

# Mitsubishi Corporation Power Solution Group

## **Domestic Offshore Wind Power Generation Business**







- **1.** The MC Group's Electric Power Business
- 2. Trends in Global and Domestic Offshore Wind Power Generation Business
- 3. Overview and Our Future in the Domestic Offshore Wind Power Generation Business

## **1. The MC Group's Electric Power Business**

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## Mitsubishi Corporation/The MC Group's Electric Power Business



MC's Roadmap to a Carbon Neutral Society was announced in October 2021.

- Halve GHG emissions by FY2030 (FY2020 baseline) and achieve net zero by 2050
- Invest approx. ¥2 trillion in EX by FY2023
- "Create a New Future" through integrated EX/DX initiatives



Through executing domestic offshore wind power generation business, we aim to promote regional revitalization and create a new future through EX/DX initiatives

#### Addressing Materiality in Our Growth Strategies (Regional Revitalization)

- We have reframed the various challenges faced by regional communities as business opportunities and will realize regional revitalization through integrated EX/DX initiatives that leverage our collective capabilities.
- A sample case, based on Japan, is shown below. We will seize business opportunities in the future by developing projects overseas, where regions are likely to face similar challenges.



## 2. Trends in Global and Domestic Offshore Wind Power Generation Business



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## **Offshore Wind Power Capacity to Date**

- Offshore wind power shows emerging growth in Europe and China and accelerated development in South Korea and Taiwan, in light of the trend of decarbonization.
- Of the 21 GW added globally in 2021, 17 GW were in China.



Graph 1: Cumulative global offshore wind power capacity and breakdown by region

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## **Offshore Wind Power Capacity Forecast**

- Russian invasion of Ukraine has accelerated/will accelerate the offshore wind power development.
- More than 370 GW is expected to be introduced on a global basis by 2030.



Graph 2: Cumulative new offshore wind power capacity from 2021 to 2031 by region

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#### Top 10 Onshore and Offshore Wind Turbine Manufacturers (FY2020)

- Seven of the top 10 were from China.
- The greatest four of China saw rapid growth in the offshore turbine sector and are building strong track records.



#### **Reference: Offshore Wind Power Compared with Other Renewables**

- Relatively stable wind condition provides higher capacity factor, which is approximately 30% in Japan and 40% in Europe, than onshore wind power and solar power. In Japan's Tohoku area, more offshore power is typically generated in winter than in summer.
- Offshore wind power has less geographical and spatial restriction and more scalability than onshore wind power, with the highest development potential on a capacity basis, while bringing attendant challenges and risks with regard to development, construction and O&M.

#### Table for Illustrative Purpose: Performance of Renewable Energy Sources

Renewable energy source	Offshore wind	Onshore wind	Solar	Small-to medium- scale hydro	Geothermal	Biomass
Stable operation (weather effects, etc.)	B Less affected than onshore wind	С	С	A	A	A
Scalability	A 10 MW or more per unit	C Less than 10 MW per unit	С	С	A	С
Development lead-time (permission, etc.)	С	В	A	С	С	С
Site availability	В	С	A	С	С	А
Facility utilization rate *Figures from Japan's 6th Strategic Energy Plan	30.0-33.2%	25.4%	13.8-17.2%	60%	83%	87% When burning solely biomass

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## **Reference: Overview of Offshore Wind Power Facilities**

• The "marine renewable energy power generation facilities", defined under the Guidelines for Public Tender of Exclusive Occupancy and Use as a scope of developers, consist of offshore wind turbines, offshore substations, observation towers, as well as offshore wind power generationrelated offshore power transmission and communication cables (including onshore substations and power and communications cables but limited exclusively to those maintained and operated by developers).



