

Examples of wind-turbine-oriented aerodynamic challenges

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Main Objectives

LCOE Reduction of (floating) wind energy by increasing the performance and the durability of Wind Energy Converters subject to hostile and non-deterministic operating conditions.

Exemples of Aerodynamic challenges on :

- Floating offshore wind turbine wakes (FL0ATE0LE project)
- Load mitigation through innovative add-ons on blades (ASAPe project)

FLOATEOLE project

Experimental characterization of the wave impact on the unsteady aerodynamical behavior of floating wind turbines

2017-2021

Grant 229k€

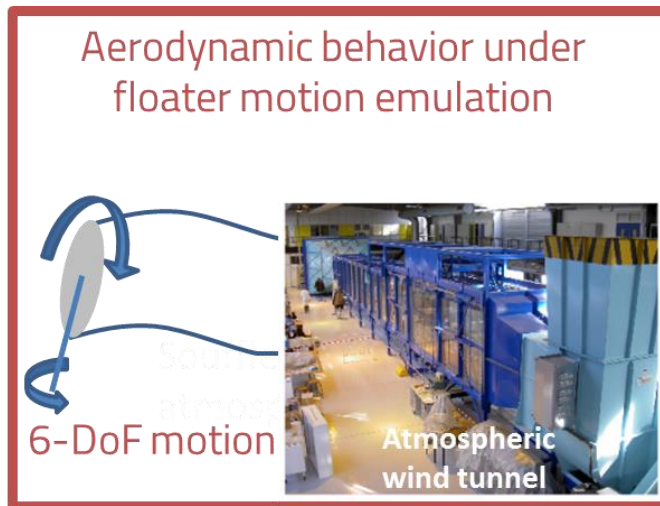


SHAKE THE FUTURE.



Methodology

- Multidisciplinary approach to study the wind – wave – structure coupling
- Experiments performed in controlled and real conditions (wind tunnel and sea test site, respectively)



Scientific and technical challenges :

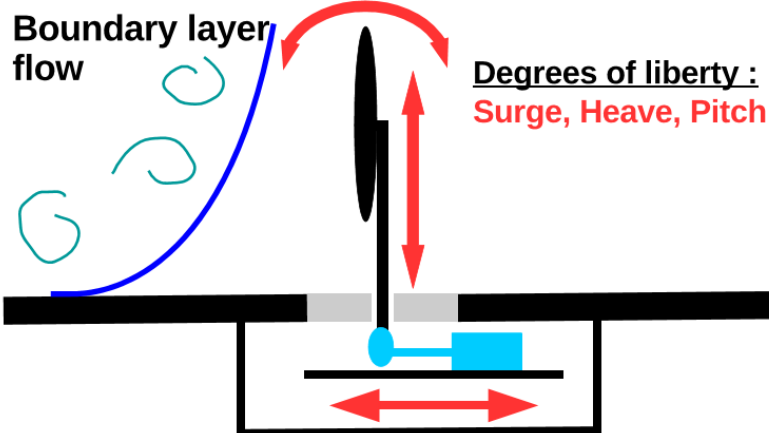
- Does the floater motion have an impact on the wind turbine wake development?
- Wind tunnel testing: Floater motion emulation at very reduced scale
- Sea testing: scanning LiDAR measurement on floating structures

Technical challenges

Wind tunnel experiments

Design a motion system that can emulate the floaters movements in different sea states

- From idealised to extreme cases
- For a reduction scale of

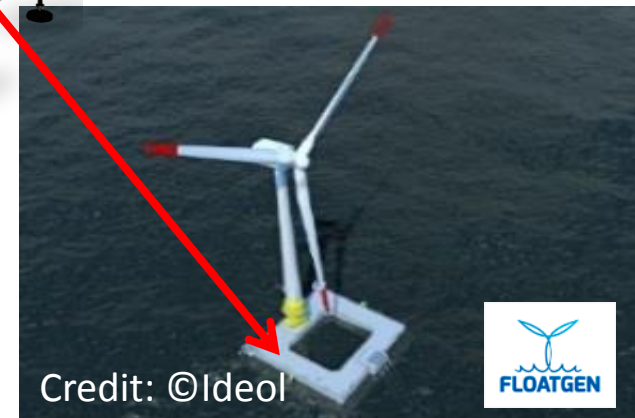


See Benjamin Schliffke's poster

Insite experiments

Mitigate the influence of floater motions on the LiDAR measurements

- Stabilizing platform
- Scanning Windcube
- of the scanning



Credit: ©Ideol



ASAPe project

Wind turbine load mitigation through the implementation of sensor and actuator add-ons for the dynamic adaptation of the blade aerodynamics

