



Performance of Partial Shaded PV Generators Operated by Optimized Power Electronics

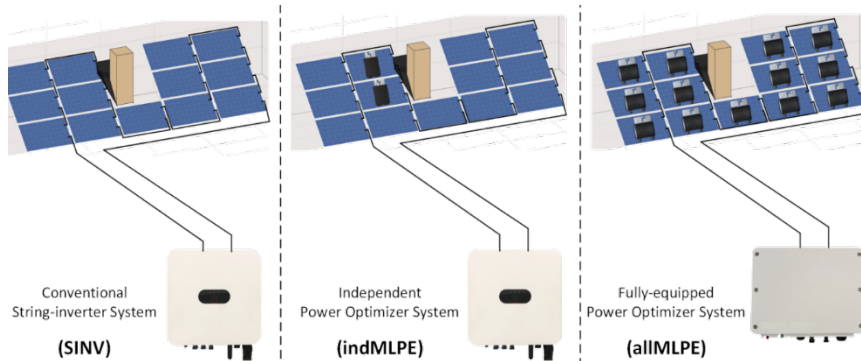
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Performance of Partial Shaded PV Systems



Introduction

- The Evolution of PV Technology from String Inverter – Optimiser – Hotspot-free PV module
- Fair manufacture data sheet values missing
- Challenges in PV planning and recommendation of the most efficient power electronic system topology



PVPS Performance of Partial Shaded PV Generators Operated by Optimized Power Electronics 2024

This report provides insights on partial shading and power electronics for maximizing PV system performance.

Performance of Partial Shaded PV Systems



Insufficient Manufacturer Data Sheets

- Manufactures only show best case eff. →
- Real efficiency lower by typical 1 to 2.5%

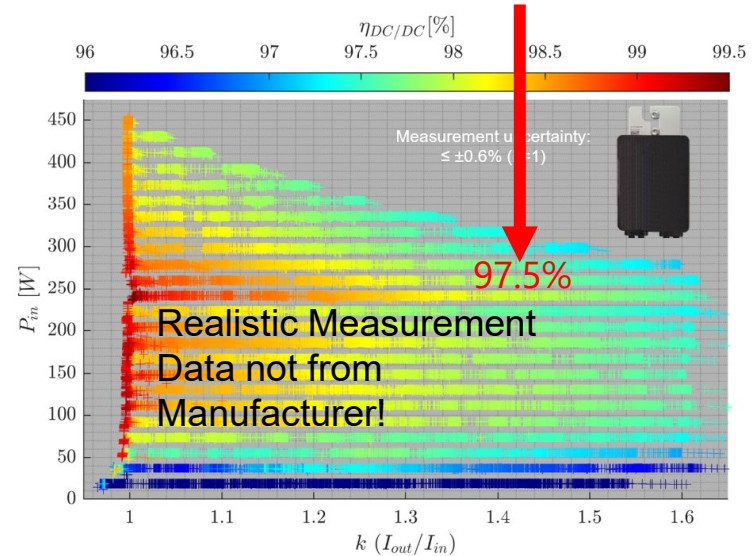
Baised System Recommendation

- Optimiser not always the most efficient choice

Insufficient PV Comm. Simulation Tools

- Using only best case efficient of optimiser
- Have not implemented the complex calculation of the individual operating points of the optimiser

Technical Manufact. Specifications	SUN2000 -450W-P
Maximum efficiency	99.5%
European weighted eff.	99.0%



Performance of Partial Shaded PV Generators



The study has identified several key areas where improvements are needed:

- Urgent call to optimiser manufacturers to finally provide realistic efficiency data, standards
- Cost analysis of replacement of optimiser including craftsman compared to string inverter

Optimizing PV Plant Design

- Collaborative Efforts for Improved PV Planning:
Website information of typical shading conditions and exact annual performance, transfer research findings to commercial PV design software
- Extension of the recommendations in the Task 13 report to improve performance such as for the efficient power electronic system choice together with new hotspot-free PV modules and optimum distance from module to shading objects based on exact annual performance simulations

Shading Scenarios			PV Module	Power Electronic Systems		
Shading degree	Objects	Modules affected	Type	SINV	indMLPE	allMLPE
Weak		<10%	Standard	+	+	-
			4+ Bypass diode	+	+	-
Medium		>10% and <40%	Standard	0	+	+
			4+ Bypass diode	+	+	+
Strong	Buildings, trees	>40%	Standard	-	0	+
			4+ Bypass diode	0	+	+