Policy coherence developments to finally unleash Japan's offshore wind market

2019

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Executive summary

Japan is yet to realise its offshore wind ambitions announced following the Fukushima Daiichi nuclear plant accident of March 2011. Policy developments have not matched the ambitions while the focus on offshore wind floating technology has been hindered by high costs. The picture is improving. The Japan Wind Power Association has played its part in bringing the responsible government ministries together to design coherent offshore wind policy. In addition, positive developments in other emerging offshore wind markets of Asia-Pacific have added urgency to Japanese policymakers' plans to establish a local offshore win market and industry and cease the resulting technology export opportunities.

Private image by Thomas Poulsen

This *Policy coherence developments to finally unleash Japan's offshore wind market* (the Report) is part of a series of reports on the global emerging offshore wind markets. The reports have been crafted by the Panticon team during the months of September through April, 2019 to mark the new name of the management consulting company. Panticon is particularly strong in the Offshore Wind and Logistics sectors within the three core disciplines of Strategic Management Advisory, Mergers & Acquisitions, and Market Research & Analysis.

The Report has been created using an extensive library of data sources (see Reference section). The main data sources used as the basis for the Report were made up of 500+ pages and mainly consisted of various publications by government related organisations, academic journal articles, offshore wind industry articles, and press releases by firms across the offshore wind market supply side as well as demand side.

The Report contains forward-looking statements, which by their very nature, address matters that are, to different degrees, uncertain as they pertain to the future. These, or any other uncertainties, may cause the actual future results to be materially different than those expressed in the forward-looking statements as contained within this Report. At Panticon, we do not undertake to update our forward-looking statements, nor do we assume any liability for actions or dispositions made by firms, organisations, and/or individuals based on information contained in this Report.

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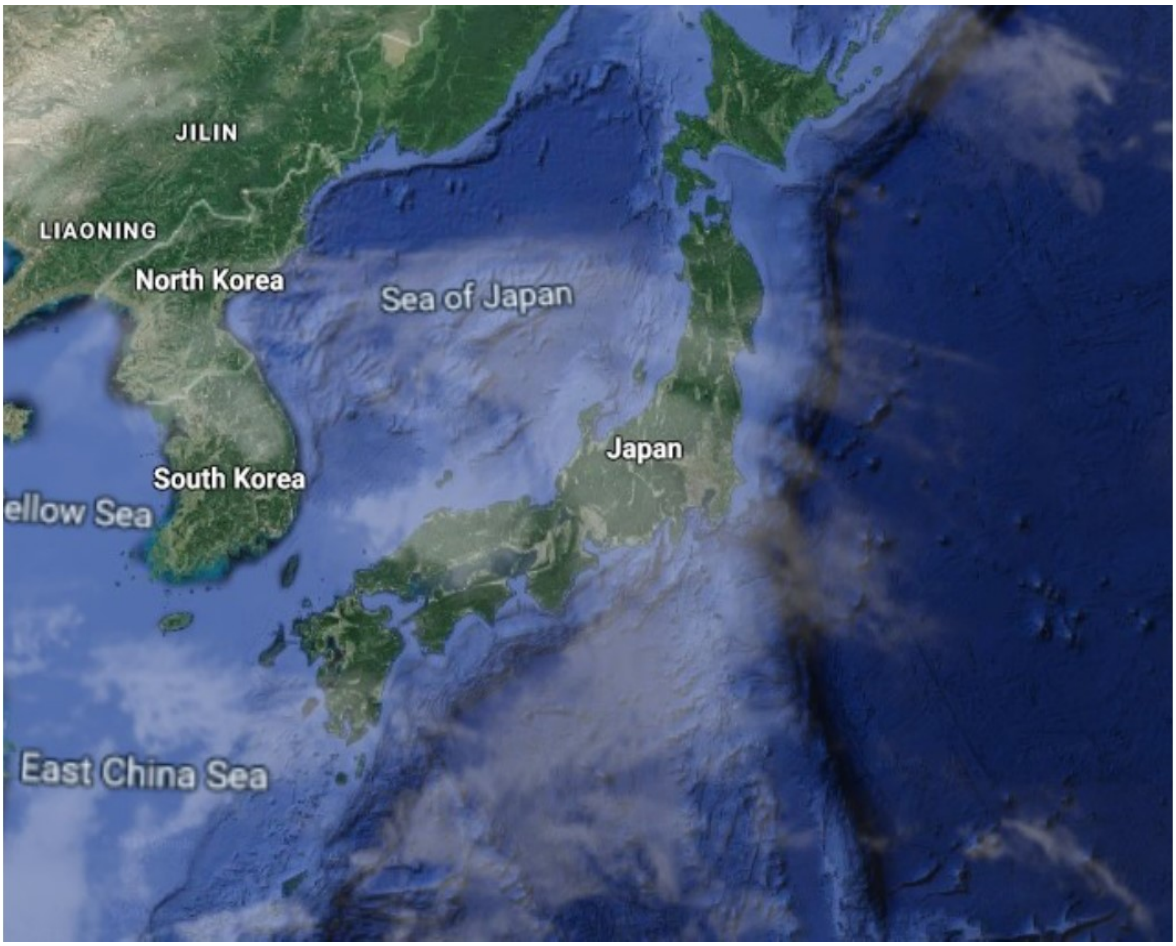

