Fukushima Floating Offshore Wind Farm Demonstration Project
(Fukushima FORWARD)

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Contents

- Background and objective
- Technical challenges and solutions
- Social acceptance and collaboration
- Conclusion and perspectives

Background

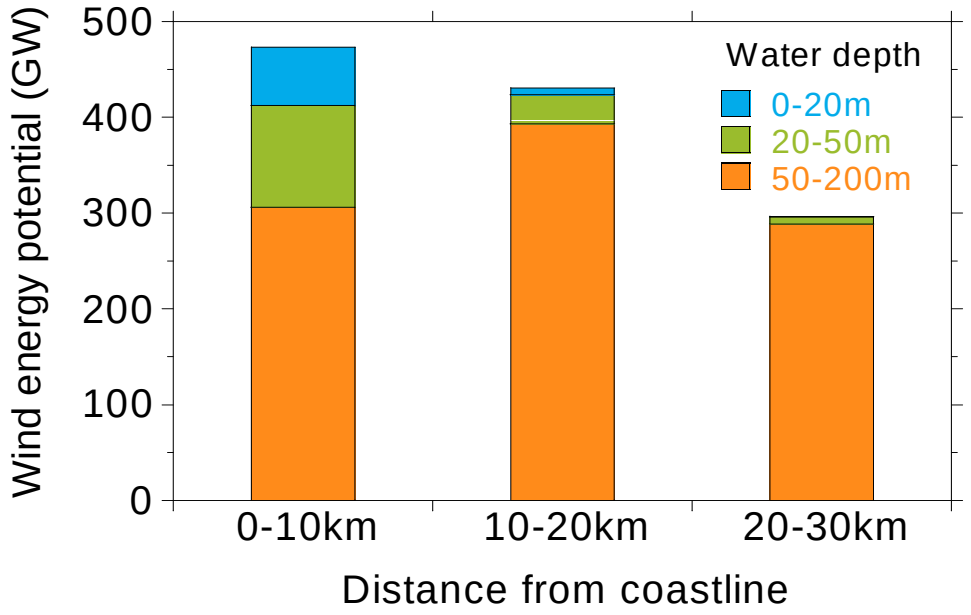
Benefits

- Offshore wind energy potential along Japan is 1.2TW, while the total capacity of the conventional sources is 0.2TW.
- More than 80% of the offshore wind energy potential in Japan are located at deep water.

Challenges

- Floater concepts
- Measurement and Prediction technology
- Floating substation
- Cost efficiency
- Advanced Material