### Shift to Larger Scaled Wind Turbines and Strained Supply Chain

- Turbines have scaled up in short time to obtain greater capacity efficiently, since generating power is proportional to the square of the radius and to the cube of the wind speed.
- Turbines have scaled up under the suitable environments for offshore wind power generation, such as shallow seabed and strong and stable winds, manufacturing and construction technology have progressed and de facto standards have formed. As a result, relative risks are visualized and projects come to have less uncertainty.
- Accelerated development has strained the existing supply chains. Larger scale potential areas with less uncertainty tend to be prioritized.



Notes: Illustration is drawn to scale. Figures in blue indicate the diameter of the swept area.

## **Overview of Domestic Offshore Wind Power Projects**

• In the "Vision for Offshore Wind Power Industry," the Japanese government has set the targets of 10 GW of capacity by 2030 and 30–45 GW by 2040. In light of these ambitious targets, there are over 20 projects in the pipeline across the country.

#### Zone status as of September 30, 2022

Category	Zone Name	MW	18. Ishikari, Hokkaido
Promotion	1.Goto City, Nagasaki Pref. (Floating)	17	15.Gan-u and Minamishiribeshi regions, Hokkaido
zone	2.Noshiro City·Mitane Town·Oga City, Akita Pref.	478.8	Developer selected 16. Shimamaki, Hokkaido
	3.Yurihonjo City (North•South), Akita Pref.	819	14. Hiyama, Hokkaido
	4.Choshi Citv. Chiba Pref.	390.6	17. Matsumae, Hokkaido
	5.Happo Town and Noshiro City, Akita Pref.	360	approx. 1,800 MW 9. Admont Pref. (northern side of the Pref.)
	6.Enoshima Island, Saikai City, Nagasaki Pref.	420	Lienne Teum and Nachine City, Alite Pref.
	7.0ga City•Katagami City•Akita City, Akita Pref.	340	2. Noshiro City: Mitane Town: Oga City: Akita Pref.
	8.Murakami City•Tainai City, Niigata Pref.	350, 700	7. Oga City·Katagami City·Akita City, Akita Pref.
Promising	9.Aomori Pref. (northern side of the Pref.)	300	3. Yurihonjo City (North·South), Akita Pref. 🖉 — 🧾 🏹 20. Kuji City, Iwate Pr
Zone	10.Aomori Pref. (southern side of the Pref.)	600	11. Yuza Town, Yamagata Pref.
	11.Yuza Town, Yamagata Pref.	450	8. Murakami City·Tainai City, Niigata Pref.
	12.Isumi City, Chiba Pref.	410	24. Toyama East (Bottom fixed and Floating - For Start
	13.Kujukuri Town, Chiba Pref.	400	21. Awara City, Fukui Pref.
Preparation	14.Hiyama, Hokkaido		22. Hibiki nada, Fukuoka Pref. 4. Choshi City, Chiba Pr
Zone	15.Gan-u and Minamishiribeshi regions, Hokkaido		23. Karatsu City,Saga Pref. 23
	16.Shimamaki, Hokkaido		12. Isumi City, Chiba Pref.
	17.Matsumae, Hokkaido		1. Goto City, Nagasaki Pref. —
	18.Ishikari, Hokkaido		4237
	19.Mutsu bay, Aomori Pref.		6. Enoshima Island, Saikai City, Nagasaki Pref.
	20.Kuji City, Iwate Pref.		Legend
	21.Awara City, Fukui Pref.		Promoting Zone /      Promising Zone /      Preparation Zone
	22.Hibiki nada, Fukuoka Pref.		* Underlined items were added in FY2022
	23.Karatsu City, Saga Pref.		or the amount of grid capacity secured before tenders.
	24. Toyama East (Bottom fixed and Floating)		

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Source : Ministry of Economy , Trade and Industry https://www.meti.go.jp/shingikai/enecho/denryoku\_gas/saisei\_kano/yojo\_furyoku/pdf/017\_01\_00.pdf

