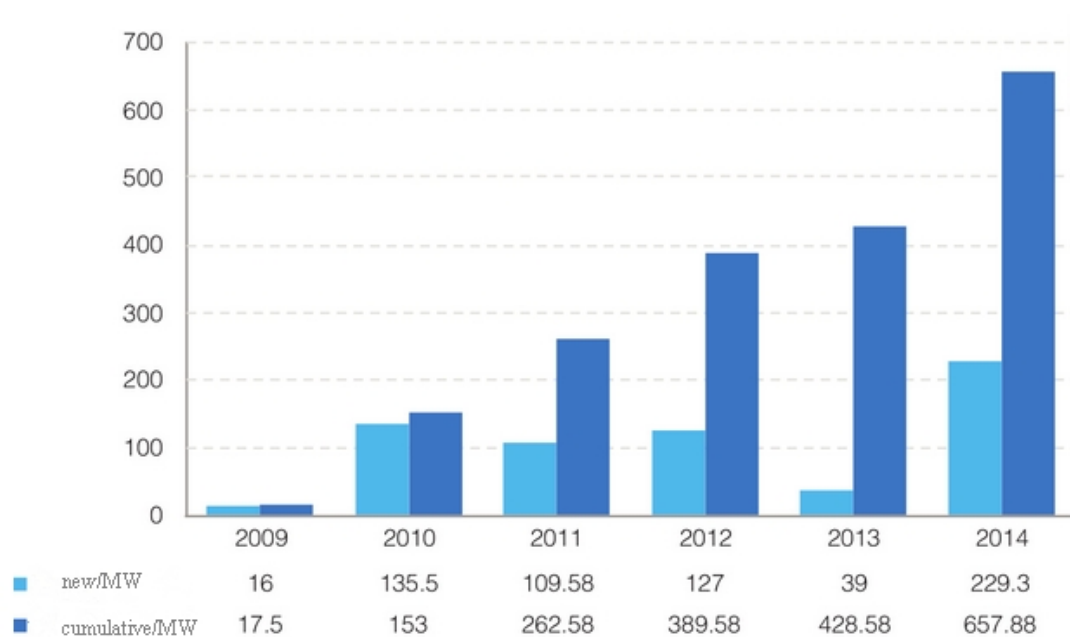


Fig. 2 New and cumulative installed conditions of offshore wind power in China

Offshore wind power management between China and UK

This section will analyze the offshore wind management regulations, planning reports and cases to find the main factors affecting offshore wind implementation. Policy is the foundation of offshore wind management, which can help us comprehensive understand the China and British organization and the function of the government. Application process shows the different between two countries in departments, content, and the public participation. Location requirements illustrate the comprehensive level of offshore wind project consideration between the two countries.

Offshore wind power management in UK

Marine Management Organization (MMO) is mainly responsible for 1 to 100 MW project, Infrastructure Planning Commission (IPC) is mainly responsible for more than 100 MW project^[4]. This section mainly introduces the application process for more than 100 MW project.

Relevant policy

At present, British offshore wind management regulations mainly include the following three policies:

a. *Planning act 2008(c)*^[5] published in 2008, which is used to build the infrastructure planning commission and establish its function, to regulate the national important infrastructure application requirements.

b. *The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009*^[6] published in 2009, regulating the related processes and evaluation methods.

c. *Marine and Coastal Access Act 2009*^[7] published in 2009, which is used to regulate all kinds of marine activities and establish marine management organizations.

Application process

Accorading to *Planning act 2008(c)*^[5], national important infrastructure project need to acquire the development permission. Therefore, offshore wind farm need to obtain permission firstly. The process is divided into six steps as shown in Fig. 3.

