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Committee on Impacts on Shipping and Commercial, Tribal, and Recreational Fisheries from Development of Renewable Energy on the West Coast – Virtual Information Gathering Sessions

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General Questions:

1. What size turbines are currently being installed on floating systems? today 10 MW, working on 18 MW right now for next generation project
2. What are the different platform types being considered for these large wind turbines?
3. What are the different mooring systems being considered for offshore wind platforms? What is the likelihood that these mooring systems and platforms could influence currents to the extent that they could affect upwelling in the North Pacific region?
4. Is there a practical limit to the number of turbines in a floating wind farm with respect to mooring anchor spacing? ~ 7- 10 diameter away so roughly a mile apart
5. For a 20MW floating offshore wind turbine, what is the approx. rotor diameter and size of platform? For optimized performance, what is the approx. spacing between platforms for a large wind farm?

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General Questions:

6. What depth of water can the structures be placed, does the water depth affect which mooring system is chosen? Somehow, but not the most major issue.

7. Approx. what percentage of the wind energy is absorbed by a large offshore wind farm. To what extent is wind velocity and gradient impacted downstream of a large offshore wind farm? Wake losses issues right now in large commercial wind farms in the UK and Denmark – couple % is what people are claiming, so quite significant.

8. Do you know of any studies conducted to understand the impact of offshore wind installations on ocean currents and potentially upwelling? Not sure I have read anything about upwhelling, which is a transport/circulation phenomena. Those structures are very transparent to ocean currents

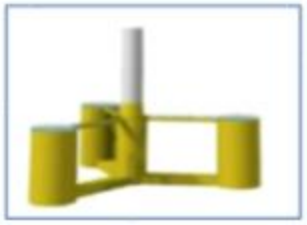
9. Is the current industry approach for substructure inspection/maintenance to disconnect the moorings and tow to shore, or to carry out those activities in place? Only large correctives, but it's cheaper than the alternative, which is not feasible on a floating to floating operation.

10. What studies have been conducted for North Sea installations related to impact on search and rescue capability in and around offshore wind farms? Lots, everyone does that ☺.

EFGL Questions:

10. What depth of water will the structures be places? ~80m
11. Will the power generated be transmitted directly to shore or will there be a substation utilized? If a substation is utilized, will the cables delivering power to the substation be suspended in the water column? No offshore substation
12. Was the fishing industry and/or other ocean user consulted when:
    a. Determining where to site the 3 WTGs? Yes, by the French government. All stakeholders were consulted for a couple years
    b. Designing the layout of the project? Yes
13. Given that projects currently being considered off the US West Coast are anticipated to produce in excess of 1GW/project, are located in waters in excess of 700m, and will likely use WTGs much larger than the 10GW WTGs proposed for this project, what can we learn from this project? – 10 MW turbines are no longer commercially avaible, Vestas is now on a 15, and commercial turbines are up to 24 MW.
14. Are safety zones envisioned around the floating foundations? If so, how far will those extend?
15. What fisheries will be negatively impacted or displaced from deployment of the WTGs? Main one is trawling.
16. Describe outreach efforts (either by the developer or the government) with the fishing industry and other ocean users. All very local, but over multiple years, but similar to all other stakeholders, NGO, etc…

OCG-Wind is the lightest, assembly-friendly solution



INO-15C (Technip)

- Tubular Columns
- Flat Panel Pontoons and Bracings
- Welded joints (assembly)

Hi-Float (HHI)

- Hexagonal Columns
- Flat Panel Pontoons and Bracings
- Welded joints (assembly)

Seatrium

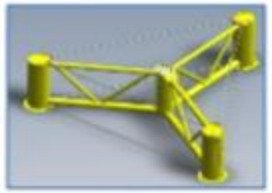
- Hexagonal Columns
- Flat Panel Pontoons and Bracings with Additional Bracing
- Welded joints (assembly)

Marubeni

- Tubular Columns
- Flat Panel Pontoons
- Welded joints (assembly)

WindFloat FC and TC (PPI)

- Hexagonal / Tubular Columns
- Flat Panel Pontoons and Bracings
- 12 welded joints (assembly)



OCG-Wind (Ocergy)

- Tubular Columns
- Tubular Bracings with K-braces
- Bolted joints (assembly)

Stiesdal (TetraSub)