Image: Satellite map from Google Maps/cropped

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List of abbreviations

CFPP	coal-fired power plan
EIA	Environmental Impact Assessment
EPC	Engineering, procurement and construction
FIT	Feed-in tariff
FORWARD	Fukushima floating offshore wind farm demonstration project
GW	Giga-Watts
GWEC	Global Wind Energy Council
HVDC	High-voltage direct current
JPY	Japanese Yen
JWPA	Japan Wind Power Association
kWh	Kilowatt hour
kV	Kilovolt
METI	Ministry of Economy, Trade and Industry (Government of Japan)
MLIT	Ministry of Land, Infrastructure, Transport and Tourism (Government of Japan)
MOE	Ministry of the Environment (Government of Japan)
MoU	Memorandum of Understanding
MW	mega-Watt
NPP	Nuclear power plant
O&G	Oil and gas
O&M	Operations and maintenance
OWF	Offshore wind farm
SPC	Special purpose company
TEPCO	Tokyo Electric Power Company Holdings, Inc.
UF	Universal Foundation
UK	United Kingdom
XLPE	Cross linked polyethylene
WTIV	Wind turbine installation vessels

1. Introduction

Following the March 2011 earthquake and tsunami off Japan's Tōhoku region that resulted in the Fukushima Daiichi nuclear power plant (NPP) accident, the world's second worst accident related to nuclear power generation, Japan announced plans (Renewable Energy Act) to cut nuclear power's 25% share in the country's energy portfolio by including non-hydro renewable energy technologies. Since then, solar photovoltaic has accounted for more than 90% of Japan's installed non-hydro renewable energy capacity. Commercial onshore development has lagged solar photovoltaic partly because of the high population densities in power hungry regions and Japan's mountainous terrain. Commercial offshore wind farm (OWF) development, hindered by a myriad of factors (see section 1.3 below), is yet to take off. By end of 2018, cumulative installed offshore wind capacity stood at 65 mega-watts (MW) across 11 pilot projects including two floating projects totalling 16 MW.

1.1. Targets and support scheme

Japan introduced a feed-in tariff (FIT) system in July 2012. The FIT system required electricity suppliers to purchase onshore and offshore wind energy at 23 Japanese Yen (JPY) per kilowatt hours (kWh) and JPY 36 / kWh, respectively, for a period of 20 years. In July 2015, Japan's **Ministry of Economy, Trade and Industry** (**METI**) approved new energy targets by 2030, namely, 22-24% for non-hydro renewables, 20-22% for nuclear, 26% for coal and 27% for natural gas.

1.2. Factors favouring offshore wind development

Japan has good offshore wind resources and established industries capable of diversifying into the offshore wind industry.

Limited land: Japan's mountainous terrain, more than 70% of the country's land, and high population density in the cities mean that it has limited land for onshore wind and utility solar development. Other factors not favouring onshore wind and solar are noise pollution concerns and reduced FIT, respectively.

Good offshore wind resources: Japan's coastline, the world's seventh longest, has good offshore wind resources with up to 1600 GW potential. The **Japan Wind Power Association** (**JWPA**) estimates the potential for floating and bottom-fixed foundation offshore wind at 519 GW and 94 GW, respectively.

Export intentions: Japan is seeking a competitive edge and technology export opportunities in the emerging global floating offshore wind market.

Diversification: Offshore wind is a boost to Japan's shipbuilding industry, the world's third largest, which has struggled against competition from China and South Korea as well as the decline in global trade following the 2008/2009 Western financial and economic crisis.

Proximity to population centres: More than 70% of Japan's population lives in urban coastal areas.

Corporate support: Growing support from the Japanese Business Federation, the Keidanren, as well as Japan's main trading companies (**Mitsubishi Corp.**, **Mitsui & Co**., **Sumitomo**, **Itochu**, **Marubeni**, **Toyota Tsusho** and **Sojitz Corporation**).

Energy independence: Japan lacks natural energy resources and is dependent on imports. It is the world's largest importer on liquefied natural gas, spurred by the closure of NPPs and some coal-fired power plants (CFPPs) following the March 2011 Fukushima Daiichi nuclear accident.

1.3. Factors hindering offshore wind development

Japan's offshore wind development has been mainly hindered by policy incoherence and the high cost of floating technology.

Opposition from other industry lobbies: Offshore wind development has faced opposition from Japan's powerful fishing industry, albeit less fierce than prior to the March 2011 earthquake and tsunami. Similarly, there has been resistance from Japan's powerful maritime logistics industry to share ocean space with offshore wind developers (most of Japan's domestic freight is transported by coastal vessels rather than by rail or truck).

