WHAT IS THE QUICKEST AND MOST COST-EFFECTIVE WAY TO IDENTIFY YAW MISALIGNMENT?

PROBLEM

Yaw misalignment can significantly reduce turbine output, increase the likelihood of failure, and increase operation and maintenance (O&M) expenses.

SOLUTION

A machine learning-based solution that's capable of detecting yaw misalignment with only two months of historical data.

RESULTS

The machine learning model can detect yaw misalignment of five degrees or more with 96% accuracy.

A widespread challenge in the wind industry is a condition known as yaw misalignment. Yaw misalignment occurs when a wind turbine is operating while not pointing directly into the wind. This has two consequences:

1. The turbine produces less energy, therefore losing revenue.

2. The turbine is exposed to increased loads from the misalignment, thereby increasing O&M expenses and the likelihood of failure.

PAST APPROACHES FOR DETECTING YAW MISALIGNMENT

The two most common ways of identifying turbines with yaw misalignment are with a light detection and ranging (LiDAR) measurement campaign or the use of physics-based methods applied to turbine SCADA data. While both of these techniques can be effective, they have significant disadvantages as well. LiDAR measurement campaigns are very costly, and physics-based methods require data from an extended period of time (typically one year) when yaw misalignment is present, resulting in a large amount of lost production and time spent operating with increased loads.

A QUICKER, MORE COST-EFFECTIVE WAY TO IDENTIFY YAW MISALIGNMENT

Avathon has developed a machine learning-based solution that does not require a costly LiDAR campaign or a year of operating data to detect yaw misalignment, but accurately detects yaw misalignment with only two months of data. Avathon Industrial AI platform builds upon the physics-based method by using historical data to train the machine learning model to detect when yaw misalignment is present. The training model can then detect yaw misalignment of

five degrees or more with 96% accuracy using only two months of historical data rather than the 12 months typically needed for pure physics-based methods.

BENEFITS

The solution runs on Industrial AI platform 24 hours a day, 7 days a week with no input required from analysts. When this platform detects a turbine operating with yaw misalignment, it automatically notifies the analyst and provides the magnitude and direction of yaw misalignment (positive or negative) so that the issue can be quickly corrected, and the turbine returned to its optimal condition. Recently, a customer used Avathon's Industrial AI platform to identify yaw misalignment affecting machines at a medium-sized project they own and operate. The platform accurately identified the turbines with yaw misalignment and provided the customer with the magnitude and direction of each incorrect turbine position. The customer was able to update the turbine yaw offset remotely, resolving the issue without a turbine climb. The benefit to turbine power production was confirmed, with corrected turbines producing as much as 2% additional Annual Energy Production (AEP), resulting in an annual revenue increase of $45,000 for the project.

EXAMPLE RESULTS OF YAW MISALIGNMENT ANALYSIS

Turbine	Status	Yaw Misalignment (deg.)
WT01	🔴	-7.0
WT02	🟢	< 3.0
WT03	🟢	< 3.0
WT04	🟡	< 5.0
WT05	🔴	+8.5
WT06	🟢	< 3.0
WT07	🔴	+8.0

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.