- Tubular Columns
- Tubular Bracings with K-braces
- Fast pin assembly

STAR1 (Saipem)

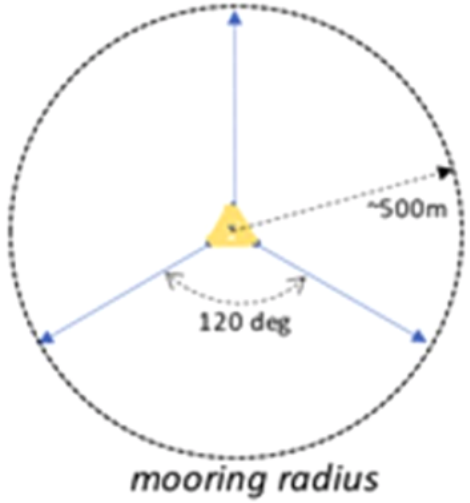
- Tubular Columns
- Flat Panel Pontoons
- 2 welded joints (assembly)

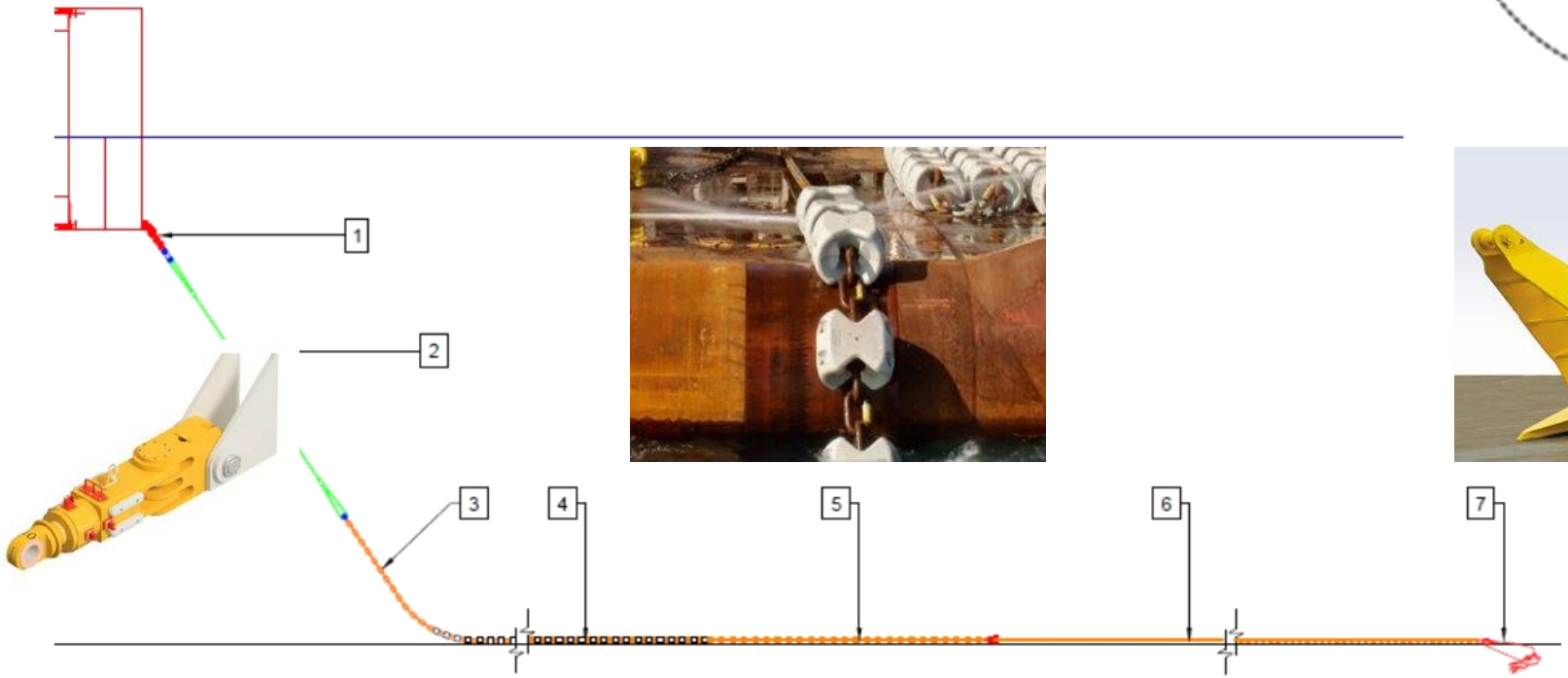
Deepsea Star (Odfjell Oceanwind)