Policy uncertainty: The Government of Japan's policy on abandoning nuclear power generation and supporting offshore wind power generation has been inconclusive. It has moved to recommission some NPPs and allowed new CFPPs.

Grid limitations: There has been continued reluctance to include renewable power on the grid and power reforms to unbundle power generation, transmission, and distribution are pending. There is insufficient transmission capacity and interconnections between the territories of Japan's ten utilities. In addition, the best offshore wind resource areas lack adequate grid connection to load centres.

High costs: Roughly 80% of Japan's offshore wind resources are in water depths greater than 100 metres making costs nearly twice as in northern Europe. The government's JPY 36/kWh offshore wind FIT is below the JPY 40/kWh rate suggested by OWF developers and the **JWPA**. In addition, typhoons and tsunamis present formidable challenges to the installation and commissioning as well as the operations and maintenance (O&M) OWF lifecycle phases.

Limited offshore supply chain: Japan has relatively little technical experience with offshore oil and gas (O&G) exploration that can be transferred to the offshore wind market. In addition, Japan is yet to finalise safety standards for maritime vessels navigating around floating OWFs.

Inadequate port infrastructure for offshore wind: Despite having many ports along its coastline, none of Japan's existing port infrastructure is suitable for offshore wind.

Lengthy environmental impact studies: Japan's *Environmental Impact Assessment (EIA) Law* applies a full EIA process to OWFs exceeding 10 MW. The process can take up to five years to complete.

Incoherence among the government ministries: Offshore wind development has been delayed by

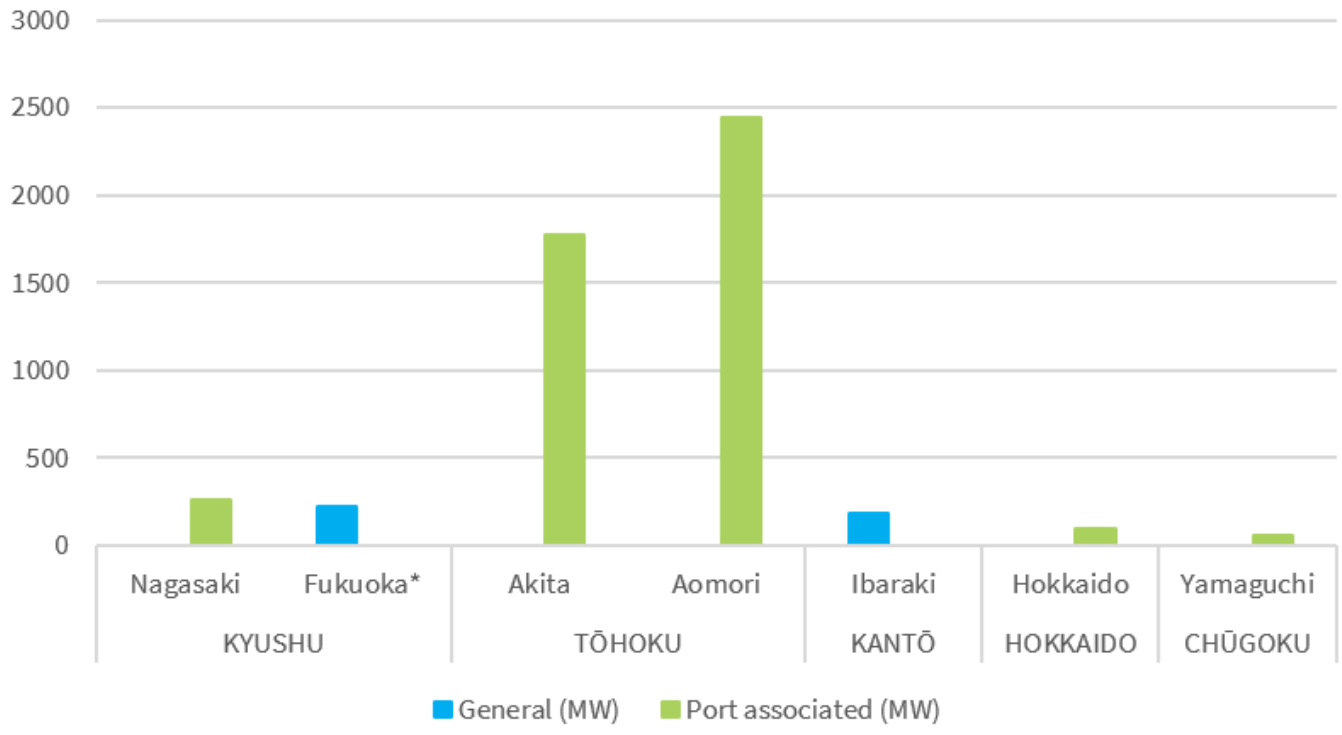
lack of coherence between government authorities (e.g., the METI, **Ministry of Land, Infrastructure, Transport and Tourism** (**MLIT**) and other government ministries and agencies) regulating the power sector resulting in overlap of responsibilities.

