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Interests of using a regional model to forecast wind power production

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European policies have decided to reduce the greenhouse gas emissions of 20% and to reach 20% of renewable power production by 2020. Increasing wind power is one of the numerous solutions to reach these goals. However, this kind of energy production depends on the meteorological conditions and gives it an intermittent behaviour. The wind speed variations cause voltage and frequency fluctuations that are unacceptable for the power grid. Therefore, forecasting production will become essential with the aim of integrating this kind of energy production into the power grid.

We compare two kinds of models : A global one and a regional one. The first model using the GFS outputs (0,5° and 3h) is not precise enough in space and time to correctly forecast the wind speed in punctual wind farms. That is why we apply some specific tunings on these forecasts. These tunings depend on the air density, the wind direction and the stability of the air mass.

The second model using the WRF outputs (4km and 15min) runs over the Belgian territory. Initial conditions are forced by the GFS outputs at 0.5° and WRF computes a physical based spatiotemporal downscaling of the meteorological variables. Some slight tunings are also needed to adjust the wind power forecasts by comparison to the wind power observations.

The interests of using a regional model are : The outputs are available in a precise resolution, thus the errors created by the spatial and temporal resolution of GFS are decreased, the high production events are successfully forecasted, the roughness rose is not needed and the WRF model are configurable to adapt the forecasts the best as possible to the wind farms.