1 PhD student

Aeroelastic Instability in Large Scale Wind Turbines

Heat and Power Division (Energy Technology Department)

The Heat and Power Division within the Energy Technology Department (KTH, Sweden) performs research in areas related to power generation energy systems with large emphasis in sustainability: solar energy, wind energy, biomass and polygeneration. Turbomachinery aeroelastic phenomenon is a major field of research, with the aim of enabling more efficient and reliable designs. The research projects have close contact with industrial and research institutions through the national and international consortiums (Turbopower, FUTURE, KIC InnoEnergy, Erasmus Mundus, among others). The Division also performs research towards education in the area of life-long learning inside its education and research areas.

The position is part of the KIC InnoEnergy innovation project OFFWINDTECH (Offshore Wind Enabling Technology), with close collaboration with industry and research institutions such as RePower, IREC (Spain), USTUTT (Germany), IST (Spain), UPC (Spain), Gas Natural (Spain).

Study Description

The present project aims at studying the aeroelastic instability in Horizontal Axis Wind Turbines (HAWT) and how this is affected for deep water offshore large-scale designs, where aeroelastic problems (flutter) might become a limiting factor. For this purpose both analytical as well as fluid-structure coupled models shall be employed for analysis of a base-line turbine blade and compared with a new blade optimized design for deep water offshore applications. Recommendations for stability improvements are targeted.

The main tasks are the following:

- Literature studies of aeroelasticity in wind turbines
- Finite Element structural model of base-line blade
- Computational Fluid Dynamics (CFD) model setup with base-line blade with boundary conditions study
- Fluid-structure coupled model for aeroelastic behavior of base-line blade
- Comparison and recommendations for offshore blade design with respect to increasing stability
- Development of simplified model for accurate aeroelastic predictions
- Application of simplified model for parametric studies of different blade designs
- Identification of commercialization possibilities (patents, design procedure, educational tools, etc.)
- Propose Business plan for commercialization of outcomes
- Development of learning material, to be used inside InnoEnergy, related to the research area

**Qualifications**

The candidate should have a Master of Science or equivalent degree in mechanical engineering, vehicle engineering or related discipline which allows starting a doctorate or PhD. Profound knowledge in written and spoken English is required. Preferably, the candidate has broad knowledge of fluid mechanics and structural dynamics, with programming skills. Experience with Computational Fluid Dynamics (CFD) and Finite Element (FE) methods is desirable. Applicants must be strongly motivated for doctoral studies, possess the ability to work independently and high analytical skills. Business and entrepreneurial disposition is highly valued in accordance with the InnoEnergy vision.

**Employment**

Position as PhD-student during a maximum of four years with up to 20% department duties.

**Supervision**

Principal Supervisor Professor Torsten Fransson

Involvement of industrial partners inside wind turbines related project.

**Application**

*Last date for application: 2012-02-15*

Please send your application to application@energy.kth.se

Application shall include CV as well as transcripts from university (in PDF), motivation letter and proof or justification of English skills.