1.4. Recent policy developments addressing offshore wind challenges

In response to the challenges highlighted above, several policy related developments have been undertaken since 2016.

- In May 2016, the **MLIT** amended Japan's Port and Harbour Law to allow construction and operation of OWFs at port-associated sea areas. This helped kick-start several OWF projects. Japanese ports are exclusively governed by the **Ports and Harbours Bureau**, making permission procedure less bureaucratic and nearly conflict free from fishing lobbies. However, port and harbour waters make up less than 1.5% of Japanese territorial waters. As at January 2019, about 4.6 GW of projects (Figure 1) in port areas were in the EIA process.

Figure 1: OWF projects currently undergoing EIA process



* Fukuoka capacity includes 3 MW with floating foundations

Source: Panticon, based on multiple sources.

- In August 2017, an 80 km grid extension was under consideration in the wind resource rich but poor grid take-up Hokkaido Prefecture, Hokkaido region to boost grid capacity from 300MW to 600MW in phase I and eventually 800MW in phase II. The METI is covering 50% of the cost for construction of 265 grid towers by 2021.
- In December 2017, the **JWPA** requested the Government of Japan to:
  - prepare a law that would allow construction of OWFs outside port-related sea areas,

- harmonise environmental impact regulations with grid connection,
- introduce guaranteed long-term site leases of up to 30 years
- introduce a bidding system to select offshore wind developers.

- In March 2018, the **Cabinet of Japan** decided on the *Bill for the Act of Promoting Utilisation of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources* to establish basic rules for development of offshore wind power in the general common sea area, and thereafter submitted the draft legislation to the **National Diet**.
- In June 2018, the **National Diet**, during its 196th session, dismissed the *Bill for the Act of Promoting Utilisation of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources* due to political differences.
- In July 2018, the Government of Japan set a target of 10 GW onshore and offshore wind capacity in its Fifth Basic Energy Supply Plan as part of the 22-24% renewable energy power generation targets by 2030.
- In November 2018, the **Cabinet of Japan** re-introduced the *Bill for the Act of Promoting Utilisation of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources* to the 197th extraordinary **National Diet** session. The same month, the lower (House of Representatives) and upper (House of Councils) houses approved the Bill to be put into effect in the spring of 2019.

In March 2019, the Cabinet of Japan approved the Cabinet Order and the Enforcement Order for specifying the effective date of the *Act of Promoting Utilization of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources* as 1st April 2019. Some key steps outlined in the Act are as follows:

1. **METI** and **MLIT** consult with the **Ministry of Environment (MOE)**, the **Ministry of Agriculture, Forestry and Fisheries**, prefectural governments, fishing groups, academics, and other concerned stakeholders
2. **METI** and **MLIT** designate Promotion Zones
    - Promotion zones expected to be off Akita and Aomori Prefectures (Tōhoku region) and Nagasaki and Saga Prefectures (Kyushu region)
    - Promotion Zone selection to consider following factors:
        - The zone's offshore wind resources and other natural characteristics and its suitability for power generation
        - Impact of OWF project on maritime traffic routes
        - Proximity of OWF project to O&M port(s)
        - Likelihood of a utility company to establish grid connection
        - Utilities still reserve the right to curtail output onto the grid
        - Impact of OWF project on fishing

3. **METI** and **MLIT** prepare bidding guidelines
4. **METI** and **MLIT** invite developers/operators to competitively bid based on tariff and zone occupancy suitability, among other factors
    - No restrictions on participation by non-Japanese developers/operators. In addition, non-Japanese developers/operators not required to partner with Japanese companies
    - However, local stakeholders' opinions and the developer/operator's ability to respond to emergency situations are evaluated as part of the bidding guidelines
    - Occupancy rights not equivalent to leases
    - Developers/operators required to separately negotiate offtake power offtake agreements with respective regional utilities
5. Developers/operators submit bids to **METI** and **MILT**
6. **METI** and **MLIT** select winning bidders and approve their bid plans
    - Losing bidders which have already secured grid connection are required to "succeed" the grid rights to another winning bidder (i.e., if the winning bidder has not yet already secured grid connection)
7. Based on approved bid plans, developers/operators apply for FIT approval to **METI**
8. **METI** issues approvals
9. Based on approved bid plans, developers/operators apply for zone development permit to **MLIT**
10. **MLIT** issues zone development permit for up to 30 years

2. Offshore wind developers and owners

So far, local developers have been most active on the nascent Japanese offshore wind market.

2.1 Fixed bottom turbines

Development of OWFs with bottom-fixed foundations in Japan has been characterised by collaboration between Japanese industrial companies and state institutions. A few are outlined below in chronological order.

