Offshore Wind Power Development in Japan

Feb. 28 2017

Japan Wind Power Association (JWPA)

http://jwpa.jp
Offshore Wind Power Experience in Japan (2016)

- **Setana**
  - 2003
  - Vestas
  - 600kW
  - X 2units

- **Black**: Early exam.
- **Green**: Fixed type
- **Brown**: Floating (small)
- **Blue**: Floating type
- **National Project**: National Project

- **Kabashima at Goto Islands**
  - 2012~14 FHI 100kW
  - 2013-16 Hitachi 2MW
  - (Floating)

- **Sasebo, 2009**
  - 1/10 Model
  - (Floating)

- **Sakata, 2004**
  - Vestas
  - 2MW X 5units

- **Hibikinada**
  - 2013
  - JSW 2MW

- **Hibiki Nada, 2013**
  - MHI 2.4MW

- **Akita, 2015**
  - Siemens 3MW

- **Sakata, 2004**
  - Vestas
  - 2MW X 5units

- **Fukushima FORWARD**
  - 2013 Hitachi 2MW
  - 2016 MHI 7MW
  - 2017 Hitachi 5MW
  - (Floating)

- **Kamisu**
  - 2010 FHI 2MW X 7units
  - 2013 Hitachi 2MW X 8units

- **Fukuejima**
  - 2016
  - Hitachi 2MW
  - (Floating)

- **Saga**
  - (2013, failed)
  - 500kW Model
  - (Floating)

Note: FHI’s WTG division has merged by Hitachi in July 2012.
Offshore Wind Power Experience in Japan (2016)

- 59.6 MW, 28 turbines, 9 projects at 8 locations in total at the end of Feb.2017. It is 1.8% of total wind power installation (3,234MW) in Japan.

- 44.2 MW, 23 turbines (74%) are commercial or local government owned projects. Almost all of them are very closed to seashore, so-called “Semi–offshore”. Dolphin type or Monopile type foundations are used at these projects.

- Real offshore projects (more than 1km from seashore) are National projects.
  - Fixed type by NEDO: 4.4 MM, 2 turbines at Choshi and at Kitakyusyu (Gravity type) (Jacket type foundation)
  - Floating type by MOE: 2 MW, 1 turbine at Kabashima (Spar type floater) (GOTO–FOWT) → It granted to Goto city, relocated 10km southeast to Fukue island, reconnected to grid, and started commercial operation in Apr. 2016.
  - Floating type by METI: 9 MW, 2 turbines at Fukushima (Semi–sub type floater) (FukushimaFORWARD, on going) → 5MW turbine on advanced spar type floater was anchored in 2016 and it starts official operation in Mar. 2017.
## Offshore Wind Power Experience in Japan (2016)

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
<th>Distance (km)</th>
<th>Depth (m)</th>
<th>Rated (MW)</th>
<th>No. of WTG</th>
<th>Total (MW)</th>
<th>Start operation</th>
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<tr>
<td>Fixed</td>
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<td>2</td>
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<td>Yamagata</td>
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<td>16.0</td>
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<td>12</td>
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<td>1.4</td>
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<td>(1)</td>
<td>(2.0)</td>
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<td>Fukushima</td>
<td>Iwaki city</td>
<td>20</td>
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<td>Naraha*</td>
<td>Apr.</td>
<td>7.0</td>
<td>1</td>
<td>2.0 (+5.0)</td>
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<td>5.0</td>
<td>1</td>
<td>(1)</td>
<td>(Mar.2017)</td>
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<tr>
<td></td>
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<td>Total</td>
<td>28</td>
<td>59.6</td>
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</table>

*National projects  () : Relocated, Under commissioning
Offshore projects by Local governments and private companies

Dec. 2003
At Setana port in Hokkaido
By Local government (Setana)
700m offshore, 3m in depth
Vestas 600kW  x 2 turbines
Dolphin type foundation
1st offshore wind power in Japan

Feb. 2010 at Kamisu in Ibaragi
By Wind Power Group
Offshore from 40〜50m, 4m in depth
FHI (Hitachi) 2MW x 7 turbines
Monopile foundation (￠3m)
They withstood huge Tsunami in 2011.
Demonstration of Offshore Wind Power Generation by NEDO, at Choshi, Chiba Pref.

