DIMPACT
Design of floating wind turbines and impacts of energetic steep and breaking waves

DURATION: 40 months | LAUNCH: 2020 | Total budget: k€ 2,600

CONTEXT

When designing offshore wind turbines for a specific site, the industry has to analyze the Ultimate Limit State (ULS) of the structure, i.e. the maximum expected response that the offshore wind turbines will experience over its lifetime.

In the assessment of the ULS, the effects of energtic steep or breaking waves (hereinafter ESBW) are thought to be responsible for considerable uncertainties.As well documented in the oil and gas or fixed offshore wind turbines literature, ESBW may excite the first structural modes (the so-called "ringing" in presence of steep non-breaking waves), cause damages due to vertical water excursion ("runup") or submersion of the platform ("green water") or local deteriorations due to slamming loads. Numerical modeling of a full-scale floating offshore wind turbines (FOWT) even showed that the blade tips could hit the water in presence of realistic ESBW.

OBJECTIVE

To provide the floating offshore wind turbine industry with less conservative certification guidelines and an appropriate engineering tool accounting for the effect of ESBW in terms of slamming, runup, green water and vibration-induced effects.

EXPECTED RESULTS

- A field database of ESBW effects on a full scale FOWT.
- A wave tank database of ESBW effects on FOWT models.
- A numerical database of ESBW effects on FOWT.
- Less conservative certification guidelines for the consideration of ESBW effects (hydrodynamic loads, runup, green water) in the design of FOWT.
- More realistic input design ESBW.
- An engineering code implementing the slamming forces due to ESBW on FOWT.

TECHNOLOGIES

STAGES OF THE VALUE CHAIN

Preparatory studies   Design   Operations Maintenance

SCIENTIFIC CONTENTS

- Field experiment from the fullscale FOWT Unitech Zefyros (former HYWIND-Demo).

- Wave tank experiments in sea states of growing steepness up to the occurrence of large breaking waves.

- Numerical simulations of ESBW interacting with a FOWT.

PARTNERS

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