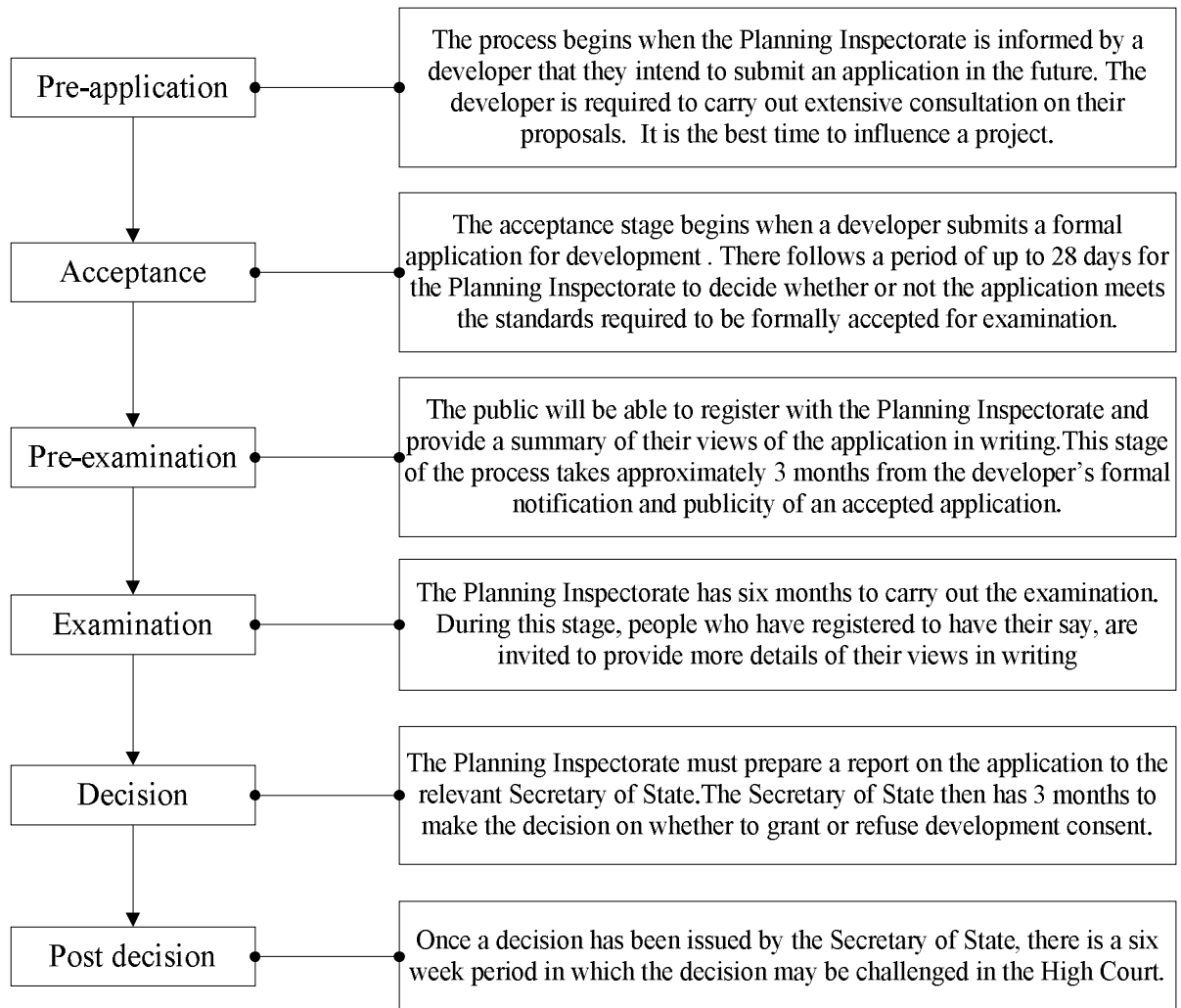


Fig. 3 UK application process

Location requirements

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 ^[6] regulates project cannot acquire the development permission if it did not consider the environment issues. Therefore, the offshore wind location need to consider the environmental factors, including marine ecology and conservation, physical process, commercial fisheries, shipping and navigation, other Marine users, aerospace and defence, community consultation.

UK not only analyzes the above directions, but also considers the potential impacts caused by offshore wind farm construction: sediment impacts – including changes to the sediment regime and resultant impacts on ecology and fish, ecological impacts – including disturbance, displacement and collision risk for birdlife, disturbance and displacement of marine mammals and impacts on the special area, construction noise impacts - leading to disturbance to fish and marine mammals, visual impact of the wind farm and its effect on the area's seascape, socio-economic impacts – including severance and displacement of shipping, fishing and yachting areas, damage to maritime archaeology and adverse impacts on military practice areas.

In practice, location requirements will be adjusted according to the conditions and environment of the project. For example, the location requirements of Triton Knoll offshore wind farm including water depth, ocean exploration and geological conditions meet the project requirements, knowing whether need to change the sea facilities or wind farm layout when renew and remake, no adverse effects on the marine biodiversity, physical environment and marine cultural heritage, highly protect

nature reserve and so on[8] .

