INNOVATIVE, LOW COST, LOW WEIGHT AND SAVE FLOATING WIND TECHNOLOGY OPTIMIZED FOR DEEP WATER WIND SITES

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FLOTANT has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 815289

PROJECT ACRONYM: FLOTANT
PROJECT TITLE: Innovative, low cost, low weigth and safe floating wind technology optimized for deep water wind sites
FUNDING: EU-H2020-LC-SC3-RES-11-2018; GA.815289
EU Financial contribution: 4,9 million Euros

START DATE: April 1st , 2019
DURATION: 36 months
PARTNERS: 17 partners from 8 EU coutries
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OBJECTIVE

The main objective of FLOTANT is to develop the conceptual and basic engineering, including performance tests of the mooring and anchoring systems and the dynamic cable to improve cost-efficiency, increased flexibility and robustness to a hybrid concrete-plastic floating structure implemented for Deep Water Wind Farms (DWWF).

CHALLENGES & SCOPE

SOLUTIONS PROPOSED BY FLOTANT

Cost reductions remain a crucial necessity for existing or new technologies — FLOTANT will develop a cost competitive integrated wind energy system with a LCOE lower than 120€/MWh by 2025 and 85-95€/MWh by 2030, achieved through new innovative technology in hybrid plastic/concrete substructure, mooring and anchoring, and dynamic cable systems which can all be used in deeper waters.

Technology development including reliable, sustainable and cost-efficient anchoring and mooring system — FLOTANT will develop lightweight reliable, sustainable and cost-efficient mooring solutions. The technology challenge will be to integrate the various innovative component behaviours into the nonlinear global mode prediction software to allow for the development of innovative mooring systems.

Power evacuation optimization and cost reduction — The technology challenge is to design cables that alleviate the severe and repeated loads, whilst maintaining a reliable and sustainable power connection. This will be addressed by identifying suitable design solutions for power cables in highly dynamic operating conditions, including connectors, conductor configuration and cable flexible and high torsion resistance sheathing options, to ensure safe, reliable, sustainable and cost effective electrical connections for FOW.

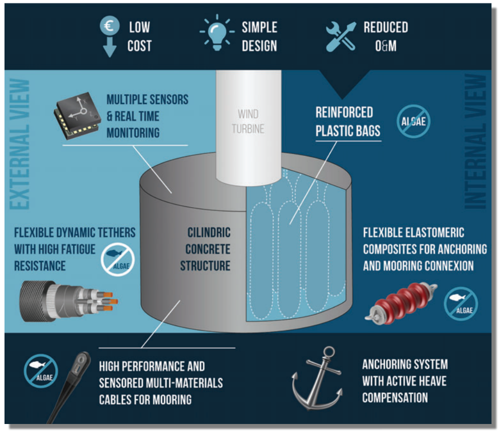
Installation techniques — Improved construction and installation techniques will be developed, reducing logistics costs, installation and commissioning. The technology developed will enable easy transport of the full unit to and from low depth harbours using full-blown bags and tugboats.

O&M concepts — Predictive O&M algorithms will be developed to minimize the corrective O&M costs. Use of non-corrosive materials, anti-fouling additives, non-complex and prefabricated structures and non-mechanical system to maintain the structure floating will contribute to minimize O&M operations as well.

Proposals with technologies from TRL 3-4 to TRL 4-5 — FLOTANT project technologies starting from TRL 3-4 will achieve at the end of the project TRL 4-5 based on testings and demonstrations in in relevant environment, including real sea conditions.

Lower environmental impacts — Reduction of the materials employed in the FOW components. Recycling and reusing techniques will be investigated to minimize footprint. Anti-fouling and anti-bite additives will be developed to ensure that materials do not harm wildlife and flora. Easy structure design to allow an easy and quickly decommissioning of the components.

Social acceptance or resistance to new energy technology, socioeconomic issues — Main issues to be addressed by FLOTANT will carefully consider: i) Sharing the use of the sea with others: fishermen, commercial or recreational navigation, military constraints, ii) Issues related with proximity to airports or radars; iii) Landscape, when site is close to the coast, and iv) Landing of evacuation lines: maximum recycling at time of decommissioning.