## 3. Overview and Our Future in the Domestic Offshore Wind Power Generation Business

## **Company Outline of MCOW**

#### Mitsubishi Corporation Offshore Wind Ltd.

#### Established on July 1, 2022



## Summary of Project Plans – Yurihonjo, Akita

Sponsors	Mitsubishi Corporation Offshore Wind Ltd. /	Mitsubishi Corporation / VENTI JAP	AN Inc. / C-TECH CORPORATION		
Overviews	Equipment: Bottom-Fixed Offshore Wind Capacity: 845 MW (65 GE turbines, 13.0 MW each) Commercial Operation Date(COD): December 2030 Project Area: North side 6,479.3 ha South side 6,561.1 ha				
	Notice of Selection Dec. 2021 <b>Development</b> (Approx. 3 years) Star Constr 20	rt of CC ruction Construction Dec. 1 (3-4 years)	DD Operation and 2030 Decommissioning (Approx. 24 years)		
Plans	<ul> <li>Certification of public occupancy plans</li> <li>Wind condition and geotechnical surveys</li> <li>Environmental impact assessments</li> <li>Surveys of impact on fisheries</li> <li>Detailed designs, certifications and permissions</li> <li>Discussion and partial implementation of regional contribution plans</li> </ul>	<ul> <li>✓ Construction of onshore BoP (Balance of Plant)</li> <li>✓ Installation of turbine foundations and subsea cables</li> <li>✓ Installation of wind turbine</li> <li>✓ Commissioning</li> <li>✓ Surveys of impact on fisheries</li> <li>✓ Discussion and implementation of regional contribution plans</li> </ul>	<ul> <li>Surveys of impact on fisheries</li> <li>Operation and maintenance</li> <li>Greater collaboration with local companies</li> <li>Planning and operation of decommissioning</li> <li>Further implementation of regional contribution plans</li> </ul>		

## Summary of Project Plans – Akita North(Noshiro, Mitane & Oga)

Sponsors	Mitsubishi Corporation Offshore Wind Ltd. / Mitsubishi Corporation / C-TECH CORPORATION				
Overviews	Equipment: Bottom-Fixed Offshore Wind Capacity: 494 MW (38 GE turbines, 13.0 MW each) COD: December 2028 Project Area: 6,268.8 ha				
	Notice of Selection Dec. 2021 <b>Development</b> (Approx. 4 years)	t of CC Tuction Construction Dec. 2 (Approx. 3 years)	DD 2028 Operation and Decommissioning (Approx. 24 years)		
Plans	<ul> <li>Certification of public occupancy plans</li> <li>Wind condition and geotechnical surveys</li> <li>Environmental impact assessments</li> <li>Surveys of impact on fisheries</li> <li>Detailed designs, certifications and permissions</li> <li>Discussion and partial implementation of regional contribution plans</li> </ul>	<ul> <li>✓ Construction of onshore BoP (Balance of Plant)</li> <li>✓ Installation of turbine foundations and subsea cables</li> <li>✓ Installation of wind turbine</li> <li>✓ Commissioning</li> <li>✓ Surveys of impact on fisheries</li> <li>✓ Discussion and implementation of regional contribution plans</li> </ul>	<ul> <li>Surveys of impact on fisheries</li> <li>Operation and maintenance</li> <li>Greater collaboration with local companies</li> <li>Planning and operation of decommissioning</li> <li>Further implementation of regional contribution plans</li> </ul>		

