Project title	Offshore floating wind power: A study of the Hexicon concept
Project number	TG4-22
Organisation	Chalmers University of Technology, Fluid Dynamics Division
Project leader	Professor Lars Davidson
Other participants	Hamidreza Abedi (Postdoc)
Report for	2016-01-10 - 2017-09-30
Participating companies	Hexicon

Project description

The aim of the project is to determine the maximum expected misalignment between turbine nacelle and platform to avoid blade-wake interaction as a source of destructive oscillatory motions of the wind turbine structure. The focus of the project is to assess the performance that can be expected from setting up active damping on the Hexicon floating structure for more efficient yaw system.

A time-marching vortex lattice free wake (VLFW) based on the incompressible, inviscid and irrotational flow has been developed to study the wake interaction of two adjacent turbines mounted on the same platform (Hexicon's platform concept). A new module has been added to take the turbine's wake expansion into account due to the blade pitch regulation (under the assumption of sheared and steady state upstream flow) in cooperation with the new active control system, currently being developed by TG4-22.

Results

The results display that the induced velocity field due to the presence of turbines in vicinity of each other has a small effect on the wake expansion. However, it slightly affects the generated power and thrust. Moreover, for some specified operating conditions, there is no blade-wake interaction because of the platform and turbines misalignment.

Among different operating parameters such as the upstream flow speed, rotational velocity of rotor and blade pitch angle, the effect of upstream flow speed on wake expansion is larger than the others. Furthermore, wake expansion due to change of operating conditions occurs far from the rotor plane. Hence, it may be possible to decrease the sides of the triangular platform. Different rotor/platform configurations (misalignment between turbine nacelle and platform) corresponding to the implemented control algorithm will be studied later.

Fulfilment of SWPTC's goals

In the project, methods for more accurate prediction methods of aerodynamic loads are developed. This will lead to:

- Making offshore wind energy more economically
- Increased lifetime of wind turbines
- Reduced maintenance costs

Deviations from project plan

All the activities (simulation method, results etc.) done during the project were agreed with industrial partner (Hexicon AB) of the project. However, they were not matched with the WPs in the approved project plan.

Publications

Conference papers

H. Abedi, *Influence of generated wind field on Wind-turbine power production in forest Region*, Wind Energy Science Conference 2017, 26-29 June 2017, Copenhagen, Denmark

External activities

Attendance, The Science of Making Torque from Wind (TORQUE 2016), 5-7 October 2016, Munich, Germany.