Conceptual diagram of FLOTANT innovative solutions

FOW Cost Reduction & Impacts — 2030

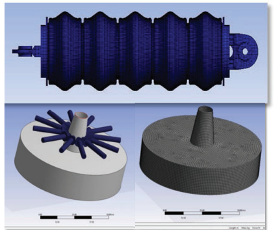
- 60% CAPEX
- 55% OPEX
- 60% LCOE
- 85-95 €/MWh
- Environmental impacts, Operation & Maintenance
- Reliability & Lifetime, Design consensus & Standardisation

METHODOLOGY & EXPECTED RESULTS

According to WindEurope report, offshore wind is expected to produce 7% to 11% of the EU's electricity demand by 2030, as offshore wind energy could have an average cost of 54 €/MWh in the most favourable locations. Energy produced from turbines in deep waters could meet the EU's electricity consumption four times over, according to estimates from WindEurope. In consequence, encouraging the development and deployment of offshore wind in deep waters is a key strategic issue for the EU. With floating solutions, wind power can expand into new deep-water areas, often further from shore, opening vast new areas and markets currently unavailable for offshore wind. However, many elements of an offshore wind farm become more expensive as depth increases: mooring, anchoring and dynamic cables are the most obvious. Far-shore sites also pose additional challenges for installation, and O&M manoeuvres.

Two Commercial Sites analysed for FLOTANT FOW solution

Canary Islands, Gran Canaria (ES) — West of Barra, Scotland (UK)



Flotant mooring system simulations

The cost of the mooring system is a growing part of the whole foundation costs as depth increases. Traditional mooring solutions, based exclusively on chains, are not a satisfactory solution, due to the high weight associated with long tethers and the lack of flexibility in the very likely case of excursions of the structure, due to currents and/or changes in the wind. The speed and off-set of these excursions can be important in the case of deep-water moorings, giving place to very important stresses in the rigid chains to counteract the inertia of the structure. Innovations in mooring components and anchoring systems to reduce loads and actively control and minimise excursions are required.

New challenges arise in DWWF for electrical transmission, as the power cable must be able to accommodate all movement and loading from the ocean in relation to the platform, as well as its own weight, and therefore has different performance specifications from the cable used in shallow-water wind farms. Advances in light weight dynamic cables are needed to reduce loads and achieve reliable and cost-effective export systems in FOW farms. Cost reductions should be achieved through optimisation of the whole energy export system, including the dynamic cable, the inter-array cabling, the floating offshore substation and the export lines.

Manufactured, pretested, preconditioned, 2 years ageing test of FLOTANT XLPE insulated 66Kv submarine cable core (FULGOR facilities, Greece)

Other aspects as installation and O&M strategies in DWWF should be optimised, boosting port-based pre-assembly and installation, removing the need for expensive heavy-lift installation vessels that would increase the investment needed as distance to shore is higher. Optimal marine management and predictive O&M strategies will enable the reduction of major repair costs, hence minimising the number of marine operations.

FLOTANT Innovative solutions will be designed to be deployed in water depths from 100m to 600m, optimizing the LCOE of the floating solution (85-95 €/MWh by 2030). Prototypes testing of this offshore wind floating platform and its associated mooring, anchoring and dynamic cable systems are foreseen in relevant environment and real sea conditions within the scope of the project. Moreover, the assessment and optimisation of the construction, installation and decommissioning techniques will also contribute to bring down the current cost of offshore wind energy, as well as, increasing its deployment. An expected 60% reduction in CAPEX and 55% in the OPEX by 2030, will be directly motivated by FLOTANT novel developments and additional reductions due to external technology improvements. In addition, environmental, social and socio-economic impacts will be assessed, increasing social acceptance of FOW in deep waters.

THE CONSORTIUM

COORDINATOR
PLOCAN consorcio PLATAFORMA OCEÁNICA DE CANARIAS — Gobierno de España — Gobierno de Canarias

RESEARCH AND TECHNOLOGICAL DEVELOPMENT CENTRES & UNIVERSITIES
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SME
tfi Marine; Hydro Bond Engineering; tx transmission excellence ltd; INNOSEA Marine Energy Engineering; INEA Informatics Energy Automation; ESTEYCO; FULGOR S.A. Hellenic Cable Industry; Adria Winch

INDUSTRY
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