Rotor/ABL Aerodynamics, TASK-1 Activities 2011

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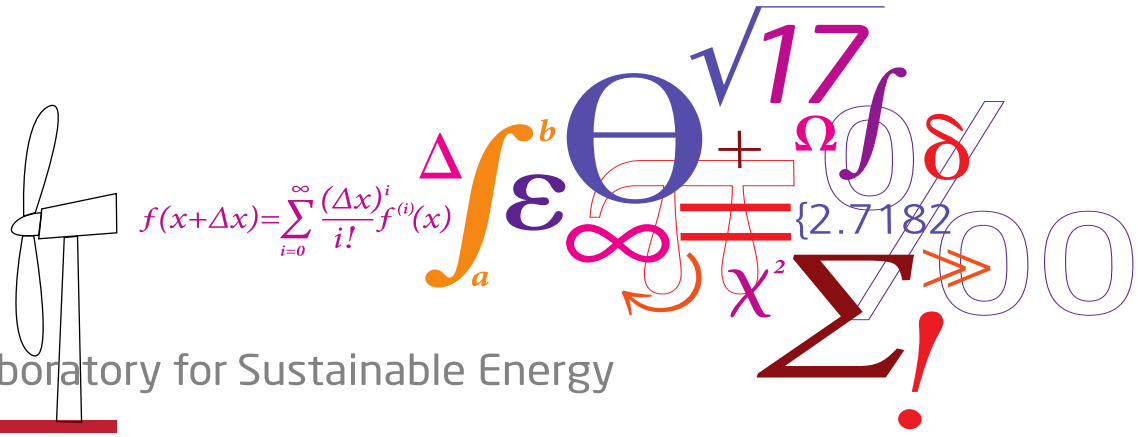

Risø DTU
National Laboratory for Sustainable Energy

Milestones

The following milestones were defined within the present package, or are related to the work

- M1: Parametric study of two modern turbines in atmospheric shear. **Month 12**
- M2: Evaluation of the importance of cross flow instabilities for modern wind turbine rotors. **Month 24**
- M3: Parametric study of two modern turbines in yaw. **Month 24**
- M4: Development of refined ’engineering’ yaw model. **Month 36**
- M5: Evaluation of dynamic stall models and airfoil characteristics with respect to dynamic inflow and inflow turbulence. **Month 48**
- M6: Simulation of various unsteady inflow conditions for the NM80. **Month 36**
- M12: Parametric study of wake/wake interaction between two or more turbines. **Month 36**

Milestone M1

Milestone M1: Parametric study of two modern turbines in atmospheric shear, (DAN-Aero, Siemens)

The computations will be performed using RANS/DES type solvers, and fully resolved rotor geometry.

- Definition of the cases to run, 3 zero shear and 3 shear cases
- Zero shear runs will include lam/turb transition
- Integral loads, rotor torque, rotor thrust
- Sectional quantities, pressure, C_n and C_t
- Wake velocities, for comparison with AL/AD models

The results will be compared to the both DAN-Aero, Siemens exp.

Partners (Risø-DTU, DTU MEK, LM-Glasfiber, Siemens, Vestas)

Milestone M2

Milestone M2: Evaluation of the importance of cross flow instabilities for modern wind turbine rotors

- This study will mainly rely on the DAN-Aero exp, computations, and 2D wind tunnel data
- It will be based on the axial flow computations from M1, DAN-Aero
- The newly developed method to investigate cross-flow instability by MEK-DTU will be applied

The aim is to provide some guidelines for the use of transition modelling for wind turbine rotor flows.

Milestone M3

Milestone M3: Parametric study of two modern turbines in yaw

- Definition of cases to run, 2 DAN-Aero, 2 Siemens cases
- We should aim at having zero shear cases
- Time history of integral loads, rotor torque, rotor thrust
- Azimuth variation of sectional loads C_n and C_t
- Eventually snapshots of velocity field, as input for other levels of models

The results will be used for milestone M4 Improvement of engineering yaw models, and will be compared to both DAN-Aero and Siemens exp.

To do list

Activity	End date	Responsible person
Hire Ph.D. related to TASK-2 and TASK-3	08-11	Risø-DTU, N. Sørens
Settle NDA issues for the DAN-Aero exp	02-11	Risø-DTU, N. Sørens
Define uniform axial cases, Dan-Aero	02-11	Risø-DTU, N. Troldbo
Define axial shear cases, Dan-Aero	03-11	Risø-DTU, N. Troldbo
Define uniform yaw cases, Dan-Aero	03-11	Risø-DTU, N. Troldbo
Compute axial cases, Dan-Aero	05-11	Risø-DTU, N. Sørens
Compute axial shear case, Dan-Aero	06-11	Risø-DTU, F. Zahle
Compute yaw cases, Dan-Aero	09-11	Risø-DTU, N. Sørens
Settle NDA issues for the Siemens rotor	03-11	Siemens , J. Laursen
Define Uniform/shear Axial flow cases, Siemens Turbine	03-11	Siemens , J. Laursen
Define yaw cases, Siemens Turbine	03-11	Siemens , J. Laursen
Compute axial flow cases, Siemens Turbine	06-11	Siemens , J. Laursen
Compute yaw cases, Siemens Turbine	10-11	Siemens , J. Laursen
Evaluation of transition for rotor flows (M2)	12-11	Risø-DTU, N. Sørens

I expect that both LM and Vestas and Siemens will join the computations related to the DAN-Aero cases