WTG: MWT92/2.4 offshore model
Foundation: Gravity type
Output: 2.4MW
Rotor Dia.: 92m
Hub Ht.: 80m
Water Depth: 12m
3km from seashore

Ref: NEDO (New Energy and Industrial Technology Development Organization)
Demonstration of Offshore Wind Power Generation by NEDO, at Hibikinada, Fukuoka Pref.

In Operation on June 2013.

Ref: NEDO
Hybrid Spar type Floater is made by pre-stressed Concrete.
Total length : 12.5 m
Undersea length : 7 m

1/10 Model, spar type floater
Co-research by Sasebo Heavy Industry and Kyoto University (in Sep.2009 at Sasebo bay in Nagasaki pref.)
Lenz type wind turbines by Kyushu University

3kW X 2 units, on the hexa shape floater by polystyrene foam in operation Dec.2011 at Hakata bay in Fukuoka pref.
Skwid: offshore wind and marine stream hybrid power system, 500kW, by MODEC

- Vertical wind turbine and Savonius water wheel (ballast weight) are connected by gear coupling
- Supported by Japanese NEDO
- MODEC intended to 500kW prototype demonstration at Genkai-nada in Saga pref. in 2013.
- Two troubles happened and MODEC quitted project. Water wheel has dropped during transportation. It damaged at anchoring, and sunk by storm.
MOE Floating WTG Project at Kabashima in Goto Islands, Nagasaki Pref. (GOTO-FOWT)

Hitachi’s Down wind type 2MW wind turbine
28 Oct. 2013: in Operation
2MW floating turbine was relocated in 2016

MOE’s national project has finished in Mar. 2016. The turbine was granted from MOE to Goto city local government. Toda Co. has moved WTG about 10km southwest from Kabashima to Fukuejima. Fukuejima has more population(38k) and larger electricity capacity than Kabashima. It was re-connected to the gridline and started commercial operation in Apr. 2016. METI approved offshore wind tariff 36JPY/kWh for it. (1st and only case in Japan)

Ref: Press release by Toda Co. on 15 Apr. 2016  

Photo: Taken by Mr. Hoichi Nishiyama
Toda Co. announced to develop 21MW floating offshore windfarm at Goto islands on 3 Oct.2016

http://www.toda.co.jp/hairyo.html
METI’s Fukushima Recovery, Experimental Offshore Floating Wind Farm Project (FukushimaFORWARD)

Project Consortium: 11 members
- Marubeni (Project integrator)
- MHI
- University of Tokyo
- Mitsubishi Corp.
- IHI Marine United
- MES
- Nippon Steel
- Hitachi
- Furukawa Electric
- Shimizu Corp.
- Mizuho Information & Research

2013
- Hitachi JMU Spar
- Hitachi 2MW Mitsui semi-sub

2016
- MHI 7MW MHI semi-sub
- 3コラム型セミサブ

2017
- Hitachi 5MW JMU Spar
- アドバンストスパー

Source: Fukushima offshore wind consortium
Floating substation (Hitachi) on advanced spar type floater (JMU), since 2013

1st 2MW turbine (Hitachi downwind type) on semi-sub type floater (Mitsui Zosen), since 2013

2nd 7MW turbine (Mitsubishi hydraulic type) on semi-sub type floater (Mitsubishi), since 2016

3rd floating turbine
- 5MW turbine (Hitachi, downwind type) is ready for shipping.
- Advanced spar type floater is under construction at dockyard in Osaka.
- The turbine was installed on the floater at Osaka bay and carried to Fukushima in 2016.
5MW Floating Wind Turbine for Fukushima Project has been completed at Osaka on 24 May 2016.

April, 2016, at Sakai Dockyard of HITZ

On 2 May at Osaka bay Sumoto port

This advanced spar type floater is designed by JMU

On 9 May

On 24 May

On 19 May

Hitachi’s Down wind type 5MW turbine HTW126

The floater has leaned temporally. But, it was recovered within 5 days.

On 18 May

On 14 May
Coming Offshore Wind Power Projects in Japan (2016)

1. 1897 MW, 18 projects at 13 locations in total now. Most of them are under EIA procedure.
2. 1387 MW, 13 projects are commercial projects. The earliest one shall be “Kashima port 1st”.
3. 5MW floating turbine is added at Fukushima in 2017.
4. 3–4 MW floating turbine shall be added at Kitakyushu in 2018 by NEDO new project.

