Wind Power Meteorology - An Overview

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Wind power is the predominant new source of electrical power in the last years. By its very nature, wind power is
dependent on weather and climate. Modelling and measurement of both, first the wind climate in form of a wind
atlas and the local wind conditions for the turbine placement and then the predictions for the next days for the
operation are of paramount importance for the success of wind power for the investor and the grid. Due to the
growth in the height of the turbines, recent studies pointed out that the logarithmic law describing the vertical wind
profile presents limitations. At the same time, the success of wind power means that wind turbines are increasingly
put in sites with complex terrain and offshore. Integration of large amounts of wind energy into the grid is another
current challenge. The most important challenges in wind power meteorology therefore are listed below:
* Wind conditions (both resources and loads) on short and long time scales for wind power development.
* Wind conditions in complex terrain (mountains, forests and coastal).
* Forecasts of wind power for the next minutes or next days, in general and for extreme events.
* Wake effects, especially for large wind farms and offshore.
* Effects of large-scale integration.
* Local, regional and global impacts of wind farms.
* Dedicated wind measurement techniques (SODARS, LIDARS, UAVs etc.).

An overview over the many aspects of meteorological input to wind power is given, as well as an outlook
to session ERE1.2 Wind Power Meteorology.