ENERGY AND UTILITIES

Solar PV plants

In a PV plant failures show up by comparison: an inverter or tracker that drifts from its twins under the same sun.

Status: In operation

The five failures that matter

#	COMPONENT AND FAILURE	SIGNALS	TYPICAL WARNING	TENEURO
1	**Inverter**: IGBT power module overheating Thermal cycling and poor cooling stress the power modules and DC-link capacitors. Internal temperatures creep up against load and conversion efficiency drops before a trip.	Internal temperatures against load and ambient, conversion efficiency, derating events, alarm frequency.	Days to weeks.	Partly. Extra temperature points. The main data comes from the inverter logger.
2	**Inverter cooling**: fan and filter failure, derating Clogged filters and worn fans reduce airflow. The inverter runs hotter and derates, losing yield long before it stops.	Internal temperatures against load and ambient, derating events, fan noise and vibration.	Days to weeks.	Yes. Fan noise and vibration, plus extra temperature points.
3	**DC side**: insulation loss, ground faults Damaged cables, moisture and ageing connectors lower insulation resistance until the inverter trips on a ground fault.	Insulation resistance trend measured in the morning, ground-fault alarms, temperature in field combiner boxes.	Days to weeks.	Partly. Temperature in combiner boxes.
4	**Trackers**: actuator and sensor faults Worn gearmotors, faulty angle sensors or lost communication leave rows at the wrong angle. That costs yield every day and risks damage if stow is missed in high wind.	Actual against commanded angle, motor current, travel time, communication losses.	Days to weeks.	Yes. Motor current and vibration where the tracker controller does not expose them.
5	**MV transformer**: overheating Load peaks, high ambient temperature and poor substation ventilation heat oil and windings. Heat ages the insulation and shortens transformer life.	Load current and power, oil or winding temperature, ambient temperature.	Months to years: it is life being used up, not a sudden alarm.	No. Load and temperatures come from the transformer monitor and the plant SCADA.

Also relevant: Strings and modules: hot spots, bypass diodes, PID and accelerated degradation; Soiling and shading losses; Overheating field connectors and string fuses.

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What we usually find in the plant, and how we read it

SYSTEM	VIA	LEVEL	PREREQUISITE
AVEVA PI	PI Web API	**Native**	Read access to the customer's PI server.
Huawei SmartLogger	Modbus TCP, via Teneuro or a gateway	**1-day activation**	
SMA Data Manager, Sungrow Logger	Modbus TCP / SunSpec, via Teneuro or a gateway	**1-day activation**	Logger register map.
Monitoring platforms (meteocontrol VCOM, Power Factors Drive)	REST API	**1-day activation**	API access enabled on the customer's account.
Plant SCADA with OPC UA or SQL	OPC UA or SQL	**1-day activation**	OPC UA or SQL access opened on the SCADA.
Tracker network controllers	Modbus TCP	**1-day activation**	Only where the controller exposes Modbus TCP. Closed controllers are project-based.
Plant SCADA on IEC 60870-5-104 or proprietary protocols	Gateway	**Project-based**	

Where predictive maintenance does not pay off

- Single modules: they are replaced when they fail.
- Small plants without string current measurement.

There, good preventive maintenance costs less. We will tell you before we start.

Standards we work with

IEC 61724-1 — PV performance monitoring: system classes and KPIs such as performance ratio.
IEC 62446-2 — Preventive, corrective and performance maintenance of PV systems.
IEC 62446-1 — Documentation, commissioning tests and inspection of grid-connected systems.
SunSpec Modbus — Open data model for inverters and meters.
ISO 14224 — Taxonomy of components and failure modes behind the Sibilla ontology.

Warning times are indicative orders of magnitude from literature and practice: they depend on the duty profile and are validated on your fleet. Last updated 2026-10-03.

Next step: put your plant forward for a pilot — info@plasmiam.com · https://www.plasmiam.com/en/assets/solar-plants

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