Offshore wind power management in China

Relevant policy

At present, Chinese offshore wind power management regulations mainly includes the following two policies:

a. *Law of the People's Republic of China on the Administration of the Use of Sea Areas* ^[10] implemented in 2002, which is used to establish the marine functional zoning and sea ownership management, promote marine reasonable development and sustainable utilization.

b. *Marine Environment Protection Law of the People's Republic of China* ^[11] implemented in 2000, which is used to protect and improve the marine environment, to prevent pollution damage, to maintain ecological balance, to promote economic and social sustainable development.

c. *Interim measures of offshore wind power development and construction management* ^[10] published in 2010, regulating the working process and responsibilities of each departments.

d. *Enforcement regulation of interim measures of offshore wind power development and construction management* ^[10] published in 2011, which is fully consider the environmental impacts, the industry contradiction and further improve the management of offshore wind construction.

Application process

Preliminary work of China's offshore wind management mainly includes application of project use rights, application of project approval, sea area use and marine environmental protection. The relevant departments includes State Energy Administration and State Oceanic Administration and others. Examination content of the related department as shown in Table 2.

Table 2 Main examination duty of department in China

Department	Working Content	Examination Content
State Energy Administration	Coastal provincial planning, national planning	Application report of project development
	Grant permission	Application report of project approval
State Oceanic Administration	Engineering on sea	Prequalification
	Navigation safety	Report of navigation safety
	Environmental protection	Report of environmental impact assessment

In application process, the State Oceanic Administration is responsible for the examination of sea area use and State Energy Administration is responsible for awarding the permission. Fig. 4 lists the main application process.

