
What does Exceedance Probabilities P90-P75-P50 Mean?

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In the planning and financing stage of a wind farm project a risk assessment is required quantifying all risks related to the wind farm financing (technical due diligence). Financial Modelling needs a comprehensive understanding of the project assumptions in combination with the performance of a sensitivity analysis in order to define an agreed base case. The result of an energy yield prediction in terms of an AEP (annual energy production) is called the P50. The probability of reaching a higher or lower annual energy production is 50:50. A risk assessment includes the quantification of the project specific uncertainties (see Fig. 1) and the whole range of exceedance probabilities (Pxx) of the wind farm's annual energy production. P75 is the annual energy production which is reached with a probability of 75%. The risk that an annual energy production of P90 is not reached is 10% (see Fig.2). Both values are widely used by banks and investors as base in their financing decisions.

In order to reduce the financial risk of a wind farm special attention should be given to the operation and maintenance contract (long term warranties including availability warranties in terms of losses in the energy production) and the performance warranties (wind farm performance in relation to a reference mast). Enhanced flow models should be used for the energy yield prediction and the calculation of the wind farm power curve which are validated for the type of terrain.

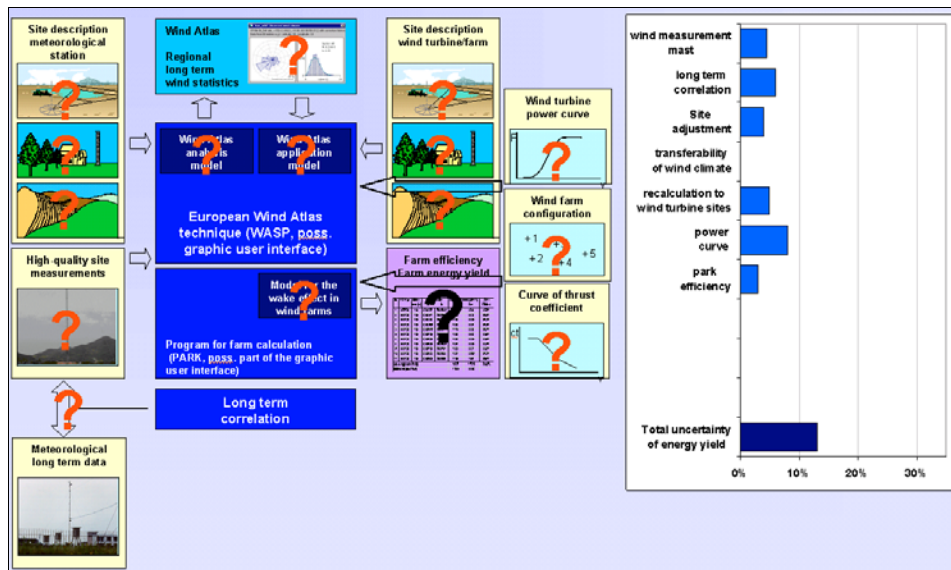


Fig. 1: Schema of a typical energy yield assessment process and its uncertainties. All steps and input data are connected to specific uncertainties, which are summarised to a typical overall uncertainty.

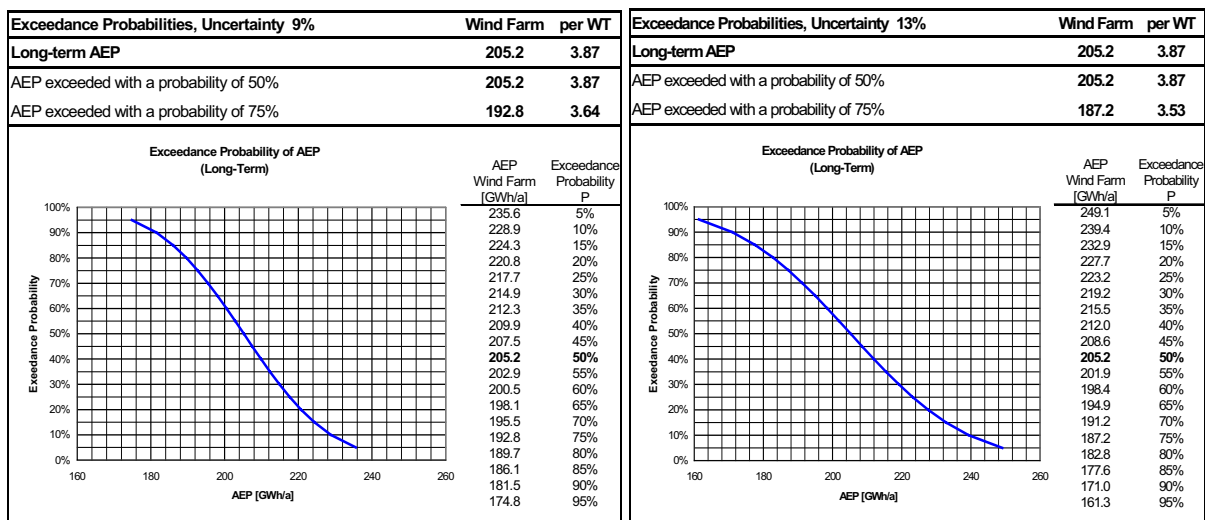


Fig. 2: Presentation of an exemplary result for the Pxx-values. The calculated result (P50) is the same in both cases, the uncertainty however is different, and hence the P90 values.

For several wind farm projects in a portfolio of an investor the risk can be mitigated by including wind farms in different wind regimes and by using different turbine techniques or turbines with reduced performance uncertainties. If the power curve of a specific type of turbines is verified 4 times (some types are measured more than 20 times) the uncertainty of the power curve can be reduced by a factor of 2. From a financiers point of view it is preferable when the P90 or P75 due to the lower risks goes up even if the P50 slightly goes down by the applied measures.

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