New research shows 20 MW wind turbines are feasible

20 Megawatt wind turbines are feasible, according to a new report from the EU-funded UpWind project, published today at the EWEA 2011 Annual Event in Brussels.

The UpWind project explored the design limits of upscaling wind turbines to 20 Megawatt (MW) and found that they would have rotor diameters of around 200 metres, compared to some 120 metres on today's 5 MW turbines.

Such turbines could be a solution for expanding Europe's offshore wind energy capacity, providing several times more electricity at lower costs than today's turbines.

EWEA forecasts that wind energy will meet 26-34% of Europe's electricity demand power by 2030, with almost as much electricity coming from offshore turbines as from those onshore.

20 MW machines could be a cost-efficient way of reaching these levels of production. However, according to the UpWind report published today, the 20 MW turbine requires a new, innovative, tailored design to make it work.

"UpWind found that making a 20 MW machine is not as simple as just upscaling today's 5 MW turbines," points out Jos Beurskens of the Netherlands' Energy Research Centre (ECN), who led the project along with the UpWind Coordinator Peter Hjuler Jensen from the Danish Technical University Risoe DTU. "We identified key innovations to the design, materials and way the turbine is operated", said Beurskens.

Amongst the main innovations UpWind suggests for a 20 MW wind turbine are:

Blades

- Lowering fatigue loads on blades allows longer and lighter blades to be built. Loads can be lowered in the ways listed below:
- Fore-bending blades and using more flexible materials - this could lower fatigue loads by 10%.
- Using individual blade control - this could lower fatigue loads by 20-30%.
- Putting the blade in two sections (like an aeroplane wing), allowing each to be controlled separately - this could lower fatigue loads by 15%. It also makes it easier to transport the blade.

Adaptation

- The future smart wind turbine would be able to adapt its position and the pitch of its blade to local wind conditions.

Wind farm layout

- Lowering the power output of the first row of turbines allows for higher overall wind farm efficiency.

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Control and maintenance

- Putting sensors on one wind turbine allows the fatigue loading on the other turbines to be estimated if the relationship of fatigue loading between the wind turbines is known.

- Loads can be alleviated preventatively by evaluating the upcoming gust before it arrives at the turbine. A nacelle-mounted LIDAR is sufficiently accurate for wind energy applications.

Although significant research is still needed, Beurskens believes we could see 20 MW turbines in operation by 2020. "Intuitively, I believe we'll see the 20 MW turbines used within 10 years," he says. "That is, providing they are the cheapest option."

However 20 MW turbines could be an option only on paper if the EU does not invest more in wind energy research, pointed out Christian Kjaer, CEO of the European Wind Energy Association, today as he commented on the project results.

"The findings of UpWind allow the industry to significantly advance its knowledge of how to develop more cost-efficient, larger turbines, expected mostly for the huge expansion of offshore wind energy. However this knowledge will never become a reality if the EU does not make a clear commitment to wind energy research", he said.

"The industry is committed to fund its share of the EUR 6 billion European Wind Initiative. It is now time for the EU and Member States to finance their share to ensure the innovations of UpWind and other projects can be further developed and applied."

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