- In September 2012, a private sector consortium comprising **Hitachi Zosen** (a major shipbuilding firm until spinning off its shipping business in 2002 in the face of growing competition), **Toshiba**, **JFE Steel**, the **Japan Weather Association**, **Sumitomo Electric Industries**, Toa, and Toyo Construction was formed. The aim was to invest about 1.2 billion Euros in developing a 300 MW OWF in Japan by 2022.
- In November 2012, **Nippon Steel & Sumikin Engineering Co., Ltd**, a unit of **Nippon Steel & Sumitomo Metal Corp.**, partnered with **Kajima Corp.**, with the goal of constructing OWFs over the next five years and capturing 50% of Japan's emerging offshore wind market.
- In March 2015, **Kyuden Mirai Energy** revealed it was studying the commercialisation of various energy technology projects, including an OWF project in Hibikinada in Kitakyushu, Fukuoka Prefecture, Kyushu region.
- In December 2014, the Akita Prefecture (Kyushu region) local government invited bids to develop sites in the Akita Port and the Noshiro Port. In February 2015, it awarded Japanese conglomerate **Marubeni Corporation** licenses to develop two OWF projects – the 65 MW Akita Port project and the 80 MW Noshiro Port project. In April 2016, **Marubeni Corporation** formed a special purpose company (SPC), **Akita Offshore Wind Farm Corporation**. The SPC comprises Japanese construction firm **Obayashi Corporation**, developer **EcoPower**, the **Akita Bank**, utilities **Tohoku Sustainable & Renewable Energy, Chubu Electric Power,** and **Kansai Electric Power**, as well as seven other local partners. In July 2016, **Marubeni Corporation** signed an agreement with of the SPC companies to carry out feasibility studies for the two proposed projects.

Policy development delays have contributed to some Japanese companies divesting from some planned OWF projects.

- In May 2014, **Soft Bank Corporation**, via subsidiary **SB Energy**, acquired shares in **Wind Power Energy**'s (Komatsuzaki) planned 100MW Kashima North OWF. It was joined by **Orix Corporation** in May 2015 and the three companies held 33.33% stakes each. However, in January 2017, **SB Energy** and **Orix Corporation** pulled out.

Meanwhile, recent policy developments point to a positive shift.

- In November 2018, Japan's largest power company group and operator of the NPP involved in the Fukushima Daiichi nuclear accident, **Tokyo Electric Power Company Holdings, Inc.** (TEPCO), began a seabed survey off Chiba Prefecture, Kantō region. In January, TEPCO revealed plans for a

seabed survey off Chiba Prefecture, Kantō region. In January, TEPCO revealed plans for a 1 GW OWF project off Chiba Prefecture.

- In January 2019, **ORIX Corporation** began a seabed geological survey off Choshi, Chiba Prefecture, with the aim of conducting a feasibility study for a 200 MW OWF project.
- In March 2019, **RENOVA Inc.**, developer of the 700 MW Akita Yurihonjo OWF project off Akita Prefecture, Tōhoku region, announced that utility **Tōhoku Electric Power Co., Inc.** will invest in the project.
- In April 2019, Hitachi Zosen and Eco Power formed a joint venture with plans to build a 500MW OWF off Aomori Prefecture, Tōhoku region after 2025.

In addition, there is increased foreign interest from European developers.

- In June 2018, Germany's **E.ON** announced plans set up a Japanese unit as early as summer 2019. In April 2019, E.ON set up an office in Tokyo. Later the same month, it signed a cooperation agreement with Japan's Kyuden Mirai to initially develop offshore wind farms in Kyushu region.
- In August 2018, Denmark's **Copenhagen Infrastructure Partners** revealed that it had set up an office in Tokyo.
- In September 2018, France's **ENGIE** and Japan's **Electric Power Development Co., Ltd.** (J-Power) signed a Memorandum of Understanding (MoU) to a non-exclusive collaboration for power projects with focus on large-scale commercial offshore wind projects in Japan, Europe and other markets.
- In January 2019, Denmark's **Ørsted** signed an MoU with **TEPCO** to work jointly on OWF projects including off Choshi in Chiba Prefecture, Kantō region.

2.2 Floating turbines

Floating turbine technology development in Japan started off with Japanese companies and institutions taking centre stage.

- In June 2012, the Japanese government installed its first floating turbine, a half-scale pilot of a floating spar, a 100 kW machine supplied by **Fuji Heavy Industries**, off Kabashima Island in Nagasaki Prefecture, Kyushu region. It was replaced in October 2013 by a full-scale version with a 2 MW **Hitachi** turbine.
- Separately, **Marubeni Corporation** developed the Fukushima floating OWF demonstration project (Fukushima FORWARD) off Fukushima Prefecture, Tōhoku region. Different phases of this demonstration project were completed in 2013, 2016, and 2017, respectively.

Japan's floating offshore wind space has been opening up to non-Japanese players via collaboration with Japanese companies.

