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Challenges and solutions to deploying floating offshore wind power in Japan (3)

Toward the Massive Deployment of Floating Offshore Wind Power in Japan

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Japan announced its target to introduce 30-45 GW of offshore wind power by 2040 in its Green Growth Strategy. In order to achieve this target, Japan needs to accelerate the process of project approval and open up more sea areas for project development, given the lead time required for development.

Given Japan's small land area and limited land for renewable energy, offshore wind power generation is a promising technology for the massive introduction of renewable energy. However, the waters surrounding Japan have limited sea area with a depth of 50-60m, which is suitable for mature fixed-bottom offshore wind power technologies; and therefore, floating offshore wind power technologies are called for. In addition, Japan has an urgent need to harness offshore wind power in its Exclusive Economic Zones (EEZs), which is one of the largest in the world.

A bill to amend the Marine Renewable Energy Act so that the sea area for offshore wind power development can be extended to the EEZ has been compiled after long discussions and is expected to be submitted to the Diet. This will enable Japan to deploy large amounts of offshore wind power and the demonstration of Japan's intentions to construct wind farms in its EEZ will be a decisive step toward the development of the floating offshore wind power market in Japan.

This report is the third in a series of three articles on the challenges and prospects for the introduction of floating offshore wind power in Japan: "Developing offshore wind power in the Exclusive Economic Zone," "Floating Offshore Wind Power as an Industrial Policy," and "Toward the Massive Deployment of Floating Offshore Wind Power in Japan".

Offshore wind power development in the EEZ

The United Nations Convention on the Law of the Sea (UNCLOS) acknowledges that coastal States may exercise sovereign rights over the exploration, exploitation, conservation, and management of natural resources and other economic activities, such as the production of wind or tidal power in their EEZs. In Europe, many countries such as Germany and the UK have developed maritime spatial plans (MSPs) which include areas designated for offshore wind power in their EEZs. A number of wind farms are already under development or in operation in the EEZ.

All States enjoy the right of navigation and overflight and the laying of submarine cables and pipelines within any EEZ. Given that neighboring countries having announced or currently constructing wind farm projects in their EEZs, it is becoming increasingly urgent for Japan to develop projects in its EEZ as early as possible. Japan should demonstrate its intention to build wind farms in its EEZ by formulating a maritime spatial plan based on both scientific data and stakeholder engagement. However, given the time required for developing such national plans, the government could formulate a concrete roadmap to achieve its offshore wind power targets and map out zones for project development.

Stakeholder coordination in the EEZ

It is important to secure the understanding of different stakeholders when constructing wind farms in the EEZ or establishing safety zones around them. In Japan, the fisheries sector will be among the most important stakeholders. In the Japanese EEZ, "offshore fisheries" are conducted with permits and licenses issued by

prefectural governors and “distant water fisheries” are conducted with those issued by the Minister of Agriculture, Forestry and Fishery. However, target parties, often large private companies, that operate in the target area are difficult to identify compared to coastal fishery rights-based fisheries. Furthermore, the stakeholders are not always based in the coastal area close to the target sea area, but can be distributed across Japan, thus often not sharing the interests or visions of local stakeholders.

Project operators can establish safety zones around wind turbines during construction or operation. The approach to allowing fishing vessels into wind farm areas varies among different countries. Even when vessels are allowed to enter an area, some fishing methods are difficult to implement. Depending on the sea area, target fish species and fishing methods differ, as well as the vessel size and geographic extent of the fishing ground; and therefore, it is difficult to predict the impact that wind farms will have on fisheries.

The call for early floating offshore wind project development

Floating offshore wind power generation has already entered the commercialization stage, mainly in Europe. However, compared to onshore wind power and bottom-fixed offshore wind power, there are fewer examples of its installation; and therefore, there are not only technological challenges but also engineering and cost issues pertaining to the relevant infrastructure and installation.

Many floating offshore wind power technologies are still in the development stage. While demonstration projects are necessary to establish the technology, the floating offshore wind power demonstration projects currently considered in Japan are too small in scale to attract foreign wind turbine manufacturers. This is because the manpower and costs required for the front-end engineering and design (FEED) of a small pilot project are not so different from what is needed in a full-fledged project. In order to advance floating offshore wind power in Japan, it is essential to offer foreign wind turbine manufacturers a clear picture that Japan has a huge and promising market. Therefore, in addition to technology demonstrations, real full-scale projects should be launched based on established technology. With announcements of GW-scale projects, floating offshore wind power is shifting from the technology-push phase to the market-pull phase.

Domestic supply chain development as a part of Japan’s industrial strategy.

The invasion of Ukraine by Russia has renewed awareness of the importance of energy and economic security. Excessive dependence on a particular country for products raises concerns about risks to stable supply in the event of supply chain disruption. When wind turbines are supplied by a certain manufacturer or when their maintenance services are provided by a particular company, they will risk suspension of the remote monitoring system, and consequently massive power outages. If they are controlled remotely by a foreign wind turbine manufacturer, they will risk suspension that will be difficult to recover in the event of war or other contingencies. Therefore, it is important to build a domestic supply chain and develop and secure the human resources and infrastructure to support domestic production and operation and maintenance.

