

The role of wind turbine generator sensors

Why do wind turbines need sensors?

As the world moves to decrease its reliance on traditional fossil fuel energy and turns to renewable resources for electricity such as solar power and wind, wind turbines are becoming dependent upon sensors that greatly improve operation and optimize maintenance.

Why is it necessary to monitor wind turbines?

Wind turbines must be permanently monitored in real time for effective maintenance. This ensures timely shutdown and can also reduce maintenance and repair costs. Predictive maintenance based on precise sensor technology plays an important role here. Humans have always used the wind's power in one way or another, for example, through windmills or sailing boats.

What is a wind speed sensor?

In a connected context, wind speed sensors are a critical component of wind farms and are extensively utilized to enable wind energy monitoring, control, and decision support for wind turbines [4]. These sensors measure wind speed, thereby playing a pivotal role in determining the operational performance of wind turbines.

Can DT be used as a virtual sensor for wind turbine generators?

The comparison between the estimated wind speeds and the real wind speeds demonstrates the effectiveness of DT as a virtual sensor for wind turbine generators. The estimated wind speeds exhibited a close agreement with the real wind speeds within 80% for the given generated power values.

How do wind sensors work?

Most modern wind sensors are mechanical or ultrasonic. Mechanical anemometers use rotating cups and a wind vane to determine speed and direction. Ultrasonic sensors send pulses of ultrasonic sound from one side of the sensor unit to a receiver on the opposite side. Wind speed and direction are determined by measuring the received signal.

What are the emerging trends in wind turbine sensor data?

Emerging trends in wind turbine sensor data go beyond process-related matters. Data collected from wind turbines is now being used to create digital twins of turbines and other wind farm components. Digital twins can be used to create simulations and help in decision-making processes.

4. Switched Reluctance Wind Turbine Generator . Switched reluctance wind turbine generators have features such as strong rotor and stator. With the rotor's rotations, the reluctance of the magnetic circuit linking the ...

The most essential sensor technology for wind turbines is used to detect wind, vibration, displacement, temperature, and physical strain. The following sensors help to establish baseline conditions and detect when

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Wind energy is playing a critical role in the establishment of an environmentally sustainable low carbon economy. This chapter presents an overview of wind turbine generator technologies and compares their ...

The construction of offshore wind turbines plays a crucial role in commercial infrastructure development. Since the construction cost is proportional to the distance from the ...

5 ???· The yaw system plays a critical role in optimising energy capture, and it can be found in the nacelle of a wind turbine. It has sensors which detect the wind direction, turning the nacelle accordingly for maximum efficiency.

Figure 2: Transport of wind turbine blades. 2. Hub. The hub of a wind turbine is the component responsible for connecting the blades to the shaft that transmits motion to the gearbox in the case of a Doubly Fed Induction ...

This approach offers a novel perspective in the context of offshore wind turbines by emphasizing the critical role of feature engineering in harnessing the full potential of deep ...

These sensors measure wind speed, thereby playing a pivotal role in determining the operational performance of wind turbines. The accuracy of these measurements significantly impacts the wind energy capture rate, ...

Pressure sensors have become a necessary component in the wind power industry, improving the efficiency and reliability of wind turbine operation. They serve a multifaceted function in enhancing the generation of ...

Predictive maintenance plays an essential role within this context. Pro-active monitoring based on precision sensor technology has already begun to be used in the production process of wind turbines and continues in ...

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