DTU 10 MW RWT

Christian Bak, DTU

With the increasing size of wind turbines for offshore sites there is an increasing need to reduce the cost of energy and thereby to optimize the aerodynamics and the structure. In the Danish project “Light Rotor” carried out 2010 to 2014 with Vestas and the Technical University of Denmark (DTU) as partners, methods to optimize turbines and rotors were developed. In connection to this a 10MW wind turbine was designed, so that future designs can be benchmarked against this design. The scope of the 10MW design was therefore not to develop neither the lightest nor the best performing rotor or wind turbine, but to establish a traditional design to check computational tools and design methods in a context, which was consistent both for low fidelity models and for high fidelity models. The 10MW wind turbine is called ”DTU 10MW Reference Wind Turbine” and is with all its details made public available. In the presentation the turbine design will be depicted, some of the aerodynamic and aeroelastic issues that were identified in the design process will be highlighted and results of the further design optimization process of the rotor will be shown.

Wind turbine wake measurements with the RPAS SUMO

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The Small Unmanned Meteorological Observer (SUMO) has been operated for five flights in the vicinity of the five test turbines of the Dutch Energy Research Center (ECN) at the test site Wieringermeer to prove the capability of the system for wind turbine wake measurements. The SUMO missions were a part of an extensive lidar based campaign (WINTWEX-W) for investigation of structure and dynamics of single turbine wakes, from October 2013 to May 2014.
The system showed satisfying in-flight behavior under the high wind (10-20 m/s) and turbulence conditions. SUMO was flown in race track patterns parallel to the row of turbines (four flights downstream and one flight upstream). The collected data enables the investigation of the strength and structure of the wakes, by capturing the reduction in mean wind speed and the horizontal extension of turbulence kinetic energy (TKE).

How can technology contribute to cost reduction in offshore wind?

Knut Bech, WIC, New Energy Solutions, Statoil ASA

The offshore wind industry experiences a considerable growth in installed capacity due to ambitious goals for increasing the renewable’s share of electricity production. While solar and onshore wind has reached grid parity in some regions, offshore wind projects in the UK has shown tendency to cost increase due increased water depth, lower than expected performance, as well as various supply chain mechanisms. Throughout the industry, it is argued that one should work towards a goal of around 100 euro per MWh, or a reduction in levelised cost of energy around 25%. Some of this cost reduction has to be implemented through technology development. Statoil is continuously monitoring our projects, updating our estimates while looking for opportunities to reduce costs through strategic engagement in technology development. The aim of the presentation is to highlight some components of the technology, how they contribute to costs and development trends that can move the industry towards the cost reduction goal.

Cost reduction for offshore wind energy

Jens Madsen, Vattenfall

In recent years, offshore wind energy investments have reached a level where activities are able to support an industrialization of technical solutions, manufacturing, and installation processes. At the same time, authorities across Europe are converging on approaches that award concessions to wind farm developers based on competitive auctions (lowest bidder wins). In order to succeed under these circumstances, developers must enforce active use of lessons learned from a steady pipeline of projects and be prepared to introduce innovative solutions, all with the goal of lowering the cost of energy. This presentation will present a Vattenfall take on this challenge, illustrated with several examples.

Decision support for installation of offshore wind turbines. Status and preliminary results.

Yngve Heggelund, CMR

The cost of installing offshore wind turbines contributes significantly to the total cost of offshore wind farms. The installation operations are usually carried out by specialized ships and crew hired for the installation period. Waiting for weather windows increases the duration of the installation period and thereby the cost of the installation process.

Today's state of the art is to compute the weather windows from simple weather parameters such as significant wave height and average wind velocity at a reference height. However, the actual limitations are the responses of the equipment to the weather, for example crane wire tension, air gap between rotor assembly and nacelle, etc. Using the physical responses in decision making would improve the cost predictions and potentially reduce the cost of installing offshore wind turbines. The weather forecasts are uncertain and these uncertainties transform to uncertainties in the equipment responses. Including these uncertainties into the decision making process is essential to make accurate decisions.

The presentation will give some preliminary results from an ongoing research project. The project partners are Christian Michelsen Research, met.no, Uni Research, Marintek, Aalborg University, University of Bergen, and Statoil.

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