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EDITORIAL

Wind energy

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Wind energy is rapidly growing. In 2006 the installed generating capacity in the world increased by 25%, a growth rate which has more or less been sustained during the last decade. And there is no reason to believe that this growth will slow significantly in the coming years. For example, the United Kingdom's goal for installed wind turbines by 2020 is 33 GW up from 2 GW in 2006, an average annual growth rate of 22% over that period. More than half of all turbines are installed in Europe, but United States, India and lately China are also rapidly growing markets.

The cradle of modern wind energy was set by innovative blacksmiths in rural Denmark. Now the wind provides more than 20% of the electrical power in Denmark, the industry has professionalized and has close ties with public research at universities. This focus issue is concerned with research in wind energy.

The main purposes of research in wind energy are to:

- decrease the cost of power generated by the wind;
- increase the reliability and predictability of the energy source;
- investigate and reduce the adverse environmental impact of massive deployment of wind turbines;
- build research based educations for wind energy engineers.

This focus issue contains contributions from several fields of research. Decreased costs cover a very wide range of activities from aerodynamics of the wind turbine blades, optimal site selection for the turbines, optimization of the electrical grid and power market for a fluctuating source, more efficient electrical generators and gears, and new materials and production techniques for turbine manufacturing. The United Kingdom recently started the construction of the London Array, a 1 GW off-shore wind farm east of London consisting of several hundred turbines. To design such a farm optimally it is necessary to understand the chaotic and very turbulent flow downwind from a turbine, which decreases the power production and increases the mechanical loads on other nearby turbines. Also addressed within the issue is how much conventional power production can be replaced by the ceaseless wind, with the question of how Greece's target of 29% renewables by 2020 is to be met efficiently. Other topics include an innovative way to determine the power curve of a turbine experimentally more accurately, the use of fluid dynamics tools to investigate the implications of placing vortex generators on wind turbine blades (thereby possibly improving their efficiency) and a study of the perception of wind turbine noise. It turns out that a small but significant fraction of wind turbine neighbours feel that turbine generated noise impairs their ability to rest. The annoyance is correlated with a negative attitude towards the visual impact on the landscape, but what is cause and effect is too early to say.

As mentioned there is a rush for wind turbines in many countries. However, this positive development for the global climate is currently limited by practical barriers. One bottleneck is the difficulties for the sub-suppliers of gears and other parts to meet the demand. Another is the difficulties to meet the demand for engineers specialized in wind. For that reason the Technical University of Denmark (DTU) recently launched the world's first Wind Energy Masters Program. Here and elsewhere in the world of wind education and research we should really speed up now, as our chances of contributing to emission free energy production and a healthier global climate have never been better.

