Application Note

Gill Instruments | Weather monitoring instruments at solar tracking farms

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Background

According to the International Energy Agency, power generation from solar photovoltaic (PV) increased by 25% in 2023, accounting for 5.4% of global electricity production. Solar PV remains the third-largest renewable energy source, following hydropower and wind.

Between 2024 and 2030, solar PV is expected to drive 80% of global renewable capacity growth, fuelled by large-scale solar power projects and a rise in rooftop installations by businesses and households.

This expansion is further driven by favorable policies. In June 2022, China released its 14th Five-Year Plan for Renewable Energy, setting an ambitious goal for 33% of electricity generation to come from renewables by 2025, including an 18% target for wind and solar. Similarly, in August 2022, the U.S. federal government introduced the Inflation Reduction Act (IRA), significantly boosting renewable energy support over the next decade through tax credits and other incentives.

Challenge

For flat-panel photovoltaic (PV) systems, solar trackers are used to optimise the angle of incidence between sunlight and the PV panels. By adjusting panel orientation throughout the day to follow the sun's path, trackers increase energy production compared with fixed installations boosting electricity generation by around 33%. This is the primary advantage of solar trackers over fixed-angle panels. Continuous adjustment to the optimal angle enhances conversion efficiency, leading to higher yields and increased revenue for large-scale solar plants. However, solar trackers also have some drawbacks:

- Adding a solar tracking system means more equipment and moving parts that can require regular maintenance and repair or replacement
- If a tracker fails while the panels are at an extreme angle, energy losses can be significant until the system is restored.
- Trackers are more susceptible to storm damage compared to stationary solar panels.

Solution

Weather monitoring is essential for solar tracking farms beyond just measuring solar radiation. Reliable wind speed and direction data is crucial to prevent damage, as tracking operations must shut down when wind gusts exceed set limits.

In addition, installing meteorological instruments to monitor environmental factors such as solar radiation, wind loading, precipitation, temperature, and humidity provides operators with critical data to identify performance and maintenance related issues affecting efficiency.

Gill's **WindSonic** ultrasonic anemometers have been extensively deployed at solar tracking farms, delivering reliable wind data in a robust, maintenance-free package. They ensure PV panels are positioned safely during high winds. Depending on the farm's size and layout, multiple **WindSonic** units may be installed – fewer for flat, square sites and more for sloped or complex terrains.

All Gill's **ultrasonic 2-axis anemometers** offer precise wind speed (up to 90 m/s with WindObserver) and 360° direction measurements. Built with durable polycarbonate, aluminum, or stainless steel housings, Gill ultrasonic anemometers provide **high-quality, long-term accuracy** without moving parts, making them **highly reliable**, **extremely low maintenance,** and ideal for exposed environments.

APPLICATION ENQUIRY