Reference Design Cases for Floating Offshore Wind Arrays

Fiona Devoy McAuliffe[1*], Ericka Lozon[2], Matthew Hall[2], Muk Chen Ong[3], Chern Fong Lee[3], Ju Feng[4], Milad Moghtadaei[5], Chris Wright[5]

Work Package 2 contributors: Matteo Baudino Bessone[6], Malcolm Bowie[7], Michel Castagne[8], Lars Froyd[9], Zhiyu Jiang[10], Junho Lee[11], Lin Li[3], Mohammad Youssef Mahfouz[12], Maxime Merle[8], Madhan Mohan[13], Miho Park[14], Yann Poirette[8], Vishnu Rajasree[15], Yong-Yook Kim[14] , Ilmas Bayati[16], Thor Snedker[16], Daniel O'Connell[17], Erin Bachynski-Polić[15], Thomas Michel Sauder[15]

[1] University College Cork, [2]NREL, [3]University of Stavanger, [4]Technical University of Denmark, [5]Gavin and Doherty Geosolutions, [6]TU Delft, [7]First Energy Development, [8]IFPEN, [9]4Subsea, [10]University of Agder, [11]Texas A&M University, [12]University of Stuttgart, [13]Interocean, [14]Institute for Advanced Engineering, [15]NTNU, [16]PEAK Wind, [17]BOEM

**f.devoymcauliffe@ucc.ie*

Introduction

International Energy Agency (IEA) Wind Task 49, Integrated Design of Floating Wind Arrays (IDeA), is developing several reference floating offshore wind array (FOWA) designs in its Work Package 2 to:

- Facilitate research and development activities and a scale change from pilot FOWAs to commercial ones
- Provide standardized baselines upon which different innovations can be developed and their benefits compared.

Design engineering and cost inputs will be made open access

Design Considerations

OBJECTIVES: Reference FOWAs should a) represent the current state of the art, b) be economic, and c) achieve a good level of performance.

PARAMETERS: Focus on **array-level design** aspects and how different **elements are integrated** => incorporate existing designs for components or subsystems where possible.

REQUIREMENTS and CONSTRAINTS: Cover the limit states required by the design standards for the technology selected and consider:

- Site characterisation and metocean conditions [1]
- Coastal infrastructure and logistics
- Cost and competitiveness.

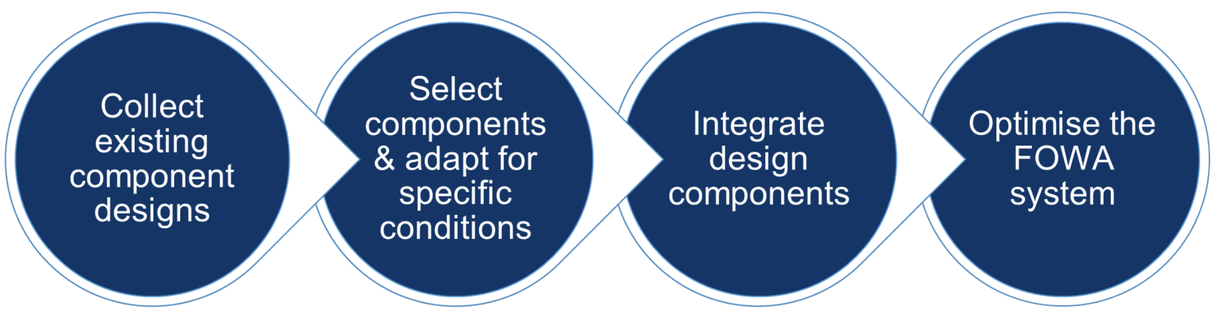
OPTIMISATION: Focus on performance and cost benefits, not logistics.

Design Scope

Extensive consultations determined what would be of most interest and relevance to the anticipated global pipeline of FOWA projects, including:

- Use water depth as the key differentiating factor
- Use existing designs for wind turbine and substructure [2]
- Design the **mooring systems, power cables, and overall array layouts.**