Legal Hurdles:
- Port associated area: Cleared in 2016.
- General common area: Start discussion in 2016.
# Coming Offshore Wind Power Projects in Japan (2016)

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
<th>Port</th>
<th>WTG (MW)</th>
<th>No.of WTGs</th>
<th>Total (MW)</th>
<th>Start Operation</th>
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<td>Wakkanai port</td>
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<td>Akita North</td>
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<td>3.3 - 5.0</td>
<td>120</td>
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<td>1897</td>
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</table>

*National projects  **Estimated by JWPA  
*** 3GW is offered at Akita far offshore by NGO, besides this table
Roadmap for the Wind Power Introduction for Japan, proposed by the JWPA

- **10GW** prospect at Energy mix plan shall be achieved at early 2020s. (3.2GW at 2016 + 10.8GW during EIA process = 14GW)
- JWPA proposes 36.2GW toward 2030 for the next stage.

![Roadmap for the Introduction of Wind Power](image_url)
Japan has Huge Wind Energy Resources

Onshore: ave. wind speed 6.5m/s considering social acceptance
Offshore: ave. wind speed 7m/s
Distance 30km
Sea depth 200m
considering social acceptance
Hurdles against offshore wind in Japan

- Small official target by Japanese government (820MW).
- Restricted shallow sea area (surrounded by deep sea)
- Floating wind power for deep sea by national projects were very expensive.
- Poor grid infrastructure at good wind area (Hokkaido & Tohoku, northern Japan)
- Moderate wind speed (Low income) at offshore area in central & western Japan
- Big law uncertainty at “General common sea area” (So-called Thomas Hobbes’s “the war of all against all”. “Who has the permission rights?” is not clear now. Concerning Fishermen’s rights, Decommissioning, etc.)
- Lack of “Jack up ships/SEP”, “Base ports”
- “Cabotage / Labor restriction” for Jack up ships
- Long EIA process (4-5 years)
Japanese trade company Marubeni retired from Kashima port offshore project due to low profitability (Local developer Komatsuzaki group continues project)

10 Jan. 2017

Marubeni cancels part of port-based project

13 January 2017 by Martin Foster, Be the first to comment

JAPAN: The Marubeni Corporation has informed the Ibaraki prefectural government it will stop developing a wind project planned for a site in Kashima port.

Marubeni said it would discontinue the project based on estimates that the wind power was not strong enough to meet targets.

The Ibaraki prefectural government said Marubeni had scrutinised profitability throughout the development period and found it fell below acceptable levels, making it difficult to approve an investment decision.

Marubeni was originally selected to develop the southern part of the port area in August 2012.

Another developer, Windpower Energy Group, won the bidding for the southern portion of the port area and will reportedly continue with the project.

The prefectural government will reopen bidding for Marubeni’s portion of the port project in February.

In August 2016, Marubeni signed an agreement with a consortium of companies, including utilities, to carry out feasibility studies for two proposed projects at two port sites in the Akita prefecture, in the northern part of the major Japanese island, Honshu.
“Port and Harbor Law” has been amended to promote offshore wind power development in Japan on 13 May.

Japanese News for GWEC, reported by JWPA
You can see them at JWPA’s Web site http://jwpa.jp/index_e.html
Japanese MILT amended “Port and harbor law” to promote offshore wind power at Port associated area in May 2016

The contents of amendment make it clear;

- “How to bid for the offshore wind power” at port associated area. (including how to expand “port associated area”)

- The concrete contents for the bidding/auctions (including decommission at the end of the projects)

- The winners get “20 years occupation permission”. (It’s too short for “from planning to decommissioning”. We have to request permit extension during project lifetime.)
現在位置: トップページ > ビジネス・産業・まちづくり > 企業等の誘致 > 風力発電関連産業 > 響灘洋上風力発電施設の設置・運営事業者の公募について

響灘洋上風力発電施設の設置・運営事業者の公募について

本市では、響灘地区のポテンシャルを活かし、産業の裾野が広く雇用創出効果が高い風力発電を主なテーマに据え、あらゆる機能が集積した「風力発電関連産業の総合拠点」の形成などを目指した「グリーンエネルギーポートひびき」事業を推進しています。