- Tubular Columns
- Tubular Bracings with Star Configuration and Additional Bracing
- 15/30 Welded joints (assembly)

Shalow Water Station Keeping System

1. Platform Mooring Connector (PMC)
2. Synthetic rope
3. Heavy chain
4. Heavy chain + clump weights
5. Heavy chain
6. Ground chain
7. Drag Embedment Anchor





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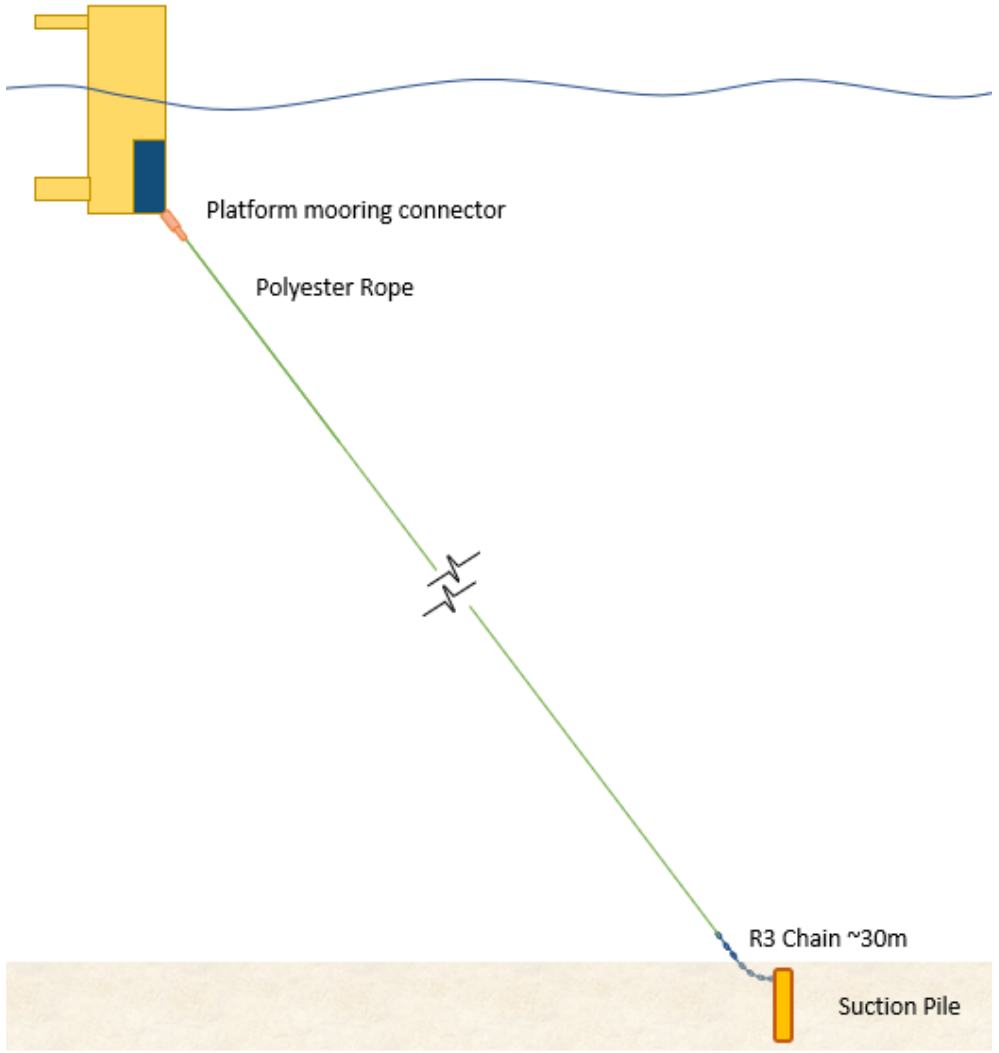
DeepWater Mooring System - Overview

3-lines spread-mooring system; relative azimuth of 120° between each line

- Semi-Taut design for this anchoring system in 700-1,000m water depth
- Polyester top segment with chain segment connected to suction pile at seabed
- 1 mooring line connected to each outer column approximately at the keel



