

HOW CAN WIND FARM OWNERS MAXIMIZE TURBINE ENERGY PERFORMANCE?

PROBLEM

Wind turbine power production depends on many disparate factors, including asset age, maintenance condition, and operating practices, all of which make it challenging to maximize performance while keeping costs down.

SOLUTION

An artificial intelligence (AI)-enabled solution that can detect performance issues while continuously and automatically monitoring turbine power performance.

RESULTS

Quickly identify underperforming turbines while also providing the most likely root cause of failures and suggest corrective actions.

INTRODUCTION

The successful optimization of wind turbine power generation is dependent on many factors, including equipment age and condition, operating practices, maintenance schedules, and the correct and timely diagnosis of impending asset failures. Turbines operated at sub-optimal levels not only drive higher maintenance and repair costs, they also generate less power, resulting in foregone revenue and potential mismatches with grid power requirements.

Wind turbine power performance is often measured by evaluating the turbine power curve, which shows power production vs. wind speed. However, the power that a wind turbine is capable of producing depends not only on the operational and maintenance factors described above, but also on external conditions like wind speed, air density, turbulence intensity, wind shear, wind inflow direction, terrain, wake effects, and other factors. Additionally, the wind speed measurement used in the power curve analysis comes from an anemometer located behind the rotor of the turbine, which affects the accuracy of the measurements.

PAST APPROACHES FOR EVALUATING TURBINE PERFORMANCE

One approach to evaluating turbine performance is to collect data for an extended period of time and have trained analysts detect underperformance. There are two shortcomings to this approach. First, the large amount of data required means that the turbine must operate below its potential for an extended period of time, potentially resulting in a large amount of lost production. Another shortcoming of this approach is that it is labor-intensive and costly, often offsetting much of the gain that results from the analysis itself. Another approach is to simply accept underperformance and live with lower revenue, which is clearly not an ideal outcome.

FIGURE 1: Typical Power Curve Scatter

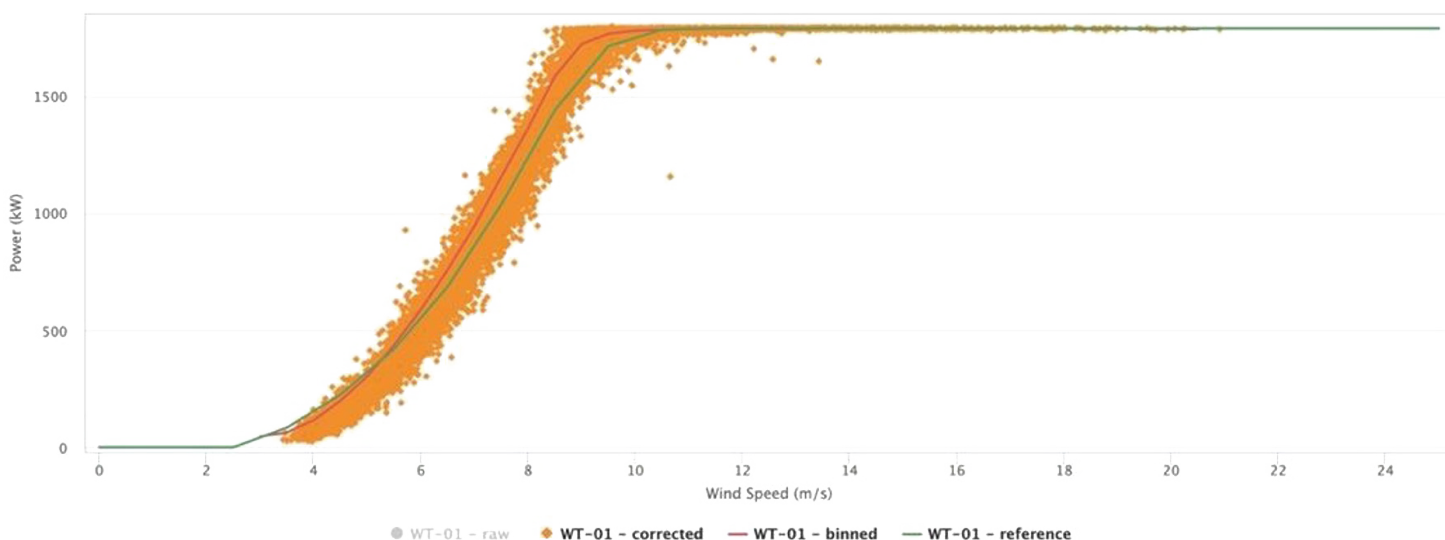


FIGURE 2: Example of Power Curve Health Score



AN EFFECTIVE SOLUTION FOR EVALUATING TURBINE PERFORMANCE

Identifying underperforming turbines quickly and cost-effectively enables wind farm owners and operators to maximize profitability. Avathon helps its customers do exactly that by leveraging the Avathon Industrial AI platform and its powerful machine learning models to continually monitor customers' turbine power performance automatically. This platform quickly and accurately detects performance anomalies and automatically alerts customers to these issues. The platform also provides customers a visual indication of turbine performance in the form of a power curve "health score." A health score of 1.0 means that the turbine is producing as expected for the given operating conditions. If the turbine begins underperforming, the health score declines and the customer is notified. The platform even classifies the underperformance and provides customers with the most likely reason and a suggested corrective action.

BENEFITS

More accurate energy loss calculations such as those provided by Avathon's Industrial AI platform help operators realize the true value from their O&M contracts. They also help owners understand where energy is being lost, so they can focus their efforts on corrective actions with the highest ROI.

The automated monitoring of turbine power performance provided by Avathon's Industrial AI platform quickly identifies underperforming turbines and notifies operators, while also providing the most likely root cause and suggested corrective actions. Since the algorithms run on a cloud computing platform with no analyst input required, large numbers of turbines can be monitored more efficiently. This allows operators to maximize energy production and increase the profitability of their assets.

ABOUT AVATHON

Avathon, a leader in Industrial AI, extends the life of critical infrastructure while advancing the journey toward full autonomy. Avathon's Industrial AI platform empowers commercial and government customers with scalable, secure, and value-driven solutions that enhance efficiency and resilience across heavy industry.

To learn more about how Avathon's AI solutions can unlock the power in your data, visit www.avathon.com.