このたび、風力発電産業の集積と北九州港の振興等を目的として、響灘に洋上風力発電施設を設置・運営する事業者の公募を、下記のとおり行います。

なお、本年7月1日、改正港湾法（以下「法」という。）が施行され、洋上風力発電施設等により港湾区域内の水域を長期にわたり占用する者を公募によって決定する占用公募制度が整備されました。今回の公募は、全国で初めて当該法の手続きに沿って実施するものです。

スケジュール

※注意: (4)質疑の受付、(5)説明会への参加及び(8)公募占用計画の提出には、9月1日（木曜日）までに参加登録をおこなっていただく必要があります。
Local Industry Group (Kyushu Electric Power, J Power, etc.) won the Kitakyushu bidding in Feb. 2017

Sited off the coast of Fukuoka prefecture on the western island of Kyushu, construction of the Hibikinada wind farm would start in 2022 following an environmental impact assessment expected to take three to four years to complete. The Hibiki Wind Energy group, which includes utility J-Power, Saibu Gas and engineering firm Kyudenko, said an online statement.

The wind farm would be built around as many as 44 turbines installed on jacket foundations roughly 10km off the port of Hibikinada, in Kitakyushu’s Wakamatsu Ward. The project will span 2,700 hectares across four adjacent sites, where wind speeds average about 7 metres per second.

The Kitakyushu government said that the project will necessitate upgrades to Hibikinada’s port infrastructure.

In addition, Hokuraku will likely establish an O&M base near the port, while NSSMC will set up a foundation production facility.

The consortium might also spearhead the construction of a gearbox production base, the local government said.

The auction for the Hibikinada project is the first public offering of near-shore development rights since the Port and Harbour Law was revised last May. The amendments have given project owners the right to operate wind farms in ports beyond the original occupancy limit of 10 years.

The Kitakyushu Seaport and Airport Bureau opened up bidding for the Hibikinada project in August, with an initial plan of at least 50MW.

The municipal authorities have already overseen the construction of several pilot projects near the Hibikinada port, most notably with the 2013 installation of a 2MW Japan Steel Works turbine on a four-legged, trussed-steel jacket foundation in 15 metres of water.

The Ministry of Environment also launched a study in early 2015 to assess the feasibility of building a 700MW, fixed-foundation project off Hibikinada.

The island of Kyushu is rapidly emerging as a potential hub for offshore wind. In early 2016, the UK Carbon Trust announced plans to set up a tidal and floating wind energy test facility with the authorities in Nagasaki prefecture.

Consortium picked to build Japan's largest offshore wind farm

A consortium led by regional Japanese utility Kyuden Mirai, has been chosen to develop what would be the Asian country's largest offshore wind farm to-date. A ¥175bn ($1.5bn) project expected to add 229MW to the current fleet.

The Hibikinada project has a concrete stability in an earthquake

15 February 2017
Updated 15 February 2017
Penta-Ocean Orders First Japanese-Built Wind Turbine Installation Vessel

Japan’s Penta-Ocean Construction and Japan Marine United Corporation (JMU) have signed a contract for the construction of one multi-purpose self-elevating platform vessel suitable for marine civil engineering works or offshore wind turbine installation in harsher weather and marine conditions.

The basic design of the jack-up vessel, the first of its kind to be built in Japan, has been supervised by the Netherlands-based GustoMSC.

The vessel is designed based on jack-ups used in Europe for installation of oil rigs or offshore wind turbines, but with a jack-up system that matches Japanese natural conditions and on-site characteristics.

It will be equipped with a fully-revolving crane with an 800-ton lifting capacity, as well as a dynamic positioning system, enabling the vessel to perform installation of large-scale marine structures such as offshore wind turbines with a capacity of up to 6MW and foundations in the water depths of up to 50 metres.

The jack-up is also designed for operations in Japan’s Greater Coasting Area and for becoming a shallower draft vessel. It will come equipped with accommodation units and a helicopter deck for emergency transfers.

The jack-up is expected to be delivered in September 2018.

As a result of latest amendment to the country’s Port and Harbor Act that took effect on July 1, 2016, the port areas will be more accessible to operators wishing to construct offshore wind farms, and the vessel is optimized to undertake this task, according to Penta-Ocean.
Offshore wind power developments in Japan have many hurdles now, but we can clear them gradually. Thank you for hearing.