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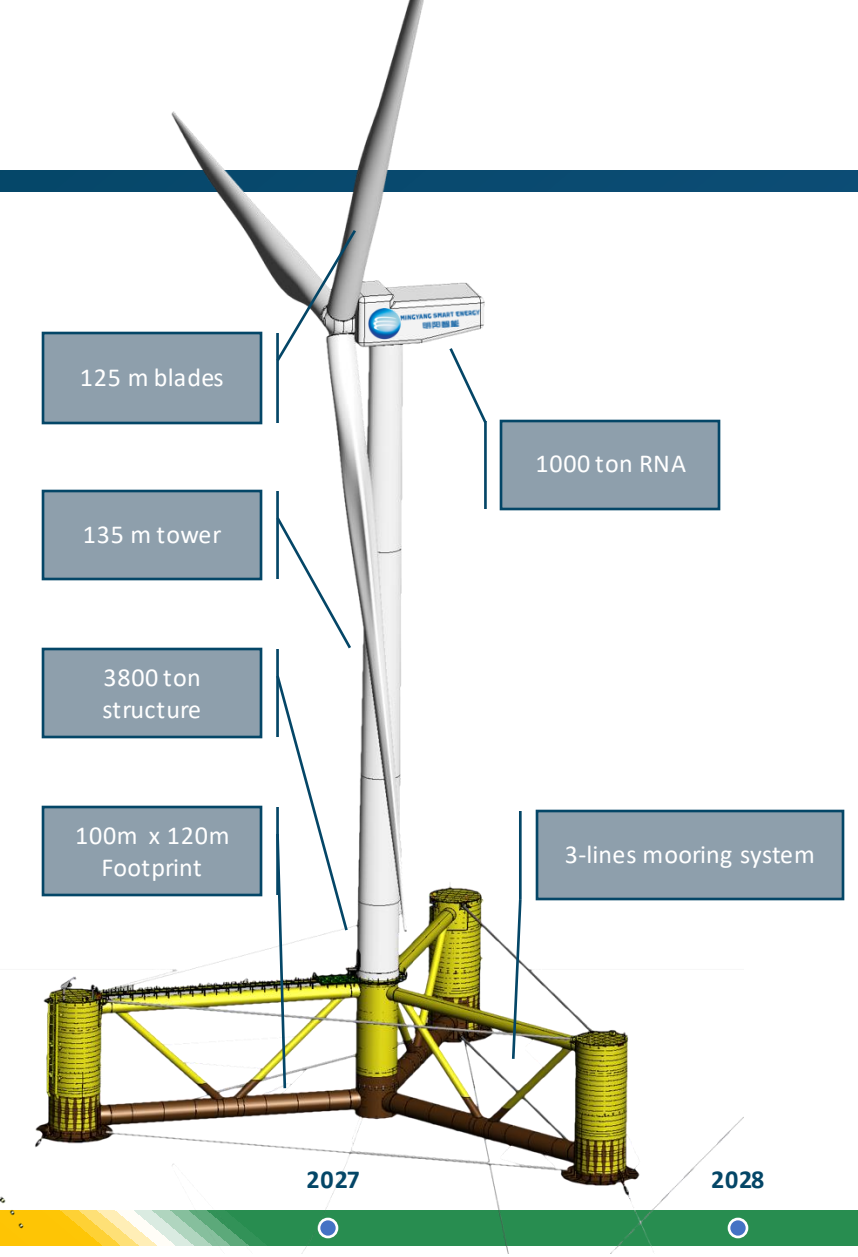
Record15+ Overview

Overview	
Client	R15 Consortium
Location	North Sea
Technology	Ocergy's OCG-Wind
Turbine	MYSE 18MW
Offshore Works	Bourbon
Lifting	Mammoet
Certification	DnV



Schedule

2024 | 2025 | 2026 | 2027 | 2028

Pre-Start
- Partners selection
- Schedule and cost planning

Phase 1A
- FEED
- Model tests
- Consortium agreement

Phase 1B
- Detail Design
- Site selection, permitting
- FID

Phase 2
- Fabrication, assembly
- Offshore Installation , commissioning
- Operations, Electricity generation, system validation

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