FLOATGEN – Design and Construction of the First Floating Wind Turbine in France

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Abstract

FLOATGEN is France's first 2 MW offshore floating turbine which will be located off Le Croisic, in Brittany. The turbine will be operated for a period of two years and the generated electricity will be fed into the national power grid. The floating foundation used for FLOATGEN is a patented square ring-shaped foundation system, open in its centre and known as the Damping Pool®; it will provide optimal stability at low cost. This floating foundation is held on-site by means of a mooring system consisting of double mooring lines at the front and double mooring lines on each side at the rear. The floating pontoon is a C55/67 self-compacting light concrete that is reinforced and prestressed. The structure has been built in the Saint-Nazaire harbour on three connected floating barges. The paper describes the main research, design and erection issues, as well as the launching process and the installation of the wind tower.

Keywords: Floating foundation; concrete structure; offshore floating turbine.

1 Introduction

At a period of time when the development of renewable energies is needed everywhere in the world (60% of the new electrical capacities being planned by 2040 from renewable sources), offshore wind power appears as one of the most relevant solutions. At the end of 2015, this sector represented 12000 MW installed in 14 countries, with an average annual growth rate of 32% between 2007 and 2015 and a significant drop in the production costs in 2016/2017. Expected by 2020, the target of a production cost of 100 €/MWh has already been reached on several projects.

The interest for offshore development has several reasons: bigger wind potential (over 4.000 full load hours vs. 2000 full load hours onshore), bigger wind turbines (>3 MW, up to 7 MW and soon above 10 MW) and wind farms (from 50 to 1000 MW of installed capacity, while the average onshore wind farm is around 50 MW). It however requires large capital investment upfront, due to the rough marine conditions which drives up technical requirements as well as costs: wind turbines, cables, substation, and of course foundations.

Offshore wind towers are currently developed in relatively shallow waters (<40m) and several foundation types are available for wind energy offshore towers: gravity-type, monopile, jacket-pile, tripod and suction caissons. The type of foundation used depends mainly on water depth and sea bed conditions: there is no "standard" concrete foundation as in the onshore wind farms.

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