

## **Statistical study of the influence of the data sampling interval on the estimation of wind turbine energy**

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### **Abstract:**

Main deficiency for wind power is variability. It is really difficult to predetermine the wind's potential since wind velocity cannot be controlled or predicted with pinpoint accuracy.

In this paper, two different methods are applied in order to estimate the monthly wind energy for different sites; those estimations are done using Weibull distribution and calculating energy with direct integration methodology. In additional, the influence of the data sampling interval is studied.

Investigations have showed that:

- The computational method based on integrating power versus time is more accurate.
- There is a very different distribution pattern of wind speed over months at selected stations.
- If wind speed data with an average one minute value is used, estimated energy varies randomly with sampling interval.
- The hourly time resolution, compared to one minute resolution provides satisfactory accuracy in wind energy estimation.
- It is sufficient to choose an hourly sample period to get good energy estimation.
- In case of data filtered respecting Shannon (for i.e. using a Butterworth filter), wind energy estimated decreases when the vesting period of the wind increases.
- With filtered data, for sampling intervals between one minute and thirty minutes, the energy decreases linearly. This result may be interesting in wind energy prediction.

Results allow better design of wind or hybrid systems. Moreover, wind speed acquisitions are minimized. A shorter time of treatment and less expensive measurement equipments are required.

### **Key words:**

Wind power, energy estimation, Weibull distribution, computational method, data sampling interval.