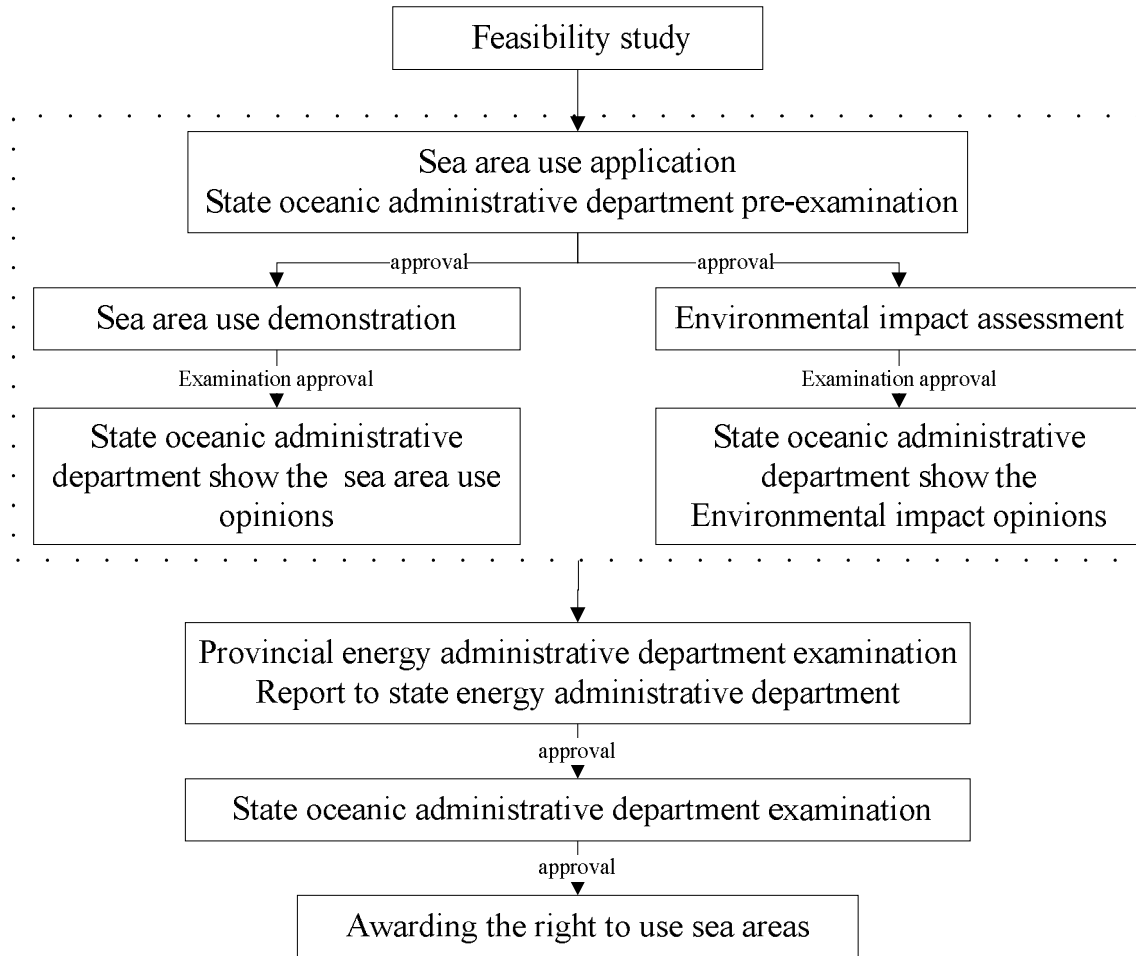


Fig. 4 China application process

Location requirements

According to the provincial offshore wind farm planning reports can be seen that each province have basic unified requirements, including abundant wind energy resource, accordance with the requirements of the marine functional zoning, avoiding port, anchorage, channel, navigation concentration areas and the route published by the competent authority, accordance with the requirements of the environmental and ecological protection to minimize the impact on birds and fish, coordination with city planning and coastline exploitation planning, avoiding military restricted areas, considering the equipment conditions and construction requirements, avoiding the pipeline and its scope of protection, conditions for hydrogeology, access systems, transportation.

Comparative analysis of offshore wind power management between China and UK

Through the above introduction of offshore wind management, China and UK have many similarities, such as location selection, multi-sectoral participation, environmental impact assessment and development permission. But in the process of operation, two countries have different emphases, consideration, management mode.

Related regulations and process

In the application process, China's department has obvious independence, UK has higher integration. On the whole, China's related departments show the corresponding supporting documents, such as sea area use demonstration and environmental impact assessment, all documents will be reviewed by State Energy Administration and State Oceanic Administration. UK emphasizes comprehensive

project examination report. The details of both Chinese and English as shown in Table 3.

Table 3 Comparison of the offshore wind power regulations and process

	China	UK
Relevant policy	Law of the People's Republic of China on the Administration of the Use of Sea Areas Marine Environment Protection Law of the People's Republic of China Interim measures of offshore wind power development and construction management Enforcement regulation of interim measures of offshore wind power development and construction management	Planning act 2008(c) The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 Marine and Coastal Access Act 2009
Mainly departments	State Energy Administration State Oceanic Administration	Marine Management Organization (MMO) Secretary of state Infrastructure Planning Commission (IPC)
Construction requirement	In principle, offshore distance should be not less than 10 km, beach width more than 10 km, water depth not be less than 10m	Each area have corresponding requirements
Development deadline	Two years after the approval	Different deadline, such as five or seven years after the approval
Main conference	Expert review meeting, Symposium	Preparatory meetings, Public hearings, Specific problems hearing
Marine department responsibility	Sea area use demonstration, Environmental impact assessment, Awarding the right to use sea areas	Investigation the impact of development

In terms of policy, China has some special offshore wind policy documents, British documents are comprehensive. In terms of application, compared with multiple department examination in China, the comprehensive level of departments in UK is higher, which will simplify the application process. In marine department responsibility, China's departments undertake more argument, review work, British departments try to assist decision-making departments.

Location requirements

Two countries consider the impact from environmental, economic, social aspects and future. Similar requirements including geography and economic conditions, environmental protection, and coordination of the relevant functional areas. But from a long-term point of view, China focus on the whole, such as the local economy or electric power development planning. UK focus on the project, considering the upgrading influence and local public consultation. Requirement details as shown in table 4.

Table 4 Comparison of offshore wind farm location requirements

	China	UK
Similar factors	Farm construction conditions(such as wind energy resources, topography and geology, transportation, hydrology, meteorology)	Water depth, marine exploration and geological conditions, wind energy resources
	Environment restrictive factor (Such as environmental and ecological protection requirements, fisheries, species and natural heritage, special marine protected areas)	No adverse effects on the marine biodiversity, physical environment and marine cultural heritage, marine ecology and conservation, fisheries
	Regional marine functional zoning (harbor limit, military region, subsea pipeline, etc.)	Protecting marine reserve, aerospace and defence, other marine users, military practice areas
	Regional social and economic situation and development planning	Social and economic influence
Different factors	Regional power status and development plan	Knowing whether need to change the sea facilities or wind farm layout when renew and remake

Environmental impact assessment

In the environmental impact assessment of offshore wind project, the similarities between China and UK lie in: considering the influence of different construction activities on the environment.