Offshore wind energy potential in Japan



Compact semi-sub

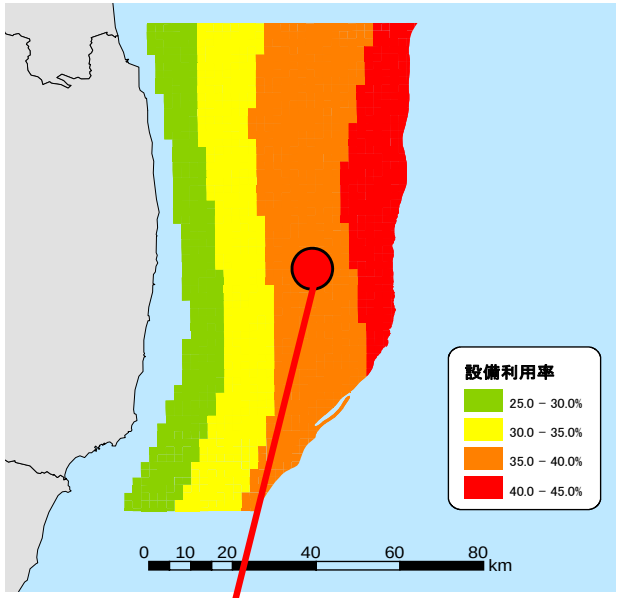
Advanced spar

V-shape semi-sub

Fukushima FORWARD project

Ideal area for floating offshore wind

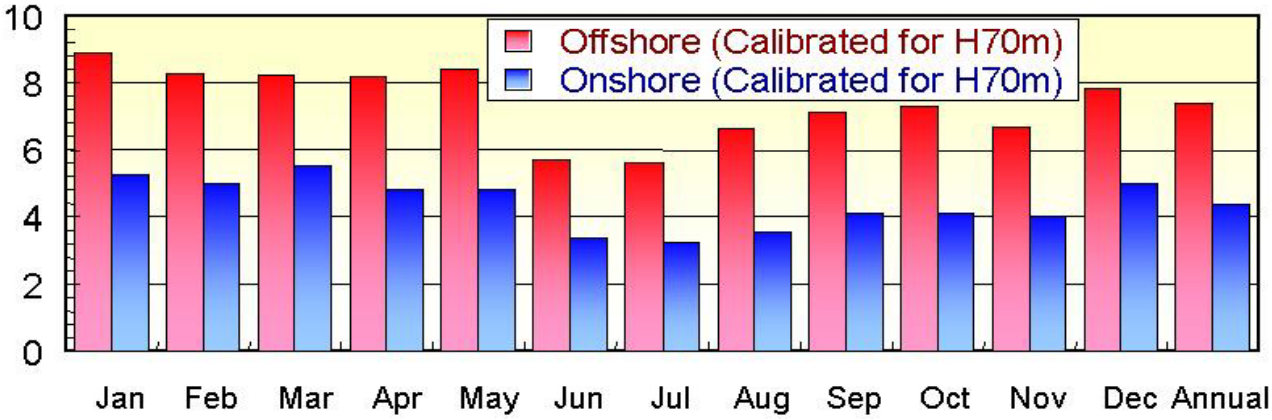
- Large wind energy potential at 20km-50km from coast, where water depth is 100m–200m
- Strong power grid for nuclear and thermal power plants
- Port facilities available



Benefits

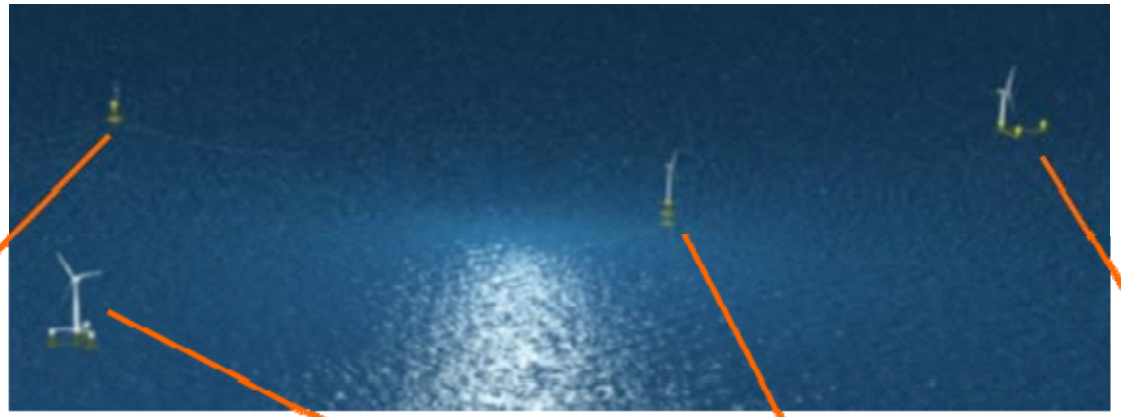
- The accumulation of wind energy industry will help the restoration of this region.

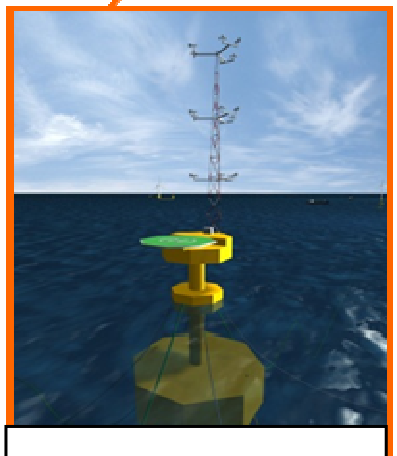
7.4m/s (offshore)　　4.3m/s (onshore)



Facility specifications of FORWARD project

Facility Name	Scale	Wind Turbine type	Floater type	Project Term
Floating Wind Turbine I	2MW	Downwind Type	Compact Semi-Sub	First
Floating Wind Turbine II	7MW	Upwind Type	V-shape Semi-Sub	Second
Floating Wind Turbine III	7MW	Upwind Type	Advanced Spar	Second
Floating Substation	25MVA/66kV	Substation	Advanced Spar	First





Substation

4 Colum Semi-Sub

Advanced Spar

3 Colum Semi-Sub

Work packages

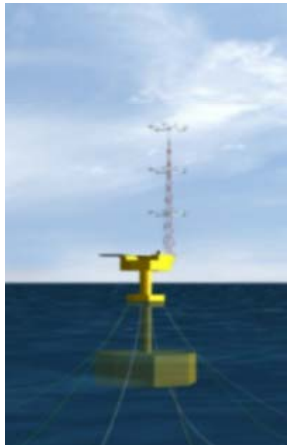
1 Preliminary study
- site assessment
- preliminary design

