SHARED ANCHORS FOR FLOATING OFFSHORE WIND: A PATHWAY TO NET ZERO BY 2050

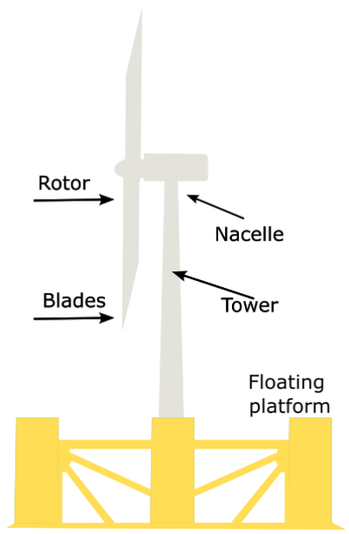
Iwinosa Aghedo
i.o.aghedo2@ncl.ac.uk
Supervised by: Prof. Mohamed Rouainia and Prof. Claire Walsh at Newcastle University

STEM for BRITAIN

Overview and Motivation

UK'S TARGET FOR FLOATING OFFSHORE WIND [1]

5GW FROM FLOATING OFFSHORE WIND (FOW) BY 2030



To meet the UK's target, Offshore wind turbines are moving into deeper waters to harness more energy from wind.

One major constraint is the anchorage system of the FOWT, which accounts for about **20-25% of the total cost of an offshore wind farm [1]**

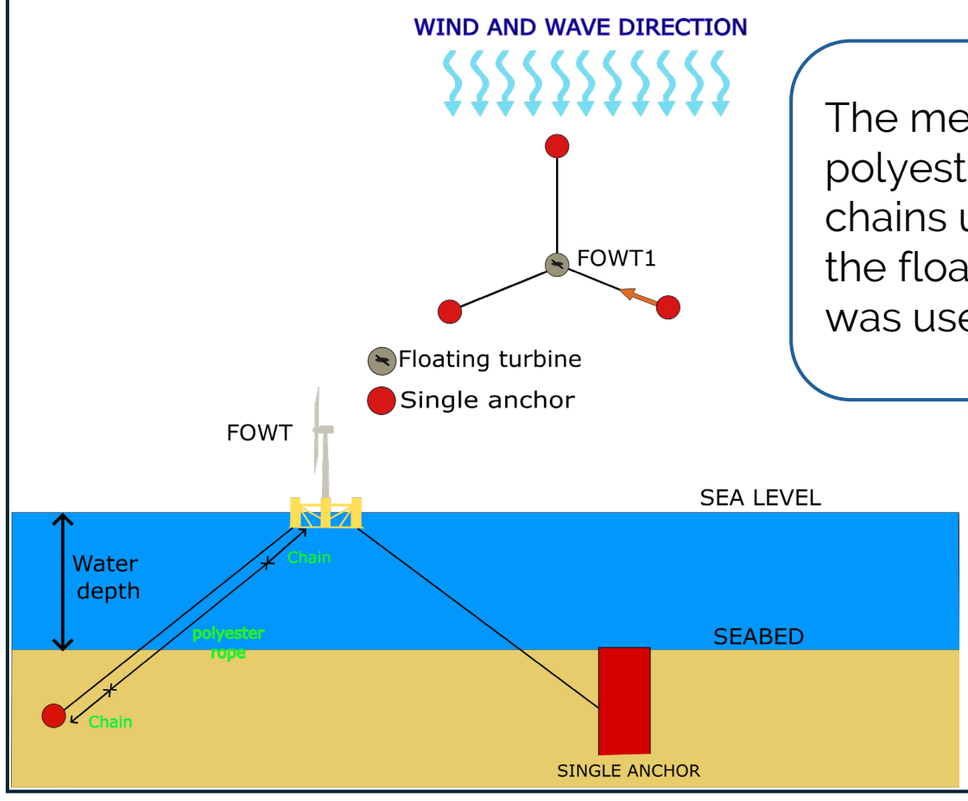
To reduce the levelized cost of energy (LCOE), the use of innovative technology, such as **shared anchors** and their performance in clay deposits, has to be assessed for **optimisation**

Major design consideration: Effect of multi-directional loading on the shared anchor

KEY POINT: Better understanding of the anchorage system is required to reduce the levelised cost of energy

