Ultimate limit optimization of the mooring system for an offshore floating wind turbine

Master thesis internship

Domain : Applied mechanics and applied mathematics
Beginning : Between March and April 2016
Period : 5 to 6 months
Location : IFP Energies nouvelles, Lyon (France)
Allowance : to be defined

Description

Floating offshore wind turbine is an active field of research. A robust design of the integrated solution should satisfy several constraints all its service time, among which the necessity to avoid rupture or damage of several components : blade, tower connection to the floater, mooring lines etc.. Those constraints have to be satisfied without overdone cost. Thus, in order to reduce the cost with respect to onshore solutions, the optimization of the design become essential.

The thesis will focus on mooring system of the floating support whose the main function is to limit the drift of the floater under wind and swell combined loadings. Several constraints are considered to ensure an appropriate configuration of the mooring system, taking into account extreme loadings as the results of 50-year return period environmental loads (cf. API and DNV standards). The optimization parameters include the mooring lines configuration, material, mass, and possible accessories (lump masses, buoyancy, …).

The student will start with an available prototype linking an in house optimizer to the FEA DeepLines code applied to a realistic offshore wind turbine study case. DeepLines software is dedicated to the simulation of floater and mooring mechanical response to the wind and swell loadings. From objective function and constraints exploration in parameter space, appropriate algorithms will be selected and compared in term of results and of time efficiency.

Requirement

M.S. in Mechanical Engineering from a European and non-French university preferentially

- Liking to numerical simulation
- Experience programming with Python and knowledge of Fortran
- Knowledge of constrained optimization

Contact and supervision

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Company

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