2 Measurement / prediction
- metocean
- floater motion
- substation / power cable

3 Floating wind turbines
- wind turbine
- floater / mooring
- advanced material

4 Grid integration
- floating substation
- dynamic cables

Phase I



Phase II

5 Operation & Maintenance
- floater / mooring
- wind turbine
- substation / power cable

6 Environment issue
- environmental assessment
- marine navigation safety
- collaboration with fishery

7 Documentation
- technical review
- manual
- project report

8 Public relation
- communication centre
- seminar and symposium

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Presentation of consortium members

Consortium Member	Main Rule
Marubeni Corporation	【Project Integrator】 Pre-Studies, Approval and Licensing, Operation and Maintenance, Collaboration with Fishery Industry
The University of Tokyo	【Technical Advisor】 Measurement and Prediction Technology, Navigation Safety, Public relation
Mitsubishi Corporation	Pre-Studies, Approval and Licensing, Environmental Assessment
Mitsubishi Heavy Industries, Ltd.	V-Shape Semi-Sub Type Floater
IHI Marine United Inc.	Advanced Spar Type Floater and Floating Substation
Mitsui Engineering & Shipbuilding Co., Ltd.	Compact Semi-Sub Type Floater
Nippon Steel Corporation	Advanced Steel
Hitachi, Ltd.	Floating Electric Power Substation
Furukawa Electric Co., Ltd.	Undersea and Dynamic Cables
Shimizu Corporation	Pre-Studies, Construction and Installation Technology
Mizuho Information & Research Institute, Inc.	Documentation, Committee Operations

FORWARD vision and challenges

Green growth in Fukushima

- Industry accumulation
- Employment
- Restoration

Fukushima FORWARD

Technical challenge

- Floater concepts
- Measurement and prediction
- Floating substation
- Cost efficiency
- Advanced material

Social acceptance

- Navigation safety
- Environmental assessment
- Collaboration with fishery
- Public relation

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Development phases and key success factors

2 Phases:

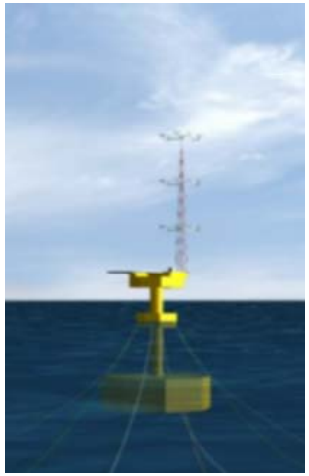
Phase I (2011~2013) → **Phase II (2014~2015)**

Floating substation
Compact semi-sub (2MW)

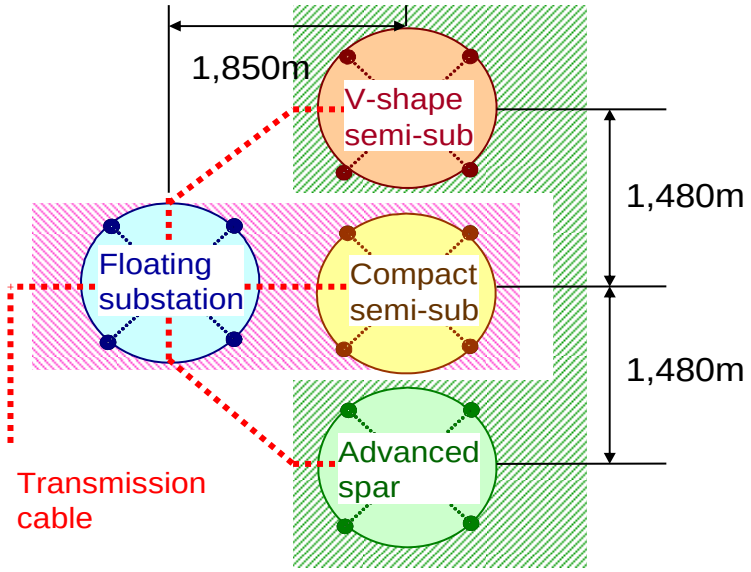
V-shape semi-sub (7MW)
Advanced spar (7MW)

Phase I

Floating substation



Compact semi-sub



Phase II

Advanced spar

V-shape semi-sub

3 key success factors:

- Design / Test / Improvement
- Cost efficiency / industrialization
- Technology maturity / Social acceptance

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