Scaling and Evaluation of Wind Data and Wind Farm Energy Yields

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Summary

The following article deals with the selection and application of long-term data. A long version of the article has been published in German in the last DEWI Magazin, which attracted very much attention. The complete long version of the article is available in English on the DEWI homepage www.dewi.de. This article is a short extract of the long version. Wind speeds and therefore also the energy yields of wind turbines are subject to temporal fluctuations. If the long-term average is the matter of interest, wind data and energy yields, which are available for a limited period only, have to be converted (scaled) to long-term periods by suitable methods and data. When using long-term data, a careful quality check, selection and adaptation of the data are necessary in order to avoid misinterpretations. One should be aware, that each correction to the long-term average includes a certain site-specific degree of uncertainty.

1. Wind Indices for Long-Term Correction

Energy yields of wind turbines already installed are usually scaled in Germany by means of so-called wind indices in order to calculate the long-term average yield. A wind index (or energy yield index) scales these energy yields with reference to a pre-defined long-term mean value and thus allows to calculate the long-term mean value of the energy yield. The scaled energy yields obtained in this way are used to carry out plausibility checks on the meteorological data input, extrapolate them, to monitor existing wind farms and to compare the energy yield predicted before commissioning of the wind turbine/farm with the energy yield actually achieved. However, the application of the wind indices is by far not that easy as it seems at first glance and detailed analyses are necessary. The article on the DEWI homepage describes the methods, their shortcomings and conclusions. For most countries, wind indices are not available yet, but it would be a great opportunity for the future to evaluate such data specific for the owners or in general.

2. Wind Data for Long-Term Correction

Correlations of site wind measurements with long-term wind data are carried out in order to extrapolate them to longer periods of time. Therefore, the use of high-quality "Measure-Correlate-Predict" (MCP) procedures applying high-resolution time-series data is not generally necessary, but under certain conditions. The successful use of these procedures requires experience and access to suitable reference data. As suitable long-term wind data often are not available, a detailed correlation has to be ruled out, anyway. With regard to the correct realisation of long-term corrections, the use of suitable procedures alone is not sufficient: the most important aspect in the long-term correlation of wind data is the selection of suitable long-term data and the checking and sometimes correction of them. Fig. 1 shows by way of example the relative distribution of wind speeds of a site measurement in comparison to meteorological stations. In this case the time curves of the data of both long-term measuring stations are plausible and correlate to the site data very well. Station 2 is very close to the site examined. However, at station 2, after detailed analysis it turns out that the mean wind speeds are too low at the end of the period. Although wind had been measured for two years at the site, station 2 led to energy yields being too high by 6% of the energy yield. Quite often it is safe to assume that the nearest meteorological station is not necessarily the best suited station for the long-term correction of wind data, but the best data have to be found in a detailed analysis. Special care has to be taken in order to find out a realistic long-term average as detailed in the article on DEWI's home page.

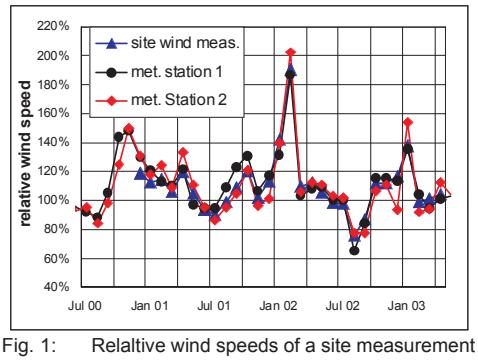

Fig. 1: Relaltive wind speeds of a site measurement in comparison with meteorological stations