Performance monitoring of wind turbines using Spinner Anemometry

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Objective

The rapid growth of wind turbines and wind farms has created the importance of performance monitoring of wind turbines. Throughout these years there have been several conventional ways to do this. One of the more recent approaches is using spinner anemometry which is established at ROMO Wind using iSpin.

How: Performance Transparency Project (PTP)

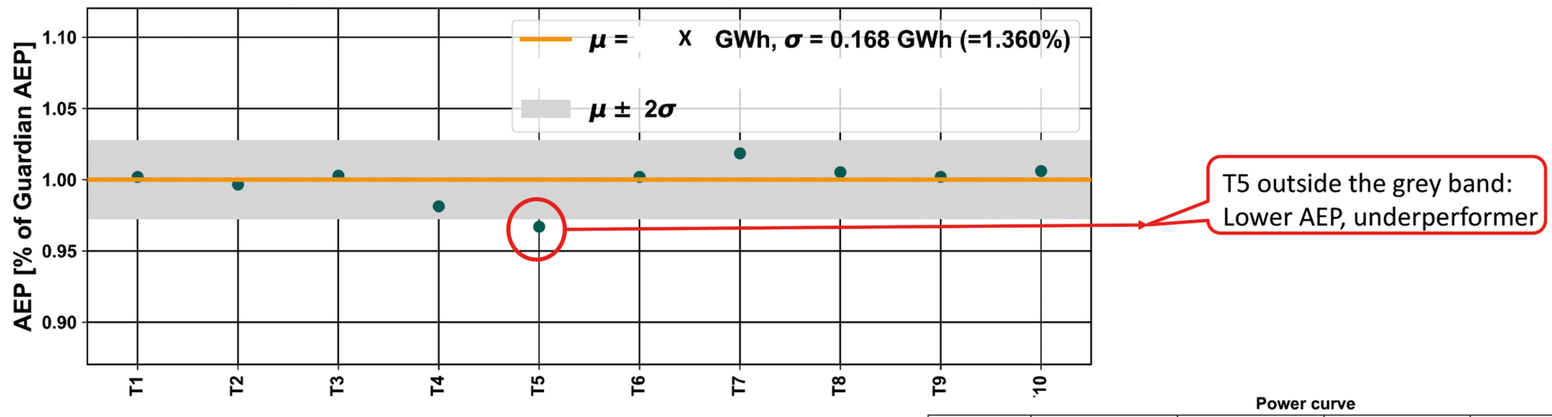
The major initiative to demonstrate the capability of iSpin to measure and compare wind turbine performances and be a robust source for performance monitoring of wind turbines is the Performance Transparency Project (PTP) [1]. In this project, 59 iSpin systems have been already installed in 6 different locations for two turbine types with varying terrain complexities. Using iSpin measurements from these different sites, this project aims at proving that iSpin wind speeds are stable and turbine independent which implies that measuring wind speeds at the spinner is more valuable and thereby promoting the use of spinner anemometers for a brighter future of performance monitoring.

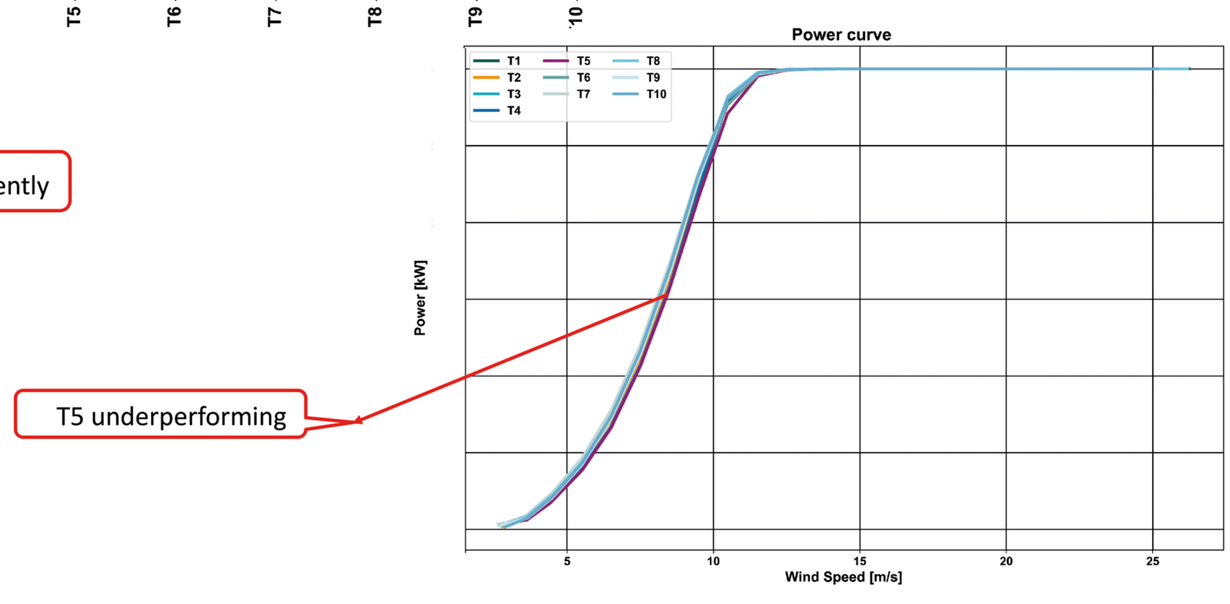
Methodology

As a step towards performance monitoring, we at ROMO Wind have developed the concept of iSpin Guardian. Using iSpin Guardian, we are able to compare the measured power curve for a specific wind turbine type to other turbines of the same type, independent of location and climatic conditions. The performance of all turbines can be compared to the iSpin Guardian power curve i.e. the average performance of the turbine type. In this manner, the underperforming turbines can be identified and later improvement can be verified in terms of increased AEP. The calculated AEP undergoes IEC air density normalisation [2], inflow angle and turbulence intensity normalisation.

Results

The concept of iSpin Guardian has been applied for a site with 10 turbines. It must be noted that the sites being analysed for PTP have different terrain complexities. The spinner transfer function (STF) used for this site has been developed from a complex site using a metmast. It can be observed that turbine T5 is an underperforming turbine according to the iSpin Guardian approach. This has been well reflected from the power curve of all the turbines, wherein T5 is underperforming. The RPM vs power curve indicated different behaviour for T5, this necessarily need not mean underperformance. In this case using iSpin, it can be concluded that T5 is an underperforming turbine.





Conclusions

The first results of PTP demonstrate the capability of iSpin to detect turbine performance in a given wind farm. The ability to use the STF of a turbine type across terrains to measure wind speeds, shows the robustness of the iSpin STF and therefore indicates better wind speed measurements. With further results from other sites, ROMO has complete confidence in establishing iSpin as a tool for wind turbine performance monitoring in the near future.

References

1. www.ptp.com
2. “IEC 61400-12-1 wind turbines part 12-1: Power performance measurements of electricity producing wind turbines”