- In March 2013, a feasibility study into how Norway's **Equinor'**s (formerly **Statoil**) Hywind floating platform technology could be deployed in Japanese waters was underway. Late 2012, **Hitachi Zosen** teamed up with **Equinor**, as part of its focus on offshore wind. In June 2017, Equinor

announced it had identified Japan, as well as California and Hawaii in the United States of America, as prime markets for the development of floating wind farms. In February 2018, **Equinor** (**Statoil** at the time) opened a country office in Japan to work on the Hywind project pipeline.

- In March 2015, French floating wind specialist **Ideol** and Japan's **Hitachi Zosen** (**Hitachi Zosen** entered the floating wind market in 2004) agreed to jointly design and build floating offshore wind turbines in Japan based on **Ideol**'s semi-submersible, "damping pool" floating foundations, which are designed for waters beyond 35 metres in depth. In June 2015, **Ideol** and **Hitachi Zosen** signed an engineering deal for Ideol's floating platform covering the design of a concrete and steel version of **Ideol**'s floating foundation platform for the Japanese market. It is part of a project led by the **New Energy and Industrial Technology Development Organization** and being developed by a consortium including **Hitachi-Zosen**, **Marubeni**, **Kyuden Mirai Energy** and the **University of Tokyo**. The project aims to develop floating technology for water depths of 50 metres and more.
- In May 2017, US-based **Principle Power** and Japan's **Mitsui Engineering & Shipbuilding** signed a collaboration agreement to promote floating offshore wind projects in Japan. The agreement represents a continuation of the companies' cooperative relationship first established for the design of a WindFloat, a floating wind turbine foundation developed by **Principle Power**, to be deployed in Japanese waters. The new agreement establishes the framework for **Mitsui** and **Principle Power** to collaborate on advancement of the floating wind market in Japan through multiple project development activities. The two companies will cooperate to further enhance the WindFloat design to meet floating offshore wind deployment opportunities in Japan, and potentially other markets.
- In April 2018, **Ideol** signed a MoU with **Acacia Renewables**, Australian **Macquarie**'s Japanese clean energy unit, in a bid to develop the world's first commercial-scale floating OWF (multi-hundred MW project) off Japan with construction planned to start in 2023.

2.3 Floating turbines

In July 2018, **Sumitomo Corporation**, **Sumitomo Mitsui Banking Corporation (SMBC)** and **Development Bank of Japan** established fund management company **Spring Infrastructure Capital** to provide institutional investors with opportunities to invest in renewable energy assets locally and abroad. In February 2019, the trio established a fund dedicated to overseas offshore wind markets. The first acquisition is set to be **Sumitomo Corporation**'s stakes in the 573 MW Race Bank (12.5%) and 353 MW Galloper (12,5%) OWFs in the United Kingdom (UK).

In December 2018, **TEPCO**, via thermal power subsidiary **JERA**, announced it was acquiring equity stakes in the 128 MW Formosa OWF in Taiwan and the 172.8 MW Gunfleet Sands OWF in the UK.

In April 2019, **Starwind Offshore GmbH** (a German holding joint venture comprising **Sojitz Corporation, JXTG Nippon Oil & Energy Corporation, Chugoku Electric Power Co., Inc.** and **Chudenko Corporation**, and **Shikoku Electric Power Co., Inc**.) signed a share purchase agreement with German developer **wpd** to acquire a 27% stake in the 640MW Yunlin OWF project in Taiwan.

3. Local offshore wind supply chain

Japanese companies have garnered experience across the phases of the supply chain, albeit limited, from the 65 MW cumulative installed offshore wind capacity across various small pilot projects. The main supply chain bottle neck is within installation, particularly turbine installation. The **JWPA**, a key lobbyist player in Japan's offshore wind market, has been working to support local supply chain development including installation vessels. It has been reaching out to counterpart associations in countries with offshore wind markets such as Holland, Taiwan, and Denmark.

3.1 Development and consent lifecycle phase

Locally, Japanese firms have dominated this phase. Examples include, for the Fukushima FORWARD project:

- **Marubeni Corporation**: Feasibility study, approval and licensing, O&M, collaboration with fishery industry
- **University of Tokyo**: Metocean measurement and prediction technology, marine navigation safety, public relations
- **Mitsubishi Corporation**: Coordination for grid integration and environmental impact assessment
- **Shimizu Corporation**: Pre-survey of ocean area, construction technology
- **Mizuho Information & Research Institute**: Documentation, committee operation

As Japan looks to embrace commercial OWFs, it is increasingly reaching out for European expertise. In February 2016, Japan's **Wind Power Energy** contracted Denmark's **K2 Management** to analyse work carried out by the engineering, procurement, and construction (EPC) contractor for the 100MW Kashima OWF project off Ibaraki Prefecture, Kantō region. The goal was to use input and best practices from European offshore wind projects to suggest improvements on design, construction, and scheduling.

