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Open Invited Track on

Modelling, Control and Optimization on Wind Energy

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Abstract: The aim of this track is to bring together research works on different aspects of wind energy systems, mainly focused on modelling, control and optimization of onshore and offshore wind turbines. The track will discuss some issues of these complex systems, including application of conventional and soft computing techniques, heuristic optimization, intelligent approaches, both for system modelling and control design, and potential applications to real-world systems.

Keywords: Control, Wind turbines, floating wind turbines, Wind farms

IFAC technical committee for evaluation: TC 6.3 (Power & Energy)

Detailed description:

The development of renewable energy systems is essential to guarantee the sustainability of the worldwide electricity grid and slow down climate change. Among renewable energies, wind is one of the most used energy sources, due to its high availability. However, to contribute to this clean and sustainable trend, research on wind energy and wind turbines must continue and take a leap forward.

Among other energy efficiency goals, controlling wind turbines and farms remains a challenge for engineers. Its main difficulty from the control point of view comes from the fact that it must meet several objectives simultaneously. First of all, the control is designed to reach and stabilize the generated power at its nominal value. In turn, safety must be guaranteed under all operating conditions. Furthermore, the fatigue and the vibrations of the structure must be minimized to avoid the degradation and extend the service life. Expanding the target to other related aspect of wind turbine efficiency, many other aspects arise, as modelling and optimization.

The aim of this special session is to provide a platform for researchers, engineers, and industrial professionals from different fields to share and exchange their ideas, research results and experiences in the field of modelling, control and optimization techniques applied to wind energy systems. Contributions to this special session are welcome to present and discuss novel methods, algorithms, frameworks, architectures, platforms, and applications.

This open invited track is devoted to all topics related with wind energy systems, including (but not limited to) the following subjects:

- Modelling, identification and optimization of wind converter systems
- Modelling and identification of wind, waves, and environmental disturbances
- Conventional, advanced and intelligent control techniques applied to different elements of wind turbines
- Onshore and offshore control-oriented digital twins
- Operation & maintenance in wind turbines
- Experimental and numerical approaches
- Coupled simulation and control of floating turbines
- Modelling and optimization of offshore wind farms
- Wind and wave prediction for feed-forward control