2018-2021

Grant 60k€

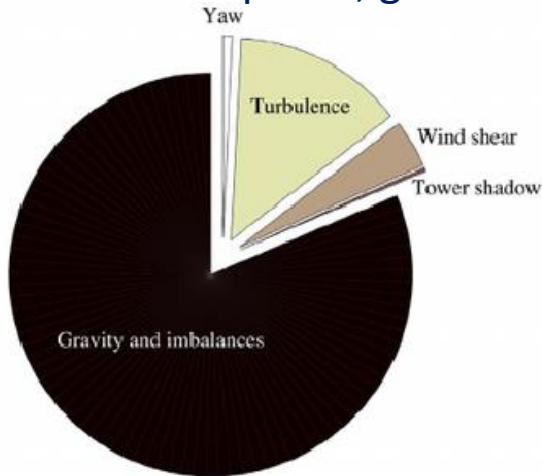


SHAKE THE FUTURE.

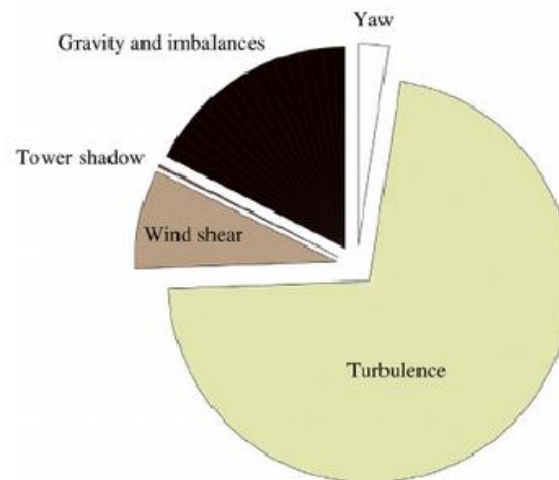


Methodology

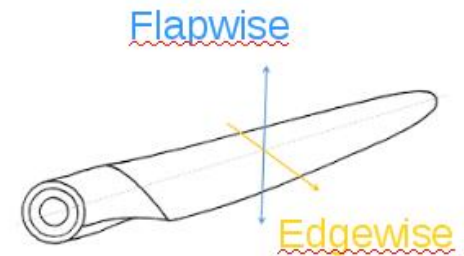
wind upstream of the wind turbine rotor is highly unsteady and inhomogeneous (misalignment of the rotor in the wind, turbulence of the atmosphere, gusts ... etc) while blades are becoming increasingly longer.



Edgewise



Flapwise



Rezaeiha, 2017

Using Add-ons (e-telltale) is foreseen to be a significant improvement to increase wind turbine lifetime.

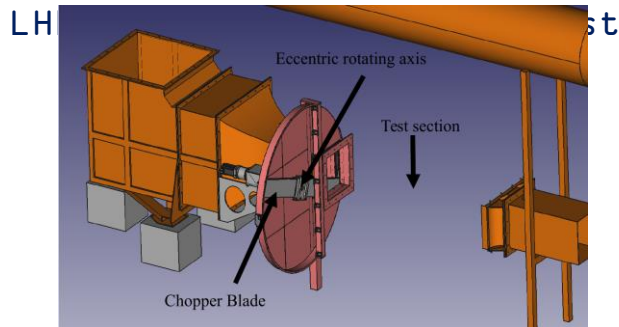


Technical challenges

Progressive TRL increase through

Testing in controlled
conditions

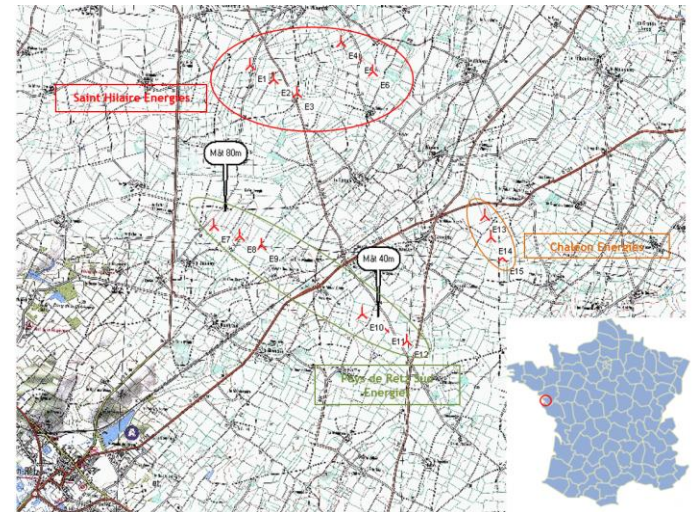
Reduced scale



See Caroline Braud's poster

Testing in real
conditions

Onshore full scale



Offshore full scale?

In prospection