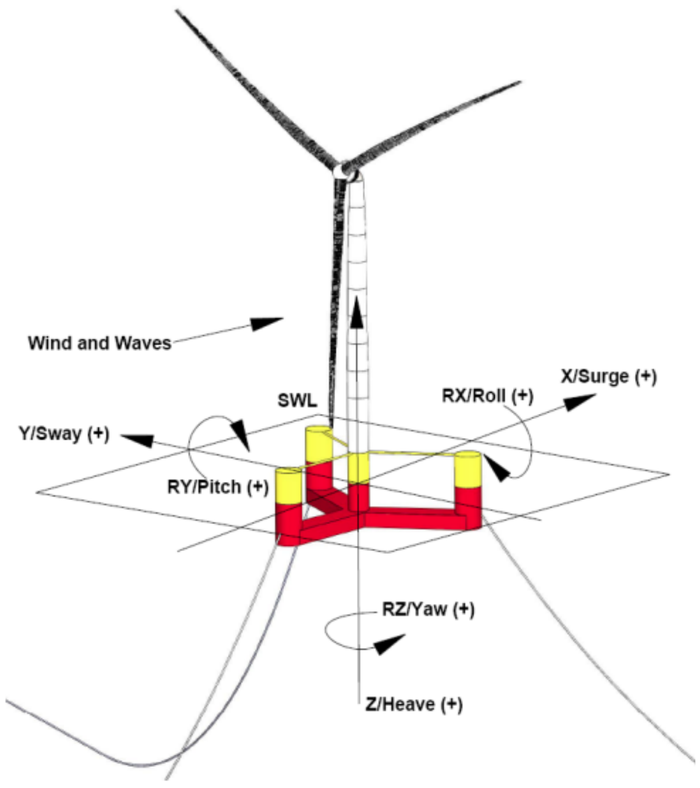
Design Process



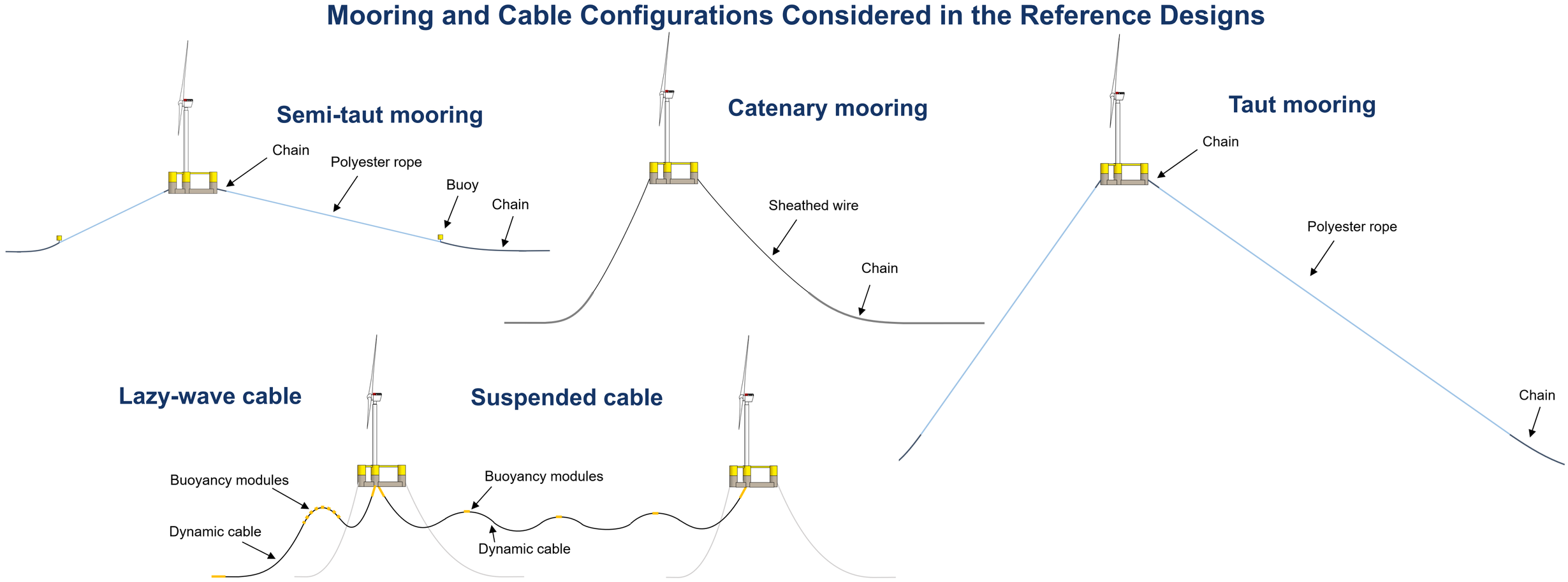
Scenario**	Shallow	Intermediate	Deep
Array capacity	67 x 15 MW = 1GW		
Depth (m)	60	300	800
Seabed	Generic		
Array layout	Rectangular		
Platform type	Semisubmersible (steel) [2]		
Mooring configuration	Semi-taut chain and polyester rope	Catenary chain and wire	Taut polyester rope
Anchors	Drag embedment	Drag embedment	Suction pile
Cable configuration	Lazy wave	Lazy wave	Suspended

**Later design variants will consider, e.g., depth gradients, seabed variations impacting layout and anchor positions, shared anchors, shared moorings, spar, and tension-leg platform options.

VolturnUS-S semisubmersible and IEA 15-MW reference wind turbine [2]



Mooring and Cable Configurations Considered in the Reference Designs



References

[1] Specified by reference sites produced in IEA Wind Task 49 Work Package 1

[2] Allen, C., A. Viselli, H. Dagher, A. Goupee, E. Gaertner, N. Abbas, M. Hall, G. Barter. 2020. *Definition of the UMaine VolturnUS-S Reference Platform Developed for the IEA Wind 15-Megawatt Offshore Reference Wind Turbine*. Golden, CO: National Renewable Energy Laboratory (NREL). NREL/TP-5000-76773. https://www.nrel.gov/docs/fy20osti/76773.pdf.

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