FLOATEOLE and WAKEFUL projects funded by

Post-doctoral position on the experimental characterization of floating wind turbine wake by scanning LiDAR

The Laboratory of Hydrodynamics, Energetics and Atmospheric Environment (LHEEA) of Centrale Nantes is working on the measurement of atmospheric flows in order to obtain accurate wind resource assessments for wind energy applications. They have received the support of industrial partners and funding from the WEst-Atlantic Marine Energy Community (WEAMEC) to run two research projects called FLOATEOLE and WAKEFUL. They are dedicated to (1) the in-situ experimental characterization of floating wind turbine (Floatgen prototype) wake and a partial wind resource assessment of the site where the FWT is installed (SEMREV open sea test site) by scanning LiDAR, (2) the correlations between the FWT wake behavior and the incoming wind conditions and the floating motion. Some parts of these projects benefit from the joint LiDAR experiment performed with the University of Stuttgart and Ideol in the framework of the German project VAMOS.

Summary of the FLOATEOLE project

The goal of the project is to combine wind tunnel and full-scale offshore experiments in order to characterize the wave influence on the aerodynamic behavior of the floating wind turbines and on their wake development. Indeed, wake interactions, particularly strong in offshore conditions, are responsible of power production loss and structural fatigue increase. The wave effects is emulated in wind tunnel by applying a controlled motion to the wind turbine models. The motion scenarios will be representative of idealized sea states, and then of more realistic ones. The unsteady behavior of the wind turbine wakes is captured and some unsteady wake models adapted to floating systems will be proposed. This work is completed by full scale measurements with a scanning LiDAR system of the local environment of the floating wind turbine prototype FLOATGEN; the wind resource as well as the wind turbine wake will therefore be captured in real sea state conditions.

Summary of the WAKEFUL project

The major objective of the project is to measure the far wake of the FOWT, some hundred meters downstream the turbine, in order to understand its interactions with the floater motions and the atmospheric unsteady variations. The final goal of the project is to evaluate the ability of models to correctly predict the unsteady wake of a FOWT. In the first part of this project, a dedicated motion compensation strategy (platform or/and post-processing) will be developed to compensate for the motion of the floater where the LiDAR will be installed. The second part is

dedicated to the measurement and analysis of the data collected. The project will benefit from the presence of several LiDARs to analyse the far wake (scanning LiDAR) as function of the inflow conditions (nacelle-mounted LiDAR) the project will focus on the analysis of the temporal variations of the far wake (unsteady wake) and its meandering. The scanning LiDAR is also used to provide datasets of atmospheric conditions.

Position description

The postdoctoral candidate will be affiliated within Laboratory of Hydrodynamics, Energetics and Atmospheric Environment (LHEEA) of Centrale Nantes and will collaborate with researchers from two different research teams (DAUC, SEMREV+). He will interact with the industrial partner IDEOL that supports the project and owns and currently operates the floating wind turbine prototype FLOATGEN on the SEMREV sea test site.
They will be in charge of:

- Setting-up and monitoring the scanning Lidar measurement campaigns, depending on the objectives of investigation (project driven)
- Performing the data quality check and processing the obtained data sets to extract exploitable wind speed measurements
- extracting the wind resource parameters that are important for the WT far-wake development
- characterizing the WT far-wake properties (velocity deficit and added turbulence)
- determining the influence of the real-time sea state and incoming flow on the wake behavior
- proposing adaptations to existing steady and unsteady wake models to take the floating aspects into account

Candidate

The candidate must be able to work in a dynamic environment made up of several actors and to conduct onshore and offshore measurement campaigns
Good communication skills and with a particular expectation on the quality of the deliverables is expected.
They must have a great sense of responsibility and must be aware of the procedures related to confidentiality and Intellectual Properties rights

Prerequisites:

- Graduate of a Ph.D. in Fluid Mechanics or Atmospheric sciences
- Strong background in remote sensing, LiDAR measurements and data processing
- Knowledge of wind resource assessment and wind energy
- Good verbal and written communication skills.

Contacts

- Sandrine Aubrun, Professor in LHEEA/Centrale Nantes: sandrine.aubrun@ec-nantes.fr
- Boris Conan, Assistant Professor in LHEEA/Centrale Nantes: boris.conan@ec-nantes.fr

Application

The application should be sent by email to Sandrine Aubrun and Boris Conan. The email should contain the following documents, compiled in the following order into a single PDF file (6MBs max):

- Covering letter
- Curriculum Vitae
- The PhD certificate (or letter from the supervisor attesting that the PhD will be awarded before June 1st, 2021)
- Recommendation letter(s) from previous supervisors or employers
- Work experience certificates, if applicable
- List of publications, if applicable

Position details:

Application deadline: March 31, 2021
Starting date: June 1, 2021
Duration: 12(+6) months
Gross salary: 2400-2650 €/month