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RESERVE AND CONGESTION MANAGEMENT USING WIND POWER PROBABILISTIC FORECASTING: A REAL CASE-STUDY

Presently, it is widely acknowledged by end-users (e.g. System Operators, Wind Power Generation Companies) that wind power forecasts up to few days ahead could contribute to a more reliable and less costly power system operation; in addition, it will increase the competitiveness of wind energy in electrical markets, when compared with conventional generation. As a result from the European Project ANEMOS (http://anemos.cma.fr), several forecasting tools providing deterministic and probabilistic forecasts for a single wind farm or a region were developed according to a set of end-users requirements.

The new research priority, addressed in the ANEMOS.plus project (http://www.anemos-plus.eu), is to integrate wind generation forecasts and information on their uncertainties inside the algorithms of the operational management tools and market trading processes.

The aim of this paper is to present two new decision support tools installed and running at the Portuguese system operator (REN), in the framework of a demonstration task of ANEMOS.Plus, as well as details about their practical implementation. Moreover, results from this real case-study are also presented.

The first tool is a reserve management tool intended to support the system operator in defining the operating reserve requirements for the next day or hours. The tool uses as inputs the conventional generation levels dispatched by the market pool, the load probabilistic forecast, the forecast of other renewable sources (e.g. small hydro) and the probabilistic forecasts provided by the ANEMOS platform for the total wind power generation in Portugal (resulting from an upscaling process).

The second tool is a fuzzy power flow intended to help day-ahead network constraints management by identifying possible branch congestions and node voltage violations. The tool integrates wind power probabilistic forecasts by node and wind farm into to the power flow calculations. The output is a fuzzy set characterization of the power flow variables.

The results show that the probabilistic method for setting the operating reserve gives information to the end-user about the risk that he is taking (in contrast to deterministic approaches), which allows a more secure power system operation. Trade-off analysis between risk and reserve cost is included, as a decision-aid tool. The fuzzy power flow approach allows a more realistic load flow forecasts and increase the capacity of identifying the risk of congestion in specified branches.