# Rera Tech Inc. Development of Offshore Wind Farm and Wind Measurement Method in Japan

## History of Offshore Wind Power in Japan

- Fixed-bottom type
- Floating type

**The first installment in Japan**

- Setana, Hokkaido 0.6MW×2
- Sakata, Yamagata 2MW×5
- Fukushima
  - Floating offshore wind farm demonstration project in Fukushima was launched
  - 2MW×1
  - 7MW×1
  - 5MW×1
- Kashima Port, Kamisu, Ibaraki 2MW×7
- Kashima Port, Kamisu, Ibaraki 2MW×8
- Choshi, Chiba
  - Offshore wind power demonstration project in Choshi was launched
  - 2.4MW×1 (First case at offshore area)
- Goto, Nagasaki
  - Offshore wind power demonstration project in Goto was launched
  - 0.1MW×1
  - 2MW×1 (First case as a floating type at commercial scale)※1
- Kitakyushu, Fukuoka
  - Offshore wind power demonstration project in Kita-kyushu was launched
  - 2MW×1
- Kitakyushu, Fukuoka
  - Next-generation floating offshore wind turbine demonstration in Kita-kyushu was launched
  - 3MW×1

"Vision for Offshore Wind Power Industry" was announced at the 2nd public-private council.

Enforcement of the Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy Power Generation Facilities.

- Akita Port, Akita 4.2MW×13
- Ishikari Bay New Port, Hokkaido 8MW×14
- Noshiro Port, Akita 4.2MW×20
- Kashima Port, Kamisu, Ibaraki 8MW×19
- Nyuzen, Toyama 3MW×3
- Goto, Nagasaki 2.1MW×8
- Kitakyushu Port (Hibikinada), Fukuoka※2 9.6MW×25

**R1**

- Noshiro, Mitane, Oga, Akita 12.6MW×38
- Yurihonjo, Akita 12.6MW×65
- Choshi, Chiba 12.6MW×31

**R2**

- Happo, Noshiro, Akita 15MW×25
- Oga, Katagami, Akita, Akita 15MW×21
- Murakami, Tainai, Niigata 18MW×38
- Enoshima, Saikai, Nagasaki 15MW×28

※1 Installed in 2013, launched commercial operation in 2016

※2 Expected to start commercial operation in 2025

## Measurement Method

**Direct Measurement** | **Indirect Measurement (remote sensing device)**

| Onshore Metmast (around 1990-) | Vertical LiDAR (around 2009-) | Scanning LiDAR (around 2013-) | Floating LiDAR System (around 2015-) |
|---|---|---|---|

### Onshore Metmast (around 1990-)

Tower facilities to measure wind speed and direction. The height is limited to 60m by domestic regulations, but due to deregulation in 2022, it has been partially allowed to be taller than 60m but less than 90m.

Onshore Wind Turbine

### Vertical LiDAR (around 2009-)

Measures wind by irradiating laser beams in the sky. With the increasing size of wind turbine, it has been installed to measure wind at high height that cannot be reached by metmast. In principle, the measurement is carried out in conjunction with metmast.

### Scanning LiDAR (around 2013-)

Fixed-bottom type Offshore Wind Turbine

Laser beams from coast to sea area and measures offshore wind conditions within a few kilometers from coast. Observation by multiple units enables measurement of turbulence and other fine-scale phenomena.

### Floating LiDAR System (around 2015-)

Floating type Offshore Wind Turbine

Vertical LiDAR is installed on a floating structure offshore to measure wind directions overhead. Measurements can be taken offshore where scanning LiDAR cannot reach.

## Wind Measurement Evolution

The market for offshore wind power has grown dramatically in recent years, and one of the factors of this growth has been driven by the advancement in wind measurement technology. Accurate wind measurement is essential to reliably assess the economic viability and safety of wind farm projects. On the other hand, the cost of installing offshore metmast is enormous. Therefore, shifting to a low-cost wind measurement is also an important perspective. Over time, the locations of windfarm have expanded from onshore to offshore, and then to deep-water areas. Along with this trend, wind measurement methods have shifted from direct measurement (metmast) to indirect measurement (Doppler LiDAR).
This infographic visualizes the history of offshore wind power and the evolution of measurement equipment in Japan.

This infographic is based on Rera Tech Inc.'s own research and may have slight differences in information such as actual capacity, year, etc.
Please refer to the information of each project for details, such as for the year of when the project started and the starting year of operation. Please note that the size of the installed turbine sizes may not be accurate.