Differences are the following two points:

1. Analyzing perspective of environmental impact factors

China considers the environmental impact factors from three aspects: natural environment, ecological environment and social environment. UK considers this from four aspects: physical environment, biological environment, nature conservation and human environment.

2. Environmental impact factors selection and analysis methods

China assesses environmental impact mainly from the two aspects:

a. Construction activities influences: construction activities can be divided into four parts, including wind turbine construction, cable laying, construction site, oil sewage.

b. Post-implementation influences: hydrological dynamic, landform and sediment, ocean ecological environment, fishery, birds, landscapes, shipping, noise, electromagnetic wave, sewage and garbage.

UK assesses environmental impact from three stages: construction, operations, retirement. For example, civil engineering and mining in the period of construction, turbine operating in the period of operations, dismantling in the period of retirement. According to the planning reports and related documents, the main factors that influence the offshore wind farm between the two countries as shown in table 5.

From table 5, UK has more details, for example, China only considers the influence of the offshore wind farms on birds, UK considers birds and marine mammals. Meanwhile, Human environment influence in UK was considered more comprehensive than China, such as health and safety, architecture, archaeological heritage. But China impact factors selection with its characteristics, such as coal saving, emission reduction, considering the nearby residents lighting.

Table 5 Comparison of the main environmental impact factors

	China	UK
Similar factors	Noise	Noise , vibration level and other damage
	Birds	Marine mammals and birds
	Electromagnetism	Physical environment
	Terrestrial ecosystem (Such as Vegetation and land use)	Terrestrial ecosystem and biological environment
	Nature Reserve	Nature conservation
	Ocean ecology (Such as plankton, benthos, fish)	Fish and shellfish resources, Marine total extract, Aquatic ecosystem
	Hydrology dynamic	Water hydrology and submarine morphology, Water quality, Sediment
	Landform and sediment	Geology
	Sewage and atmospheric environmental impact	Sewage and garbage, Local air quality, Regional \ global air
	Social environment	Social economy, Shipping and navigation, Offshore oil, Gas exploration and infrastructure, Commercial farming, Civil and military aviation
	Landscape	Landscape
Different factors	Shadow	Ocean science, Health and safety, Architecture and the archaeological heritage

Public participation methods

British developers need to carry out the local comprehensive consulting in the pre-application process, everyone who has registered and made a relevant representation will be invited to attend a preliminary meeting run in the pre-examination process, people who have registered to have their say, are invited to provide more details of their views in writing in the examination process. *Marine and Coastal Access Act 2009* ^[7] regulates application must attract the public attention and establish the departments which accept public feedback.

Compared with the UK, China's offshore wind projects in the application process without mandatory public participation. *Administration of the Use of Sea Areas* don't make regulations about the public. *The regulations for the right to use sea areas* regulates "When necessary, shall be for the public", but the public time, content, methods are not clear. This fuzzy stipulation may lead to the departments take evasive attitude to the public. Although departments organize expert review after receiving sea use demonstration, experts belong to the elite cannot fully reflect the view of the public. Therefore, only expert evaluation is not a substitute for the role of public participation.

Conclusions

In terms of application process, China procedure is more complicated and public participation is not quite comprehensive. UK procedure avoids repetitive work effectively and makes stakeholders comprehensive understand the project.

In terms of related department management, China's department has obvious independence, lacking department communication channels. UK has higher integration, establishing offshore wind project communication and research platform. It is convenient to department communication, to know the project situation and feedback in time, to carry out the research.

In terms of assessment, impact factors selection involves multiple aspects, such as environment, resources, and military. UK emphasizes human environment, for example, turbines running effects on human health and safety, Radar signal interference effects on residents living.

In view of above analysis we put forward the following suggestions: a. Offshore wind application should be pay more attention to public participation. b. Establishing offshore wind communication and research platform. c. Developing specialized, perfect, definite standards. d. Strengthening human environmental impact study in the early stage of the plan. e. Simplifying the application process.

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