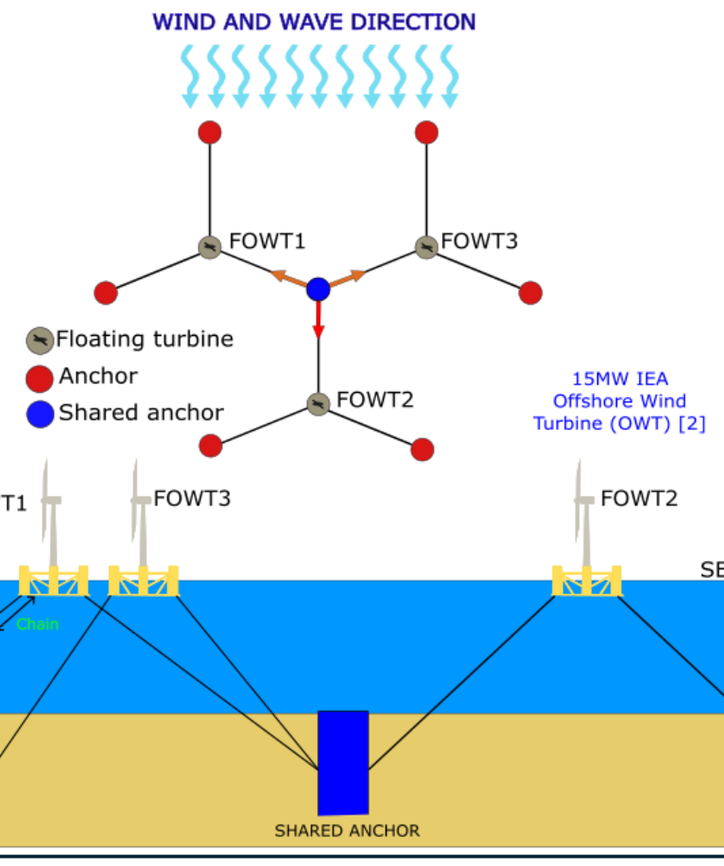
Concept of the single and shared anchor system with polyester rope

Concept of the single anchor subject to ocean wind and waves



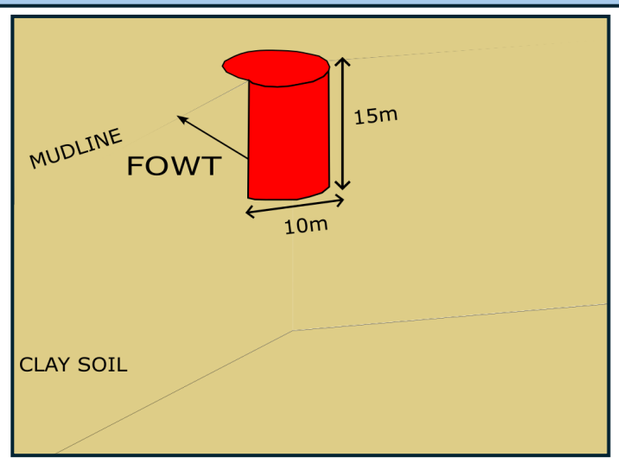
The methodology comprised of using a polyester rope between the conventional chains used in connecting the anchor to the floating platform. The polyester rope was used to optimise the design.

Concept of the shared anchor



Design Benefits of shared anchors over single anchors

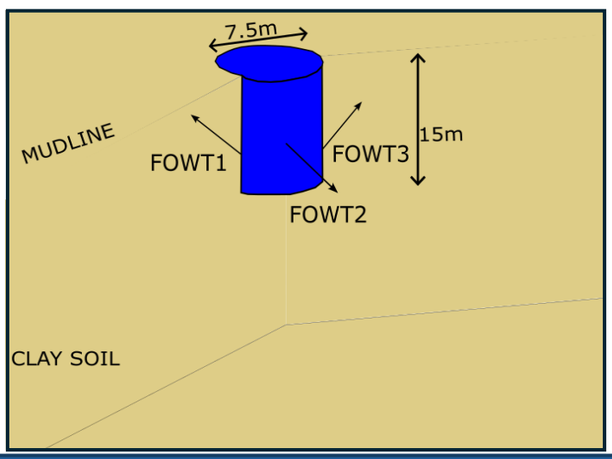
With a shared anchor, the peak loads due to multi-directional cyclic loading **decreased by 60%** in comparison to a single anchor subjected to unidirectional cyclic loading



With a shared anchor, the diameter of the caisson anchor supporting three(3) 15MW offshore wind turbines **was reduced by 25%, reducing CO2 emissions** compared to when a single caisson anchor was used to support one 15MW offshore wind turbine.

KEY TAKEAWAY: The use of shared suction anchors for station-keeping floating wind turbines provides a pathway to net-zero by 2050.

When anchors are used in deeper waters, optimisation can be further achieved with the use of **polyester rope.**



A shared anchor reduces the total number of anchors, installation costs, and geotechnical investigation costs for an offshore wind farm.

In addition, from my analysis, the diameter for the shared anchors can be further optimized using **polyester rope in deeper waters**, which **saves costs** compared to a single anchor.

References:

[1] DNV, "FLOATING WIND: TURNING AMBITION INTO ACTION," Veritasveien 1, Oslo, Norway, November 2023.
[2] C. Allen et al., "Definition of the UMaine VolturnUS-S reference platform developed for the IEA wind 15 megawatt offshore reference wind turbine," National Renewable Energy Lab.(NREL), Golden, CO (United States); 2020.

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