

This special issue on Wind Energy contains a collection of contributions covering a variety of topics providing an indication on the research and development trends wind energy underwent last year. Most of the contributions originate from presentations made during the January 2007 ASME Wind Symposium in the United States of America and the European Wind Energy Conference.

At machine level, as expected, there is a strong participation of aerodynamics and its companion, aeroelasticity. Progress in this direction is of major importance for the reliability of wind turbines especially when access to the machine is difficult as in offshore installations. Also important is the performance aspect, which is directly linked to costs. In this connection, control can provide great help by allowing either reduction of loads or increase of the energy capture at the same level of loads. The connection of loads to reliability either in terms of extremes or fatigue concludes this thematic area. In aerodynamics, open questions concerning dynamic inflow, stall, and 3D flow evolution, in particular, at stand still, are being considered and progress is reported mainly in terms of modeling. With respect to control, performance aspects of the variable speed concept also in combination to pitch variation are analyzed. Finally, in terms of loads, the present contributions focus on the assessment of the setup in terms of extremes, modeling of the turbulent inflow, and the joint wind-wave effect on offshore installations.

At resource level, two important aspects are considered: The first concerns site assessment and the option of speeding up the process by means of numerical simulations and the issue of analyzing the uncertainties connected to measurements. They are both of particular interest for investors and developers. Progress in this direction is expected to further promote the use of wind energy by reducing investment risks.

In recent years, interest in wind energy applications has expanded to less friendly sites as compared to earlier practice. Offshore installations as well as projects in remote areas have revealed the necessity of condition monitoring. The experience from

such a project together with recommendations is reported. Again, this is a topic of particular interest for developers.

Following the history of wind energy progress, it is clear that the sector is undergoing a fast transformation in all aspects. In terms of research, in addition to the existing open questions, the clear trend for larger wind turbines will bring in new problems. At present, the typical commercial size is at 2.5–3 MW, while today there are operating designs up to 5 MW. Improving the design and at the same time increasing the reliability of the machines will be the main challenges for the next generation of wind turbines. It will involve research on materials, aerodynamic design, power and load control, development of multiphysics simulation procedures, etc. Similarly at the developers' level, aspects such as site assessment and condition monitoring, more accurate procedures will be needed. Also research on developing faster manufacturing procedures will be needed. The fast market expansion worldwide, with a strong participation of China and India, will increase the demand rendering the already supply shortage more severe. In conclusion, the future for the wind energy sector is promising with the research community having a particular role. We hope that the present issue of JSEE is contributing to this perspective.

Closing this editorial note, I would like first to sincerely thank the authors and reviewers for working concurrently to complete the review process for this issue. I would also like to thank Patrick Moriarty from NREL and Takis Chaviaropoulos from CRES for their assistance in recruiting papers from the ASME and the EWEA conferences.

**Spyros G. Voutsinas**

Guest Editor of special issue on "Wind Energy,"  
Laboratory of Aerodynamics,  
NTUA,  
15780 Zografou, Greece