

Austrian Wind Atlas and Wind Potential Analysis

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1. Introduction

Due to the diversity of the Austrian orography with its complex terrain and distinct river valleys in the West as well as flat areas in the East, the Austrian wind resources are characterised by a large variety of local winds, low level jets and supra-regional wind streams. Due to the interaction of the different wind systems, an accurate simulation of the *theoretical* wind conditions is neither possible through stand-alone application of dynamic models nor through geo-statistical techniques.

In previous estimations on the *realisable* wind potential in Austria, only criteria of regional planning have been considered but other crucial parameter for wind energy projects like technical development of turbines and profitability have been neglected. This combined with the inaccurate wind resource estimations caused severe uncertainties in the results.

In order to overcome these shortcomings, the project "Austrian Wind Atlas and Wind Potential Analysis" (<http://windatlas.at>), funded by the Austrian Research Promotion Agency (FFG), was initiated.

Aim of this study is on the one hand the development and testing of a new modelling approach in order to calculate a detailed wind resource map, which fits the reality as accurately as possible and, on the other hand, the subsequent comprehensive modelling of the wind potential that is *realisable* under alterable parameter settings.

2. Methodology

For the calculation of the wind resources a combination of the dynamic weather model MM5 at 2 km resolution and a geo-statistical interpolation method has been applied for the first time in order to reach a resolution of 100 x 100 m. Due to this new approach several improvements have been implemented especially in the

context of spatial structuring of the model. The quality of the results is further improved through the integration of wind observations from 176 surface stations by building up spatially distributed error correction functions. This way the variability of the Austrian orography and wind resources is met in detail.

In order to allow for a subsequent comprehensive modelling of the *realisable* wind potential in Austria, a GIS model has been set up. This model not only considers aspects of regional planning and environmental restrictions but also aspects of systems engineering (like different turbine capacities) and economic parameter (like investment costs, operational costs, feed-in tariffs ...). The interrelationship of the individual parameter has been investigated and a validation of the results has been performed by using actual energy yields of existing wind farms.

3. Results

The calculations on the *theoretical* wind potential are currently being performed and will result in error-corrected mean wind speeds and frequency distributions on a highly resolved grid of 100 x 100m. This data is the main input data for the subsequent GIS model.

This GIS model of the *realisable* wind potential will be available online. On a free internet platform the user has the possibility to choose technical, economical, environmental and spatial parameters via a scenario matrix and trigger an 'on-the-fly' calculation, which is based on those personal settings. The so calculated *realisable* wind energy potential is illustrated on district level.

The study will be concluded until autumn this year and the main results will be available at DEWEK.