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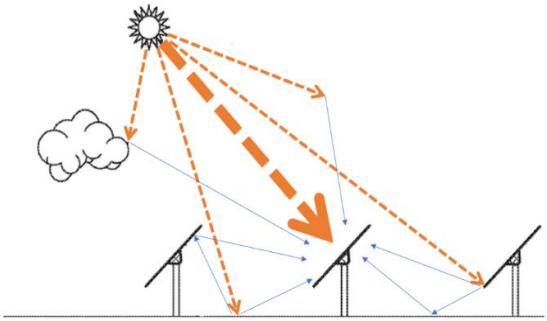
Measuring the Sun since 1983

The Multi Planar Irradiance Sensor (MPIS™)

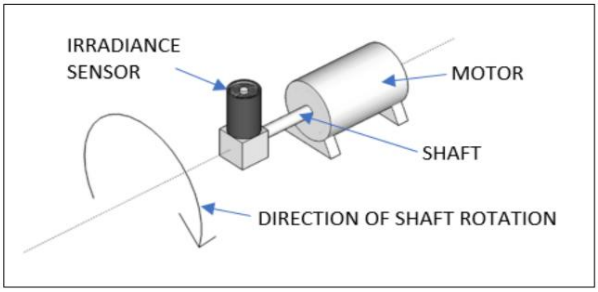
The MPIS™ is the first device able to directly measure the tilt angle of the plane of maximum solar irradiance available to large scale 1-axis tracking PV power plants. It is also the first device which can yield a reliable measurement of the incident irradiance striking both the front and rear of bi-facial PV modules simultaneously.

Common tracker control practice has been to frequently adjust array tilt to follow the sun across the sky. This assumes the plane perpendicular to the sun receives the highest energy input. While this assumption is largely true under clear sky conditions, varying atmospheric and ground reflectance conditions often result in the tilt angle of the plane of actual maximum irradiance significantly deviating from that of the plane perpendicular to the sun.



Historical measurement practices employ fixed-position or slowly moving sun tracking sensors which are incapable of accurately or directly determining the tilt angle of maximum irradiance. In contrast, the MPIS™ quickly samples plane-of-array solar Irradiance (POAI) at multiple small angular increments about a fixed rotational axis.

The simplest form of a MPIS™ device uses a robust, commercially available silicon photodiode pyranometer attached to a motor shaft. The pyranometer's hemispherically-planar field of view periodically moves through rapid partial or full rotations as a sequence of irradiance and tilt angle measurements are captured at a high sampling rate. Each MPIS™ rotation thus yields a highly granular, nearly instantaneous function of POAI versus tilt angle around a fixed axis by a single, fast-response sensor inherently ensuring excellent sample-to-sample comparability.



The MPIS™ measurement approach may potentially enhance several avenues of PV technology development. These include providing direct feedback to 1-axis tracking PV plant control systems, improved performance estimates and better evaluation of ongoing operational performance. MPIS measurements may also improve near term irradiance forecasting and overall grid dispatch control, in addition to improved development stage site assessment.

MPIS™ systems have been used as part of a PV system control improvement research project being conducted at Sandia National Laboratory's PV Systems Evaluation Laboratory (PSEL) in Albuquerque, New Mexico and Eugene, Oregon.