PERFORMANCE ANALYSIS OF A WIND FARM USING OPERATIONAL DATA
ANÁLISIS DE DESEMPEÑO DE UN PARQUE EÓLICO CON DATOS OPERACIONALES

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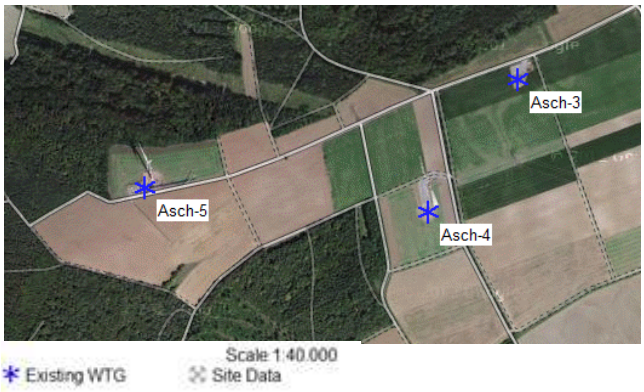
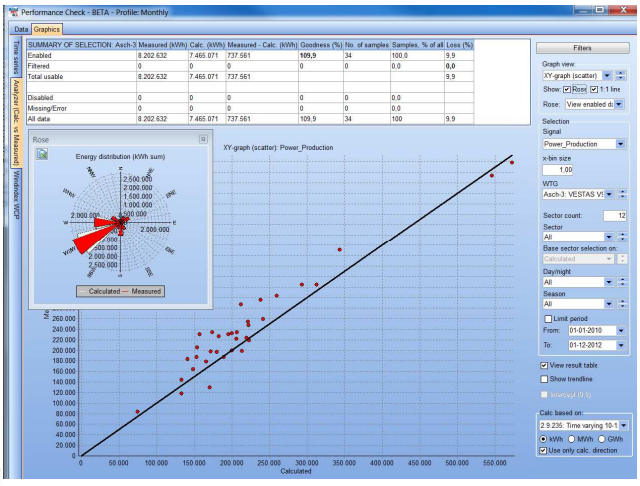
The performance of three operating wind turbines Vestas V 90 was analyzed and improvement measures were identified. The data was imported into the performance check module of WindPRO



Deviations between the modeled and the measured power production can have multiple causes, both modeling uncertainties in the meso scale data and in the micro scale flow model, terrain model, wake model etc. and in the efficiency of the power conversion. Therefore, these impacts are investigated isolated from each other.

1. Wind Index

Nacelle anemometry was found inadequate for the assessment of wind speed, hence several wind indexes based on meso scale data were compared. One model was chosen as data source for power predictions.

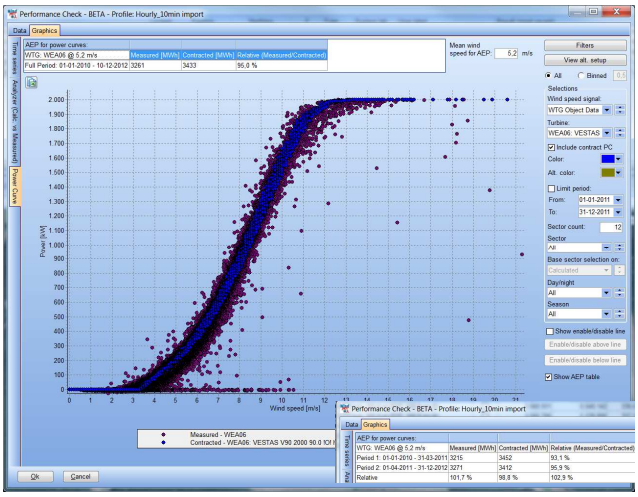


2. Terrain and flow model

Predicted power production was compared sector wise with real power production whilst tuning in the roughness and orography model as well as the wake model. As a mayor deviation in this case, the wake decay constant was adjusted.

3. Power conversion

The performance check module allows depicting the measured power curve (non averaged / non binned). The “measured” power curve is then compared to the “contract” power curve, both based on the calculated, wake reduced wind speed, identifying a 5% AEP deviation.



The variation seen in the contract power curve are due to air density variations. Both curves are compared considering the same density conditions each interval. Comparing predicted and measured power, the measured power curve was found to have an underperformance. A change in the operational strategy (rpm/pitch setting) had a positive effect on performance, the turbines were now able to produce more energy in low wind speeds.