

PhD position at IFP Energies nouvelles (IFPEN)
In applied mathematics

Optimization under probabilistic constraints of complex structures – Application to the anchoring of floating offshore wind turbines

Among the new marine sources of energy under development, the offshore floating wind turbine solution offers a panel of advantages : a stronger and sustained wind, less usage conflicts than its onshore or fixed offshore near the cost counterparts. Nonetheless its feasibility demonstration is complex and the offshore floating wind turbine must guaranty its reliability with respect to the whole set of environmental stresses (wave, wind, current) likely to occur in a ten years period. The reliability of the structure is in particular insured by the anchoring system of the floating support which restrict the wind turbine motion. The design of the anchoring must avoid the ruin caused by a failure of the anchoring lines under extreme stress, or as a consequence of accumulated damage during the lifespan of the structure. These constraints inherit the random characteristics of the marine environment, and the lack of consideration of this uncertain aspect can lead to unexpected ruins caused by a non-robust optimal design. The problem can be state as the search for an optimal design minimizing the manufacture, maintenance and installation costs while satisfying probabilistic constraints of threshold exceedance type. Solving this problem combining reliability (statistic/probability) and MINLP (mixed-integer non-linear programming) optimization is a scientific challenge, and is decisive for the economic feasibility of the floating offshore wind turbine technology.

Mots clefs: Optimization, Statistic, Reliability

Academic supervisor	Professor, GARNIER Josselin, Laboratoire de probabilités et modèles aléatoires
Doctoral School	ED 386 : science mathématiques de Paris Centre, www.ifd.upmc.fr/fr/organisation/ed/ed386.html
IFPEN supervisor	Doctor, MUNOZ ZUNIGA Miguel, Research engineer, Applied mathematics department, miguel.munoz-zuniga@ifpen.fr
PhD location	IFP Energies nouvelles, Rueil-Malmaison, France Laboratoire de probabilités et modèles aléatoires, Paris, France
Duration and start date	3 years, starting preferably on october 1, 2015
Employer	IFPEN, Rueil-Malmaison, France
Academic requirements	University Master degree in statistic or/and optimization
Language requirements	Fluency in French or English, willingness to learn French
Other requirements	Notions in R/Matlab/Scilab/Python/C

For more information or to submit an application, see theses.ifpen.fr or contact the IFPEN supervisor.

About IFP Energies nouvelles

IFP Energies nouvelles is a French public-sector research, innovation and training center. Its mission is to develop efficient, economical, clean and sustainable technologies in the fields of energy, transport and the environment. For more information, see www.ifpen.fr. IFPEN offers a stimulating research environment, with access to first in class laboratory infrastructures and computing facilities. IFPEN offers competitive salary and benefits packages. All PhD students have access to dedicated seminars and training sessions.