Monitoring brings your yield killer to light

White Paper - Operation & Maintenance

Why is professional monitoring important?
Identifying risks, avoiding malfunctions, ensuring yields!

Photovoltaic is still a worthwhile investment despite the recent reductions in subsidies! The industry managed the Herculean task of reducing the cost of energy from renewable sources – from photovoltaic in particular – with cost reductions and cost optimizations on the component side, long with construction cost reductions. Yet, despite these savings, the recent reduction in subsidies has a greater impact on a plant's profitability and its return on investment. For this reason, it is the authors' view that it is essential today to have professional monitoring solutions for photovoltaic plants.

Neutral, comprehensive plant monitoring, such as the monitoring platform from Solar-Log™ is indispensable for detecting PV plant damage at an early stage and avoiding yield losses and high costs. Continuous, automated, manufacturer-independent monitoring ensures that a plant operates effectively, producing reliable yields throughout its entire operational life and that the investment pays off.

The research and consultancy group Wood Mackenzie, that has focused on the international PV market for some time now, expects that unplanned repairs at PV plants will cost the industry around the world a staggering 16 billion US dollars over the next five years. Professional PV monitoring helps reduce many of these costs to only those necessary for the maximum operating efficiency rather than the fixed-rate maintenance work that is performed today.

Cable ducts are designed to protect cables from damage; improper installation will cause problems.
Source: Solare Datensysteme GmbH

Downtime and performance variations are detrimental to yields

- Breakdown risks start with the **planning**. Incorrectly sized plant designs, incorrect inverter layouts, less-than-ideal orientations of modules and the lack of current and later shadowing calculations cause reduced yields. These types of problems are rather unfortunate since they cannot be solved at all or only with a great deal of effort. If they cannot be solved, this results in reduced yields over the entire operating life of the plant and often leads to a total economic failure (note: Here it is important to consider the economic aspects and energy side separately).
- Good planning also needs good execution. **Installation** mistakes will result in financial losses. In practice, faulty installation of the components, incorrectly installed connection boxes or poorly laid cabling are common. These lead to technical problems and plant malfunctions or even to technical faults that result in fire in the worst case.
- The **components** installed at the plant can cause other risks for the investment. Statistically, inverters are the first thing to break down before the plant has reached the end of its operating life. Dirt, storm and hail damage, frost and cable damage from rodents, but also disconnections due to poor grid values or too sensitive measuring equipment in the inverter are additional potential causes for reduced yields.

All of these problems can be avoided, quickly detected and even prevented in advance with an open, professional monitoring platform.

Impact of undetected outages

The financial losses caused by problems not detected immediately are often enormous and, in many cases, also lead to larger repairs. This applies to smaller residential plants as well as to larger commercial plants.

Here are some everyday examples. **They prove how quickly the modest investment in a monitoring system pays for itself.**

PV Plant

Total power	5.4 kWp
Inverter power	5.4 kWp
No. of inverters	1
Location	Germany, BW
Feed-in Tariff	0.3405 € / kWh
Plant completion	August 2010

1. An inverter breaks down at a small residential roof system with 5.4 kWp. Tariff rate 0.34 euro/kWh: Every day that the breakdown is not detected results in a financial loss of 10 euros. The loss totals 300 euros when the breakdown is not detected until a month later. A monitoring system would have detected the problem immediately, reducing the downtime to less than a day.

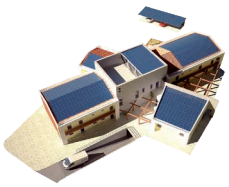
PV Plant

Total power	52.38 kWp
Inverter power (INV 4 + 5)	20.16 kWp
Percentage INV 4 + 5 w/plant	38.5 %
No. of Inverter	7
Performance of invertres	2 x 4, 2 x 6, 3 x 10 kW
Location	Deutschland, BW
Feed-in Tariff	0.3723 € / kWh
Plant completion	June 2010

2. Partial failure at a small commercial plant with 52.3 kWp due to a plant malfunction or damage. Tariff rate 0.37 euro/kWh: The malfunction is not detected until several months later. This means yield losses of well over 1000 euros. Had the malfunction been detected immediately and fixed within 5 days, the downtime would have only resulted in a loss of about 170 euros. The losses in one month here are greater than the investment in a monitoring system that would have prevented such great losses.

PV Plant

Total power	338.59 kWp
No. of inverters	41
Location	Germany, BW
Feed-in Tariff	0.3958 € / kWh
Plant completion	April 2009



3. Complete failure at a large commercial plant with 338.6 kWp. Tariff rate 0.39 euro/kWh: The malfunction is not detected until a months later. This results in yield losses of about 37,800 euros. Had the malfunction been detected immediately by a monitoring system and fixed within 5 days, the total yield losses would have been less than 3,000 euros.

Ensuring yields with professional monitoring

- Monitoring systems and data loggers provide comprehensive plant monitoring.
- Professional monitoring systems learn from data from different plants to make more focused predictions earlier. This may sound like “voodoo” but is in reality nothing more than the application of algorithms with a large data pool than with just self-contained systems.
- Malfunctions and abnormalities in the plant performance are detected precisely and at an early stage.
- Saves time and is easy to use with an online portal.
- Additional functions, such as the comparison of historical plant data, also reveal gradual yield declines.

The ongoing changes in the photovoltaic industry lead to the regular occurrence that component manufacturers disappear and there are no longer any partners to contact.

Here an independent and neutral monitoring system to quickly detect malfunctions is an essential means of safe-guarding investments. Plant operators need not worry when a component manufacturer goes bankrupt as long as they have an inverter-independent monitoring system.

Continuous optimal yields are only possible with professional monitoring. Monitoring has a positive impact on the balance sheet. The modest costs for a manufacturer-independent system that allows for the early detection of malfunctions and problems quickly pay dividends.

Just like the demands placed on photovoltaic increase, so too do the opportunities and possibilities. Professional monitoring platforms such as the Solar-Log™ system keep pace with latest developments and establish future application that can be used independently of the component manufacturers. Smart Energy applications, for example, can already be quickly implemented by such systems regardless of the component manufacturers used.

Another challenge will be coming up with new, future business models that will require more data communication than just from yield and billing meters at the grid connection point. The requirements for data security and the protection of personal data will also increase with the development of digital business models. [cf. Blog contribution: Digitalisierung und Blockchain erhalten Einzug in die PV-Branche; Blog Solar-Log™; accessded on 25 November 2019]