## Summary of Project Plans – Choshi, Chiba

Sponsors	Mitsubishi Corporation Offshore Wind Ltd. / Mitsubishi Corporation / C-TECH CORPORATION					
Overviews	Equipment: Bottom-Fixed Offshore Wind Capacity: 403 MW (31 GE turbines, 13.0 MW each) Commercial Operation Date: September 2028 Project Area: 3,948.7 ha					
	Notice of Selection Dec. 2021 <b>Development</b> (Approx. 3 years) Start of Construction 2025	CO Construction Sep. 2 (3-4 years)	D Operation and Decommissioning (Approx. 24 years)			
Plans	<ul> <li>Certification of public occupancy plans</li> <li>Geotechnical surveys</li> <li>Environmental impact assessments</li> <li>Detailed designs, certifications and permissions</li> <li>Surveys of impact on fisheries</li> <li>Discussion and partial implementation of regional contribution plans</li> <li>Cortication</li> <li>Surveys</li> </ul>	struction of onshore BoP lance of Plant) allation of turbine foundations subsea cables allation of wind turbine missioning veys of impact on fisheries cussion and implementation of onal contribution plans	<ul> <li>✓ Operation and maintenance</li> <li>✓ Greater collaboration with local companies</li> <li>✓ Planning and operation of decommissioning</li> <li>✓ Surveys of impact on fisheries</li> <li>✓ Further implementation of regional contribution plans</li> </ul>			

## **Mission of MCOW**

- Our slogan is "Together to our future with the wind and the ocean".
- Promote offshore wind power as the next main power source in a carbonneutral society.
- Create the future of Japan by working together with all local stakeholders, supported by the treasured resources, wind and ocean.









#### "Our Future" (1) Creating Related Industries: History in Europe

Originated from transfer of foundation component technologies for marine structures of the Northern Sea oil fields (offshore platforms).

A stock of highly skilled specialized personnel was built up in the industry.

The supply chains and related infrastructures were widely and deeply developed (manufacturing plants, base ports, related vessels, etc.).

#### Offshore oil platform (Illustrative)



A great breadth and depth of technologies and industries have been created over the last 30 years.

Projects are highly resilient to risks unique to offshore wind farms from such causes as natural environment and the rapidly expanding size of equipment.

Technologies have been developed rapidly in accordance with the expansion in offshore wind power installation.

## Base port for offshore wind farm (Port of Esbjerg, Denmark)



Offshore wind farm construction expertise has grown not in engineering companies but in maritime civil engineering companies that also operate Jack-up vessels (engineers' mobility is highly fluid in the market)

Developers have specialized in project management.

#### Jack-up Vessel



#### "Our Future" (1) Creating Related Industries: Approaches in Japan

- States and Issues in Japan
- Advanced level of elemental technologies that can serve as a foundation for developing offshore industries
  - Construction: Advanced technical capabilities for offshore structures
  - Engineering: Project-management expertise proved in overseas projects
  - Manufacturing: High-quality manufacturing capabilities
- Potential to grow development and construction technologies with rapid introduction of leading-edge knowledge and technologies from Europe.
- MCOW aims to create and grow the related industries, by introducing leading-edge knowledge and technologies from Europe, and connecting them to domestic partners.

Collaboration with an European constructor that has a wealth of offshore construction expertise

Involvement of a Japanese constructor

Introducing project management know-how Developing project-management measures adjusted for Japan

Incorporating domestic products and technologies

Contributing to the global competitiveness of domestic suppliers

Assembly

Transport



Installation

Kajima

Van Oord

(the Netherlands)

MCOW

GE

Toshiba

TDK

Eneco

**C-TECH** 

Etc,







 Turbines

 Market controlled by three U.S. and

 European companies and Chinese

 manufacturers

#### Large components

(towers, blades and monopiles) Rapid expansion of other Asian countries, such as South Korea and China

#### "Our Future" (2) Self-motivated and Self-sustaining Regional Contribution Plans

- MC defines its goal under Midterm Corporate Strategy 2024 as "Creating MC Shared Value (MCSV)", the continuous
  creation of significant shared value by elevating MC Group's collective capabilities in order to address societal challenges.
- MCOW aims :
  - for regional communities to become self-motivated and self-sustaining where developers and communities are not overly dependent on one another.
  - to create MCSV, maximizing societal and environmental values of its business in a way that contributes its sustainable operation for our offshore wind power generation business.



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