3rd Factsheet update

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

Innovative, low cost, low weight and safe floating wind technology optimized for deep water wind sites

PROJECT ACRONYM: FLOTANT
PROJECT TITLE: Innovative, low cost, low weight and safe floating wind technoloy optimized for deep water wind sites
FUNDING: EU-H2020-LC-SC3-RES-11-2018,
Grant agreement: 815289
EU Financial contribution: 4,9 million Euros

START DATE: April 1, 2019
DURATION: 36 months
PARTNERS: 17 partners from 8 countries
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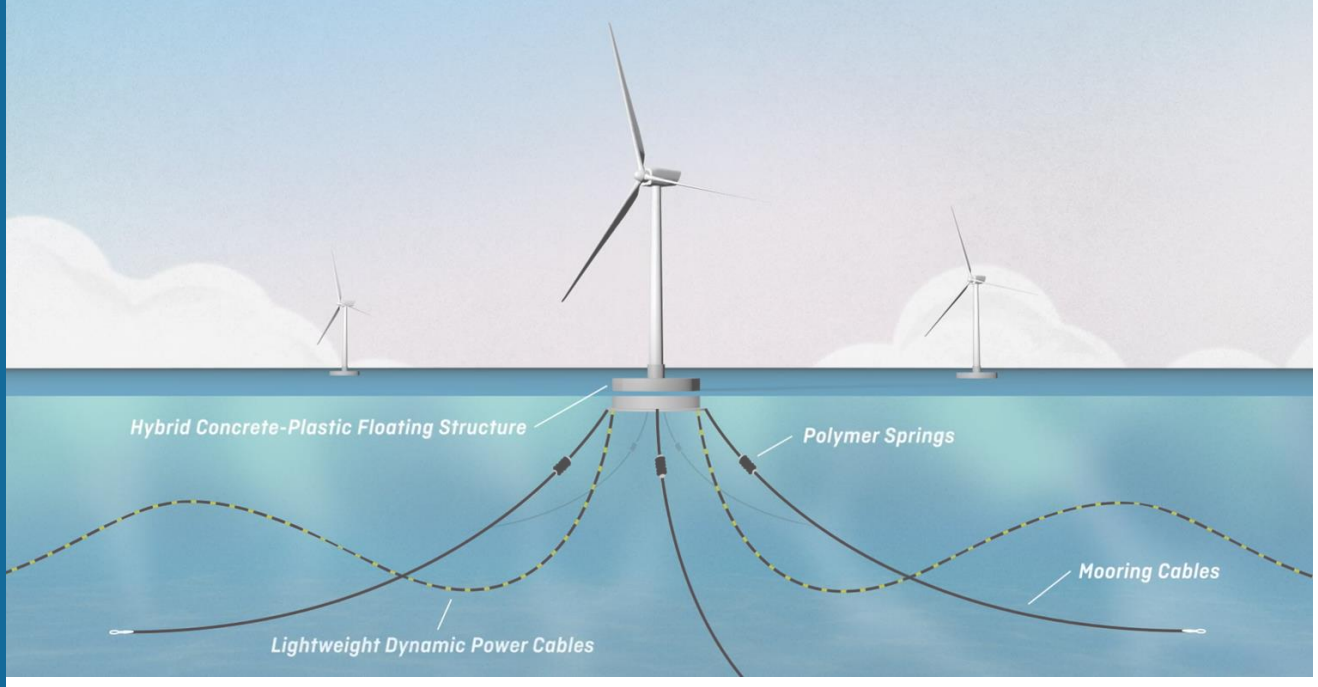

The main objective of FLOTANT is to develop the conceptual and basic engineering, including performance tests of the mooring and anchoring systems and the dynamic cable to improve cost-efficiency, increased flexibility and robustness to a hybrid concrete-plastic floating structure implemented for Deep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

Two Commercial Sites analysed for FLOTANT solution

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

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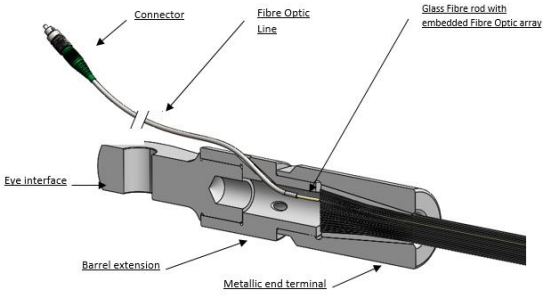
The mooring polymer springs developed can deliver significant reductions in load and fatigue for the whole mooring system for both locations as follows:

Scenario	Load Reduction	Fatigue Reduction
West of Barra	~35%	~38%
Gran Canaria	~45%	~60%

Furthermore, new manufacturing process for polymer springs, made of Hytrel® 5556, and metal structure can achieve 30-40% of cost reduction.

