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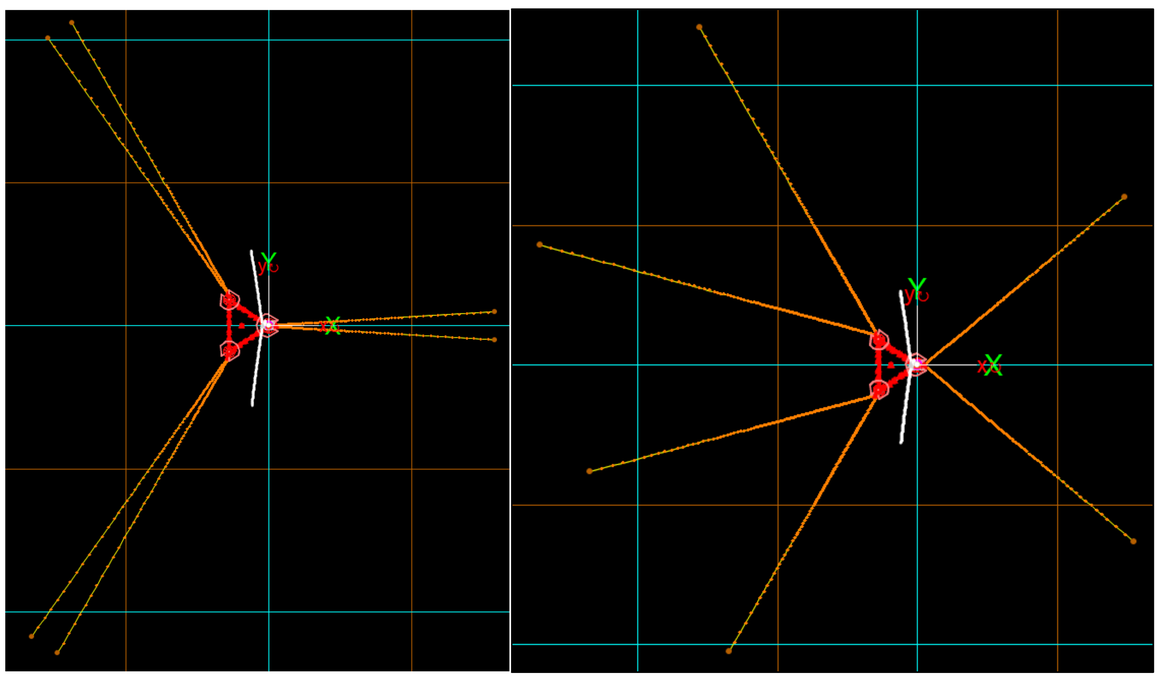
Developing the Next Generation 12+ MW Offshore Wind Turbine for Clean and Competitive Electricity

Innovative mooring systems for Floating Wind Farms



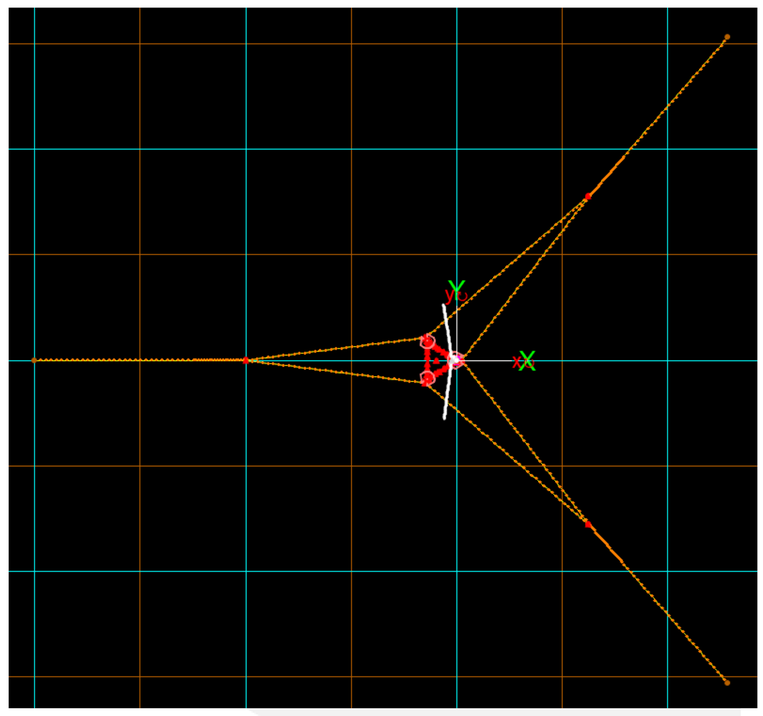
Baseline (left) and alternative (right) mooring system

	Baseline	Alternative	Y-Share
Lines no.	3*2	3*2	3*2
Anchor no.	6	6	3
Top section	Polyester	Polyester	Nylon
Bottom section	Chain	Chain	Chain
Cluster	Tightened	Splayed out	Shared

Mooring systems description

What has been studied ?

This ReaLCoE project investigates the basic design of a generic ("baseline") catenary mooring system and an alternative catenary mooring system where lines are more evenly spread. This secondary system was assessed to see the impact of locating mooring lines closer to the driving metocean. The two systems are then compared in terms of performance and cost. Finally, a further innovative (semi-taut bridal system with nylon ropes) mooring system is investigated.



Y-Share alternative mooring system

What are the main outcomes ?

When compared to the alternative system, the baseline system responded marginally better in ULS and fatigue. The more geometrically stiff system ("alternative") allows a lower pretension. In addition, it offers benefits in offset and yaw motions and then eases cable design. The alternative case mooring system is estimated to be 9 % more expensive than the baseline system.

The "Y-Share" mooring system showed strong performance, greatly reducing ULS loads and maintaining a very stable yaw motion. Moreover, this system greatly reduces the amount of chain (roughly only 30% of the original length) and divides by two the number of anchors.
Further studies should be made to assess the cost saving, the effect of ageing nylon properties (stiffness and creep) and mitigate the accidental scenario (including loss of buoyancy module, rope and/or chain section).

	Baseline	Alternative	Y-Share
Pretension	1.00	0.71	1.43
Rope MBL	1.00	0.78	0.61
Chain diameter	1.00	0.98	0.98
Rope length	1.00	1.20	8.00
Chain length	1.00	1.10	0.31
Max tension	1.00	1.13	0.62
Max offset	1.00	0.85	1.28
Lowest fatigue life	1.00	0.67	0.75

Comparison of mooring systems performance (non-dimensional values)

ReaLCoE's vision is to unleash the full potential of offshore wind energy
€35/MWh LCoE Goal, +12MW WEC Capacity, ~32 mio € Total Budget, 42 month project duration

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