# Measuring success in the photovoltaic industry

DuPont consultants can offer unique experience in eradicating monitoring issues at PV plants


## Summary

Measuring solar irradiance (the input for all photovoltaic [PV] systems) provides the knowledge to make important decisions on future energy yield, efficiency, performance and maintenance—all of which are crucial factors for returns on financial investment. To make reliable decisions, it's important to have reliable measurements. DuPont PV Consulting Services can help determine which of your instruments are underperforming and which may require calibration or maintenance to prevent further degradation and energy loss.


**Historical data analysis + thermal (IR) + visual inspection**

**PV plants use pyranometers to measure solar radiation and make critical decisions based on reference yield and performance ratios**

**Maintaining and calibrating measurement instruments like pyranometers is a key factor to preventing accelerated degradation and energy loss at PV plants**

## Pyranometers and PID

A pyranometer is an irradiance sensor that converts the global solar radiation it receives into an electrical signal that can be measured. It involves optical and electrical components that can also be affected by soiling drift and degradation.

Regular calibration is part of the quality management for all measuring instruments. Due to their prolonged exposure to the sun, irradiance sensors are especially susceptible to error if not properly maintained. Therefore, to attain the high accuracy necessary to monitor PV system performance and degradation, pyranometers must be calibrated frequently.

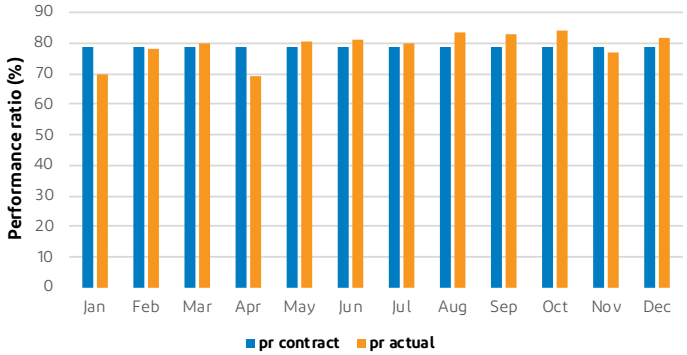
Inconsistent maintenance and calibration of a solar plant's irradiation sensors can affect all related key performance indicators, such as reference yield and the performance ratio of the plant. Sensors that are improperly calibrated can lead to an oversight of certain power failures in the plant, including potential induced degradation (PID).

PID is a defect experienced by some PV panels when cells become polarized as a result of sodium ion migration from the glass to the cell surface. This results in gradual and sometimes dramatic power losses. Although PID can be prevented by specific electrical designs, it is inherently caused by a panel's sensitivity to voltage differences between the cells and the frame in the presence of moisture. It is particularly exacerbated by specific cell constructions and encapsulant formulations.

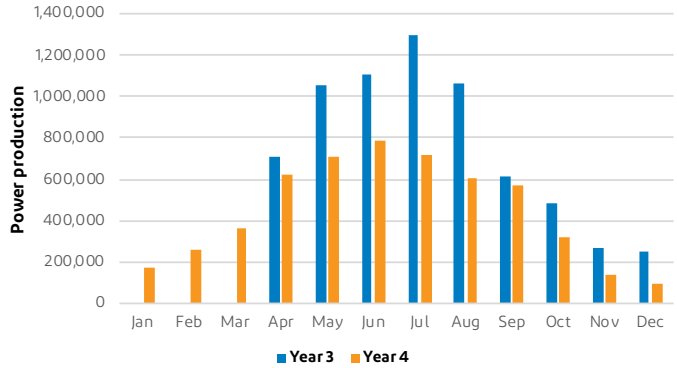
## Passion for precision

A 5.8MW ground-mounted photovoltaic plant was constructed in the UK. On the surface, it looked as though the plant was performing consistently to the expected standards of production. The average monthly performance ratio was approximately 80% in both the third and fourth year of the plant's lifetime.

In a routine check, DuPont consultants discovered discrepancies between the performance ratio reported by the operator and the energy output of the plant. The performance ratio is used to assess the quality of services provided to operate and maintain the plant. It calculates the ratio of the energy received by the plant as measured by the weather stations and the energy produced. An examination of the power data revealed an average power loss of 33% between year 3 and year 4 of operation, peaking at 45% in the month of July. Upon site inspection, DuPont consultants spotted a thermal signature typical of PID, also referred to as the "chessboard pattern."




Before historical analysis




After historical analysis

After careful analysis, DuPont consultants recommended an immediate recalibration of all irradiance sensors and a system fix to recover the power lost through the PID problem. As an additional preventive measure, DuPont consultants recommended annual checks of the weather stations be performed by independent service providers.

## Conclusion

At the PV plant, the irradiance data enables the determination of the expected power output and therefore the determination of any loss of performance. It is crucial that this data be reliable and accurate to reduce the uncertainties on the project's performance. DuPont, backed by decades of experience in the solar industry, can offer a multimodal approach to PV plant issue investigations. DuPont consultants can help you to understand risks linked to monitoring errors, so you can mitigate power losses now and in the future, preserving energy production and protecting financial returns.

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