



ALCAP EDUCATIONAL DOCUMENT | SOLAR PV

Solar PV Monitoring and Maintenance

How to protect energy yield, detect faults early, manage warranties, and keep a PV asset safe and available

PV has no fuel bill, but it is not maintenance-free. Monitoring, inspections, planned work, fault response, data quality, and disciplined documentation protect production and reduce lifecycle risk.

WHAT YOU WILL LEARN

- Which PV performance and availability indicators matter
- How monitoring turns alarms and data into action
- What preventive and condition-based maintenance include
- How to organise records, spares, warranties, and service levels

PRACTICAL. INDEPENDENT. DECISION-FOCUSED.

Written for South African commercial and industrial energy users. Prepared July 2026 | Version 1.0

01 | THE ESSENTIALS

Build the right mental model

A good O&M; plan begins at design and handover. Safe access, component labelling, isolation, communications, documentation, spare strategy, and data ownership all determine how quickly a fault can be found and repaired.

Performance monitoring

Compare actual production with an expected value that accounts for available solar resource and operating conditions. Raw kWh alone cannot distinguish weather from equipment underperformance.

Availability and alarms

Track whether the system and each inverter were capable of producing when expected. Prioritise alarms by lost energy, safety risk, recurrence, and warranty impact.

Maintenance strategy

Combine planned inspections and tests with condition-based tasks triggered by data, temperature, insulation, visual condition, soiling, vegetation, or repeated faults.

A USEFUL DAILY QUESTION

Did the system produce what it reasonably should have produced from the solar resource available? If not, isolate whether the gap comes from weather, curtailment, outage, soiling, shading, thermal derating, a component fault, or bad data.

A QUICK REFERENCE

Indicator	What it reveals	Action
Specific yield	Energy per installed kWp	Compare periods/sites carefully
Performance ratio	System losses vs reference	Trend and investigate shifts
Availability	Ability to operate	Prioritise downtime
Inverter variance	Peer underperformance	Inspect affected zone

02 | PUT IT TO WORK

Turn understanding into action

Build a simple operating rhythm: daily exception review, monthly performance report, scheduled inspections, documented fault closure, and annual strategy review.

1**Secure access and baselines**

Confirm owner-level data access, naming, capacities, expected model, and alarm routes.

2**Set thresholds**

Define expected variance, availability, response priority, and escalation based on energy and safety consequence.

3**Inspect and test**

Use planned visual, electrical, mechanical, thermal, cleaning, vegetation, and communications tasks as appropriate.

4**Close the loop**

Record fault cause, repair, parts, downtime, lost energy, warranty status, and post-repair verification.

5**Review lifecycle risk**

Analyse repeat failures, obsolescence, spares, warranty expiry, degradation, and future repowering needs.

ILLUSTRATIVE EXAMPLE: ONE WEAK INVERTER

Site generation appears close to budget, but peer comparison shows one inverter consistently 12% below similar units. A string-level inspection finds a disconnected circuit. Portfolio totals had hidden the local loss.

A GOOD DECISION LOOKS LIKE

- Reports separate resource variance from controllable plant loss.
- Service priorities reflect safety, lost energy, and recurrence.
- Every intervention leaves a traceable record and verified close-out.

03 | CHECKLIST AND NEXT STEPS

Use this before you proceed

- ☐ Confirm owner control of monitoring accounts and data export.
- ☐ Retain as-builts, serial numbers, settings, tests, warranties, and manuals.
- ☐ Define daily alarms and monthly performance indicators.
- ☐ Plan safe inspections, cleaning criteria, vegetation, and drainage checks.
- ☐ Hold critical spares or define reliable lead-time arrangements.
- ☐ Verify performance after every material repair or settings change.

RED FLAGS

- Monitoring stops at total site kWh
- Alarms are sent to an unmonitored mailbox
- Cleaning occurs on a calendar without a soiling or value check
- No controlled record of settings, tests, or warranty claims

PLAIN-LANGUAGE GLOSSARY

Availability	Proportion of relevant time the system is capable of operating.
Specific yield	Energy produced per unit of installed PV capacity.
PR	Performance ratio normalising output against a resource reference.
Soiling	Loss caused by dust or deposits on modules.
Derating	Output reduction caused by temperature or another operating limit.

SOURCES AND FURTHER READING

- NREL - PV and storage O&M; best practices
- NREL - PV system monitoring guidance
- U.S. DOE - Solar energy and storage basics

IMPORTANT NOTE

This document is for general education only. It is not a substitute for a site assessment, electrical design, tariff review, safety study, or professional advice. Use the latest applicable standards, utility rules, municipal requirements, and manufacturer instructions. Work on electrical systems must be performed by suitably qualified and authorised persons.

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