Myth: ‘Microinverters only make sense in shaded conditions.’

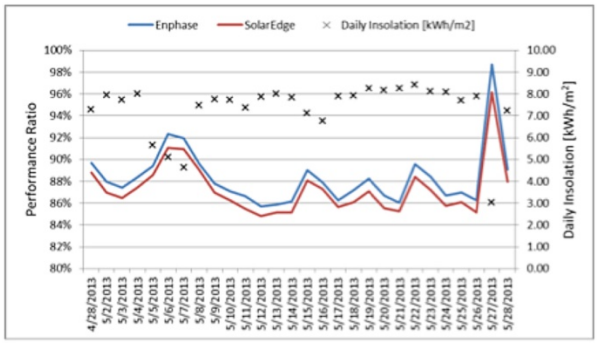
It is common knowledge that microinverters provide a significant advantage in shaded conditions over competing string and central inverter systems. Microinverters optimise the power production from each individual module to deliver maximum energy from the array; If you get shade on a module, it only affects that one particular module. In contrast, with string and/or central inverters, shading on a single module affects all the modules in that array. Does this mean microinverters make sense only in areas affected by shade? Not at all.

Beyond shade, there are a number of other impacts on a solar array that affect the overall performance. Enphase Microinverters minimise losses caused by panel mismatch, degradation, cabling, and external factors like soiling. In full sun or shade, you harvest more energy with Enphase Microinverters.

Higher system uptime

String inverter systems normally lose two percent of their annual output due to inverter outages and maintenance.[1] Enphase systems have monitoring software that can remotely diagnose and fix problems. As a result, expected annual downtime for our microinverter systems is significantly less.

[1] Standard system losses are reported in PVWatts, a modelling program that calculates solar production based on string inverter specifications.



Consistently better performance in all conditions compared to DC optimisers

Minimising Losses

In string inverter systems, module mismatch leads to system-wide inefficiencies because they are limited by the output from the weakest module in the chain. With Enphase’s distributed architecture, modules operate independently so that no single module can drag down other modules. Soiling caused by dirt or snow on one module does not affect the others. In addition, with the Enphase Microinverter System, there is no need to connect modules and inverters with long runs of DC cabling, where energy is lost.

Production in low-light conditions

In low-light conditions, the Enphase Microinverter’s Burst Mode allows panels to come on earlier in the morning and turn off later in the day, which allows the system to maintain highly efficient operations during low-light conditions. This feature has been shown to add an additional energy harvest of 0.5% - 1.0% over time.

To learn more about the Enphase Microinverter System, visit **enphase.com/au**

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The numbers are the proof

Module shading has little to do with the principal advantages of Enphase Microinverters. The real benefits are **more efficient energy conversion and a system design that minimises performance problems.**

Standard system losses

No photovoltaic system converts 100 percent of direct current (DC) into alternating current (AC) for the grid. Losses occur because of several factors such as inverter inefficiency, module mismatch and resistance in the electrical wires.

PVWatts, a widely used modelling tool for solar system performance, assumes that systems with string inverters convert 77 percent of DC power to AC power.

Adjustments with Enphase

PVWatts lets system designers adjust power conversion rates based on local site conditions, system design, and components. Enphase Microinverter Systems exhibit above-average inverter efficiency, and they reduce or eliminate standard system losses.

After accounting for Enphase adjustments, total project efficiency in PVWatts rises to 87 percent.

What about shading?

The default assumption in PVWatts is that new solar systems are not affected by module shading. But, we all know that in practice, shading affects many operating solar systems. When it does, Enphase helps by recovering about half the performance losses due to shade.

DERATE CATEGORY	STRING INVERTER CONVERSION RATE	ENPHASE M250 MICROINVERTER CONVERSION RATE
Module mismatch	0.980	0.995*
Array soiling	0.950	0.970
System availability	0.980	0.995*
DC wiring	0.980	0.990*
Inverter and transformer efficiency	0.967	0.957**
Total Derate Factor (Project Efficiency)	**0.769**	**0.87**

* Note: These values do not include an additional 1.3% increase for Enphase Microinverters due to limits on the PVWatts input values. For example, DC wiring is not used in Enphase systems so the DC wiring derate factor is closer to 1. However, PVWatts does not allow the DC wiring derate factor to be higher than 0.99.

** Conversion rates shown here are based on EU efficiency for representative string inverters and the Enphase M250™ Microinverter.

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