A cutting edge mooring cable was developed led to multistrand composite mooring demonstrators of 20 and 100 TN of strength, manufactured with a novel method and integrated load monitoring with Fibre Optic sensors to measure temperature and strain.

The mooring line is based on a multistrand structural of unidirectional composite rods composed of carbon fibre and epoxy resin with antifouling and anti-bite integrated additives.



The composite material is bonded together at the terminals with an advanced resin system which also act as load transmitter from the structural rods to the terminals.

The FLOTANT technology is a barge foundation to support offshore wind turbines optimised for deep water areas. It is made of concrete, steel and XPS foam blocks which provide buoyancy.

FLOTANT 6mD4 XPS is the floater adapted to a 12 MW wind turbine, and it is distinguished by the following dimensions:

FLOTANT 6mD4 XPS	
Steel tower length	101,69 m
Concrete cylinder length above base	9,0 m
Concrete cylinder diameter	11,50 m
Concrete slab thikness	2,00 m
Concrete slab diameter	48,00 m
Heave plate exterior diameter	55,20 m
Heave plate thikness	2,00 m
Total base height	18,00 m

The main structure is mostly made with cast-in-place concrete, with the following elements: slab, perimeter wall, bulkheads (6x) and central tube. The cells are filled with XPS foam blocks and ballast tanks.

XPS foams blocks are lighter than surrounding water, so they tend to float, generating an upwards load, which is transferred to concrete preslabs (precast concrete) placed on to top of them. These preslabs gather that vertical loads are concentrated into their center, where a tendon of high strength steel takes the load to the bottom slab, where it is transferred to the rest of the structure.

Dynamic Power Cable.

The main innovations of the manufactured cable design resulting in a cost effective, flexible and light weight cable are as follows:

- The cable core is of semi-wet design subject to influence of water ageing but eliminating the radial water penetration metal barrier over the power core, which is also subject to fatigue. Eliminating the metal barrier will reduce cost and will improve the cable's fatigue life.
- The conventional copper conductor has been replaced by aluminium which is more cost effective for the same current rating in order to study fatigue life of an aluminium conductors in dynamic cable applications.
- The conventional double steel wire armour was replaced by an innovative Carbon Fibre Reinforced Polymer (CFRP) braid with integrated Fibre Optic (FO) units to monitor the behaviour (strain & temperature) of the cable during fatigue testing.

Economic impacts

The innovations introduced within the FLOTANT project are evaluated in terms of their economic impact comparing with alternative source of generation. The cost model developed aims to evaluate the expected LCoE, CapEx, Opex, and Annual Energy Production (AEP) for 60 MW pilot park and 600 MW commercial wind farm deployments in both study locations.

To analyse the LCoE, the following inputs were required: net annual energy production from the O&M models; O&M costs; improved estimates of the requires balance of plant obtained through an inter-array cable layout optimiser; innovative component costs; and other such as development and installation costs based on the expertise of the FLOTANT partners.

The goal of this study is to assess if the targets formulated at the proposal stage of achieving 60% reduction in LCoE through a 60% reduction in CapEx and a 55% reduction in OpEx. Comparing these key techno-economic indicators with the estimated values for a 600MW deployment by 2030 of the FLOTANT technology shows that these targets have been met, both when comparing with the generic state-of-the-art defined by Carbon Trust, but also when comparing with pre-commercial deployments such as Hywind Scotland. Based on this assessment the FLOTANT system could achieve an LCoE of 73-93 €/MWh by 2030.

		Pilot park 30 MW		Wind Farm 600 MW		Wind Farm after 660 MW	
		GC	WoB	**GC**	WoB	**GC**	WoB
LCoE	€/MWh	93.21	120.83	73.05	92.99	64.38	81.79
Net capacity factor	%	61.53	54.43	61.55	54.51	61.55	54.51
CapEx/MW	k€/MW	3,955	4,665	2,936	3,426	2,480	2,903
CapEx/MW	k€/MW	3,840	4,529	2,851	3,326	2,407	2,819
OPEX/year/MW	€/MW/year	88,000	88,000	88,000	88,000	88,000	88,000