The Japanese government needs to demonstrate its commitment to promoting floating offshore wind power not only to foreign companies but also to domestic companies and thus enhance the presence of domestic players in the market in terms of both quantity and quality. Domestic companies need to be convinced that the government is determined to promote floating offshore wind power as a major pillar of its industrial development policy.

The supply chain for floating offshore wind power includes study and design, port development, manufacturing wind turbines, floating foundations and other equipment, shipping equipment and components, assembly and installation of turbines and transmission lines (submarine cables), operation and maintenance, and decommissioning. Japan lacks the experience in the offshore oil and gas operations that many North Sea countries possess and currently has no domestic manufacturing base for wind blades and thus must rely on overseas manufacturers for wind turbines. Yet, there are many Japanese companies with individual elemental technologies in the supply chain. Japan bears the potential to take the lead in building a

supply chain for floating offshore wind power by tapping on the technologies that it excels in, such as shipbuilding, submarine cable technology, carbon fiber reinforced plastics (CFRP), and marine civil engineering. However, it needs to grasp the momentum.

Japan's offshore wind industry needs to improve and reduce the cost of current technologies, and at the same time explore new technologies to solve challenges unique to Japan, such as land constraints related to manufacturing and transporting equipment. It is important to support and foster startups that develop emerging technologies with completely new concepts.

It is essential from an economic and energy security perspective that most of the supply chain be covered domestically, Stronger incentives should be provided for building factories and supply chains in Japan to encourage domestic manufacturing and procurement.

It is also important to enhance recycling and reuse efforts. Not all components of a floating offshore wind power turbine can be recycled or reused; and therefore, recycling and reuse will not solve all supply chain issues. However, it will help retain critical resources within Japan and reduce imports, thus contributing to enhancing economic and energy security. For example, recycling neodymium magnets in Japan will prevent the outflow of the rare metals, or domestic goods, contained in these products, and thus reduce imports. In addition to technological development, economic support measures, and regulations, it will be important to draw a picture in which venous industries, especially recycling, contributes to the promotion of domestic industry and the economy.

A new energy system harnessing offshore wind power

Strategic planning by the national government with the strong support and coordination from local governments will be essential not only to promote the development of a domestic supply chain for floating offshore wind power but also to optimize the energy system.

Grid connection is a critical element of future offshore wind power development. Japan's transmission grid expansion and reinforcement plan takes future offshore wind power development into consideration. However, in the longer term, there remains a possibility that there will not be enough grid capacity to accommodate all offshore wind power. Therefore, converting electricity derived from offshore wind to hydrogen is an ideal option for fully utilizing offshore wind power.

There are existing studies and pilot projects for hydrogen production using offshore wind power in Europe, especially in countries facing the North Sea, such as the United Kingdom, Germany. The development of both offshore and onshore electricity transmission lines, hydrogen pipelines, and/or other means to deliver hydrogen will be critical to integrating offshore wind power into the energy system. Japan seeks to build several hydrogen/ammonia hubs to facilitate the scaling up of domestic hydrogen/ammonia demand and hydrogen/ammonia infrastructure is a key component of hub development. Synergy with such hydrogen/ammonia hubs should be considered in the system design of integrating offshore wind power into the onshore energy system as this will reduce the overall infrastructure construction cost.

When there are infrastructure constraints to transmit wind power to other parts of Japan, relocating energy demand to regions with abundant offshore wind resources could also be a solution for integrating offshore wind into the future energy system. Regions with large offshore wind resources may also be attractive to potential off takers of clean energy. For example, data centers could be potential consumers of clean electricity and green hydrogen), and direct reduced iron (DRI) production will use great amounts of green hydrogen. This can also lead to the fostering of local industries and prevent the offshoring of domestic industries, given that the power generation cost from offshore wind is competitive enough to attract clean energy end-users.

Participatory decision-making

The amendment bill for the Marine Renewable Energy Act will introduce a two-step procedure for selecting offshore wind power projects in the EEZ. In the first phase, developers granted a preliminary permit by the government will initiate coordination with fishermen groups and other interested parties. Such consultations should involve not only those with obvious interests but a wide range of stakeholders, including local community and parties of bilateral fishery agreements. Furthermore, a framework to ensure fairness should also be established.

Today, the Japanese government designates Promotion Zones, Promising Zones and Preparation Zones for offshore wind based on discussions with local stakeholders in a committee often comprising representatives of local interest groups. Individual negotiations are often conducted by the project developer, as contribution to the local economy is included in the evaluation criteria. However, stakeholders will be difficult to identify in the EEZ and negotiations are likely to become more challenging.

Stakeholder engagement covering a wide range of parties and individuals is important for all parties to foster a sense of ownership for individual projects, and in the long run, maritime spatial plans. In the Netherlands, the development of the North Sea Agreement demonstrated the importance of not only having top-level conversations but to engage stakeholders of different levels.

Japan lacks a participatory process for decision-making that is required by law in many countries. Open discussion supported by science-based information will make outcomes more acceptable across different parties. Maritime spatial planning will require consultations with and consensus among a wide range of stakeholders, including different interest parties as well as local people and businesses spread across extensive coastal areas. There is an urgent need for a participatory decision-making process to be developed in Japan. Such processes should be led by a government organization such as the Cabinet Office or a newly established government organization that can cover inter-ministerial topics.

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