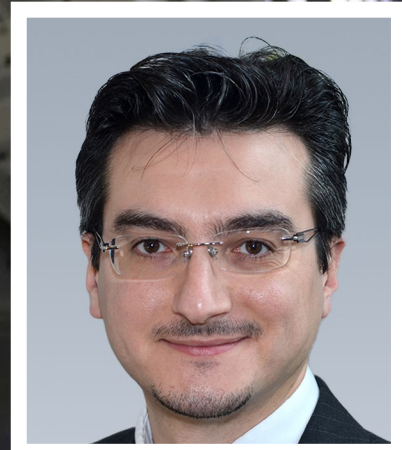


# Innovation Launchpad Network+

**CATAPULT**  
Offshore Renewable Energy



# CASE STUDY

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## The Challenge

- Floating offshore wind turbines are complex systems, but current design practices are commonly carried out in a sequential, siloed way, with limited integration between component teams. This limits the ability to optimise the turbine as a whole and can leave performance and cost savings unrealised.
- At the same time, the sector is constrained by the lack of commonality across floating offshore wind turbine support structures: to date, only bespoke solutions (i.e., design specific to a single wind farm) have been widely adopted. This lack of standardisation prevents mass manufacturing and slows supply-chain maturity, creating a key barrier to industrialisation and commercial scale deployment.
- The project therefore set out to test a clear hypothesis: that a “whole-system” multidisciplinary design, analysis and optimisation (MDAO) framework—applied to an industrially relevant floating offshore wind turbine case study—can quantify benefits large enough to justify the perceived risks of moving beyond conventional sequential design practice.

## Innovation

The project delivered a structured programme of work across four linked activities. First, it identified and prioritised the most industrially relevant floating offshore wind challenges through a targeted literature review combined with stakeholder engagement. Stakeholder input was gathered using a questionnaire introduced through ORE Catapult's Floating Offshore Wind Centre of Excellence focus groups, then analysed to produce an evidence-based ranked set of "use cases".

Second, the highest-ranked challenge was translated into a tractable MDAO problem definition, including the disciplines, couplings, design variables, constraints and objectives needed to represent real-world design drivers while remaining computationally feasible.

Third, the MDAO was implemented numerically using WEIS (<https://weis.readthedocs.io/en/latest/>) and OpenMDAO to enable integrated optimisation workflows.

Finally, the work was disseminated via presentations and draft publications, and by releasing selected software components and representative datasets openly, including a free repository with instructions to reproduce results and extend the tools (Here: [https://github.com/StrathFloaters/MDAO\\_RiR](https://github.com/StrathFloaters/MDAO_RiR)).

## Result

Two headline results emerged.

(1) Evidence-based insight on the key barrier to scale Engagement and synthesis showed strong convergence between industry and academia that the lack of commonality across current bespoke floating solutions is a major barrier to industrialisation—preventing standardisation, mass manufacturing and supply-chain maturity.

(2) Quantified benefit of integrated ("whole-system") design

Using an industrially relevant semisubmersible floating offshore wind turbine case study, the project compared a traditional sequential design approach (designing the tower first, then the platform) with coupled tower-plus-platform optimisation using MDAO. The coupled approach delivered approximately 5% savings in combined tower and platform structural mass, equivalent to ~450-500 tonnes of offshore steel

per 15 MW turbine. Using the report's stated cost assumption of ~£3,000/tonne fabricated primary structural steel, this corresponds to ~£1.35-1.5m saving per turbine, and ~£90-100m CAPEX saving for an illustrative 1 GW floating wind farm (~67 turbines).

## Impact

This project provides practical, quantified evidence that integrated, system-level engineering can de-risk and accelerate scalable, cost-effective floating offshore wind development. By showing that coupled tower-plus-platform optimisation can reduce structural mass by ~5% in a realistic semisubmersible case, the work translates "systems engineering" from a general aspiration into a demonstrable route to meaningful CAPEX savings.

The evidence matters because the sector's key challenge is standardisation and mass manufacturing of floating support structures. A standardised design—developed against an environmental zone rather than a single wind farm—requires better optimisation across coupled components, making a whole-system MDAO approach even more valuable.

Impact pathways were embedded directly into the outputs: the project released an open, free repository that enables others to reproduce the analyses and extend the tools, supporting adoption beyond the RiR period. The collaboration also catalysed follow-on activities, publicly and privately funded.



## Offshore Renewable Energy Catapult

"This collaboration delivered strategic and technical value for advancing floating offshore wind in the UK. By aligning academic research with industry needs through our focus groups and demonstrating that system-level MDAO can deliver around 5% structural mass savings in an industrially relevant case, the work provides evidence that integrated design can reduce costs and accelerate commercialisation—supported by open tools and follow-on projects." - Dr. Daniel Milano

## Maurizio Collu

"Collaborating with ORE Catapult strengthened both the technical quality and the practical relevance of my research. Access to the Floating Offshore Wind Centre of Excellence focus groups helped prioritise the challenges that matter most for deployment—especially standardisation and mass manufacturing—and regular progress meetings provided expert feedback and continuity. The project also gave me hands-on experience with state-of-the-art MDAO tools, shaping follow-on research and impact."