3.2 Installation and commissioning lifecycle phase

3.2.1. Offshore wind turbines

Hitachi Ltd, which took over **Fuji Heavy Industries**' wind turbine business in March 2012, has dominated the Japanese offshore wind market. **Hitachi** is also supplying turbines for **Taipower**'s 109.2 MW Changhua Demonstration OWF project in Taiwan and hinted at setting up a factory in Taiwan. However, in January 2019, Hitachi, whose maximum offshore turbine is rated at 5.2MW, announced that it will discontinue producing WTGs and instead reinvigorate its alliance with Germany's **Enercon** for Japan's onshore wind market. Indeed, in light of the improving policy developments, the leading European giants, **Siemens Gamesa** and **MHI Vestas**, with machines exceeding 8MW, have expressed strong interest in the market. Hitachi's withdrawal leaves engineering giant **MHI**, the only Japanese

turbine manufacturer to make it into the European offshore wind market, as the only Japanese offshore wind turbine maker. This is largely thanks to the 2014 joint-venture, **MHI Vestas**, with Denmark's **Vestas**. In June 2017, **MHI Vestas** announced plans to set up a Japanese branch. Meanwhile, **Mitsubishi Corporation**'s historical presence in Taiwan was instrumental in **MHI Vesta**s' being selected preferred supplier for up to 1.5 GW offshore wind capacity in Taiwan in March 2018.

3.2.2. Balance of plant

Because of the small size of Japan's cumulative installed offshore wind capacity, Japanese companies have a limited offshore balance of plant track record and capabilities. However, the potential to scale-up and become global suppliers is huge.

3.2.2.1. Sub-sea cables

Japan's **Furukawa Electric** supplied subsea cables for the Fukushima FORWARD project.

The capabilities of Japanese companies are high when viewed at a global level. In June 2015, **J-Power Systems** (**Sumitomo Electric Industries**) was awarded a contract for a subsea high-voltage direct current (HVDC) interconnector cable system between the UK and Belgium. J-Power Systems' responsibility will be a full EPC including design, manufacturing and installation of a state-of-the-art HVDC XLPE insulated cable system – the first time it will been used operationally as an HVDC system at DC 400 kV.

3.2.2.2. Foundations

For floating projects, Japanese companies **Nippon Steel & Sumitomo Metal** (advanced steel material,), **MHI** (V-shape semi-sub (7MW)), and **Mitsui Engineering & Shipbuilding** (compact semi-sub (2MW)) have limited track record from the Fukushima FORWARD project.

For bottom-fixed foundations, Japanese companies are taking the lead and collaborating with experienced Western companies. In February 2015, **Hitachi Zosen** revealed it will supply foundations for a 220 MW OWF off the coast of Japan's Niigata Prefecture, Chūbu region. In March 2018, Danish-Norwegian contractor **Universal Foundation** (UF) signed a cooperation deal with **Hitachi Zosen** to develop **UF**'s Mono Bucket suction bucket foundation technology for the Japanese offshore wind market. **Hitachi Zosen** is collaborating with **Kyoto University** and **Toyo Construction**.

3.2.2.3. Sub-stations

Japanese companies have a unique but limited track record in floating sub-stations. They include **Hitachi Ltd** (floating sub-station) and **Japan Marine United Corporation** (advanced spar, floating substation) for the Fukushima FORWARD project. Meanwhile, in December 2018, **Hitachi Ltd** reached agreement to acquire the power grid business of leading offshore wind player **ABB** of Switzerland.

