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Comparison of the economic impact of different wind power forecast systems for producers

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Deterministic forecasts of wind production for the next 72 hours at a single wind farm or at the regional level are the main requirement for end-users. However, for an optimal management of wind power production and distribution it is important to provide, together with a deterministic prediction, a probabilistic one. A deterministic forecast consists in a single value for each time in the future for the variable to be predicted. At the opposite, probabilistic forecasting informs on probabilities for potential future events. This means providing information about uncertainty (i.e. a forecast of the PDF of power) in addition to the commonly provided single-valued power prediction. A very significant probabilistic application is related to the trading of energy in day-ahead electricity markets. It has been shown (Roulston et al., 2002) that, when trading future wind energy production, using probabilistic wind power predictions can lead to higher benefits than those obtained by using deterministic forecasts alone. In fact, using probabilistic forecasting it is possible to solve economic model equations trying to optimize the revenue for the producer depending for example by the specific penalties for forecast errors valid in that market. In this work we have applied a deterministic system and different probabilistic wind power forecast systems based on ensemble meteorological models (ECMWF EPS and COSMO LEPS, Alessandrini et al. 2013), quantile regression and "analog ensemble" method (recently proposed by Delle Monache, 2013) forecasting wind power for the day-ahead market in the case of a wind farm in Sicily (Italy). Considering the penalties regulations recently introduced in Italy, every method is tested simulating operative conditions. The economic benefit of using a probabilistic approach for the day-ahead energy bidding are evaluated resulting in an increase of around 5% in the annual income for a wind farm owner.