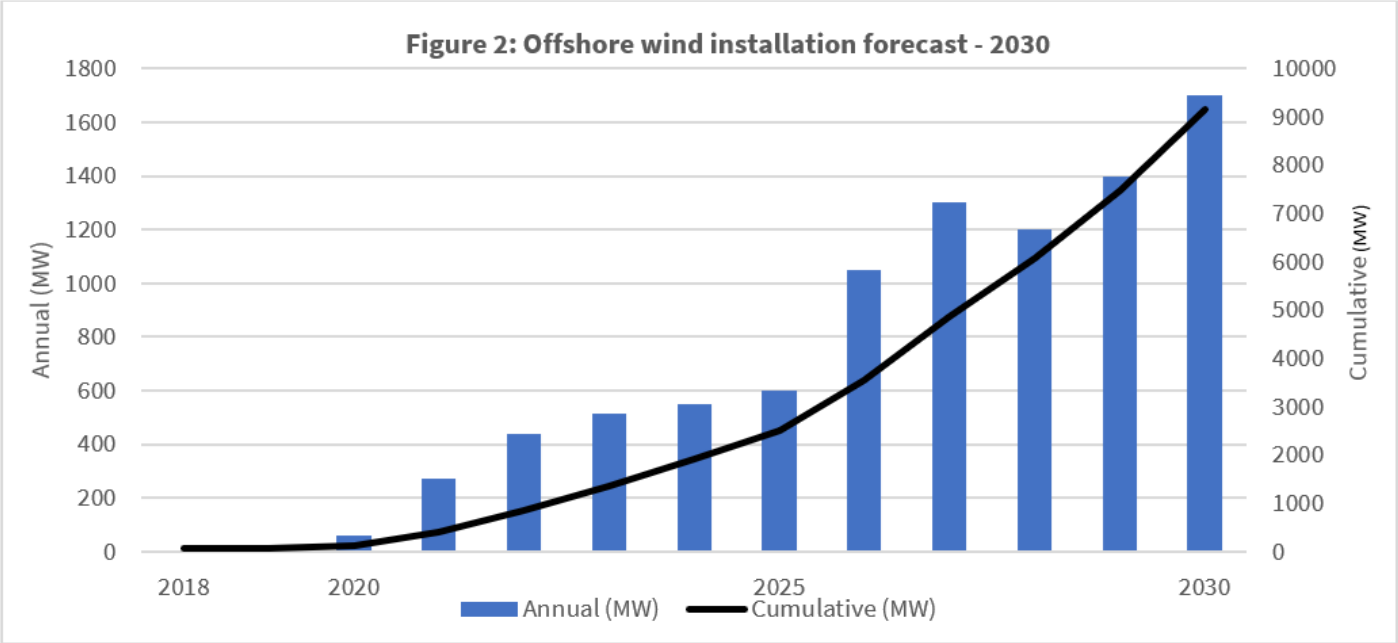
3.2.2.4. Installation vessels

Japan has a shortage of offshore wind turbine installations vessels (WITVs). However, Japanese companies own a leading WTIV company in Europe. In addition, since Q3 2017, plans for construction of new WTIVs to serve the Japanese offshore wind market have been unveiled.

- In May 2012, **Marubeni Corporation** and **Innovation Network Corporation of Japan** (INCJ), supported by Japan's **Mitsui OSK Lines** as an additional investor by February 2017, acquired **Seajacks International Limited**, a UK-based offshore wind power installation provider. Ever since, **Seajacks** has accumulated experience in both the offshore wind and offshore O&G markets in Europe. It has a fleet of five vessels and aims to expand into Asia's emerging offshore wind markets. In April 2018, **Seajacks** was selected preferred installation supplier for the 120 MW Formosa I phase 2 OWF project in Taiwan and its WTIV Seajacks Zaratan will be relocated from Europe to Taiwan as part of an agreement with **Siemens Gamesa**.
- In July 2017, Japanese shipbuilder **Penta-Ocean construction** and **Japan Marine United Corp** announced plans to build Japan's first multipurpose self-elevating jack-up platform capable of installing 5 MW and 6 MW fixed-bottom offshore wind turbines. The vessel was delivered in December 2018, three months behind schedule, and was christened *CP-8001* in January 2019. It is equipped with a fully-revolving crane with a maximum lifting capacity of 800 tonnes at 26 m height. It can install turbines of up to 10 MW capacity at water depths of up to 50 m. Holland's heavy construction maker **Huisman Equipment** built the platform's Pedestal Mounted Crane.
- In May 2018, a collaboration of Japanese firms **Toda Corporation** and **Yoshida Co., Ltd,** with support from Japan's **MOE**, had a vessel designed for the installation of floating offshore wind turbines delivered.
- In October, 2018, **Huisman Equipment** signed a contract with **Japan Marine United Shipyard** for the delivery of a 1,000 t SWL Pedestal Mounted Crane for **Obayashi Corporation'**s and **TOA Corporation'**s offshore WTIV capable of handling 10 MW+ turbines.

4. Offshore wind installation forecast

Japan's **METI** has proposed moving to a new system of auctions for fixed foundation offshore wind. The current offshore wind FIT, at JPY 36/kWh, will be maintained for floating projects up to a cumulative total of 820MW. Thereafter, the auction system will be applied for all projects. According to the Global Wind Energy Council (GWEC), Japan has a further 12 GW of offshore wind projects at various stages of development.



Source: Panticon, based on multiple sources.

5. Conclusion

Although the high cost of floating technology has contributed to delays in take-off of Japan's offshore wind market and industry, the trend towards projects in deeper waters could work in favour of Japan becoming the number one floating offshore wind market and floating offshore wind industry in the world. The leadership is not guaranteed as floating offshore momentum is already gaining pace in Europe.

For bottom-fixed foundations offshore, declining LCoE in Europe (where Japanese firms have invested project development and installation, among others), emergence of nearby markets in the region, e.g. Taiwan, where Japanese firms will get more opportunities to gain offshore wind experience, are factors likely to encourage Japan to make good on its pro-offshore wind policy. In parallel with the momentum behind the passing of *the Act of Promoting Utilisation of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources*, efforts are being made to streamline the EIA approval process from up to five years to under two years.

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Who we are

At Panticon, we are particularly strong in the Offshore Wind and Logistics sectors within our three core disciplines of **Strategic Management Advisory**, **Mergers & Acquisitions**, and **Market Research & Analysis**. We are mainly focusing on the business side to improve our clients' performance, create value in the long-term, and to create sustainable competitive advantages.

How we create value

- Tailor-made strategies
- Support M&A endeavours
- Share knowledge
- Analyse markets
- Advise our clients in every aspect of our three core disciplines

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