

How to Choose: AC vs DC Coupling in Solar + Storage

Published: 2025-09-10 | MARWELL SOLAR Blog

Adding storage to a solar plant forces one fundamental design choice: connect the battery on the AC side or the DC side? Neither is universally better - but one is usually better for your project. Here is how to decide.

The basics

Solar panels and batteries both speak DC; buildings and the grid speak AC. DC coupling connects the battery before the inverter - one hybrid inverter manages PV and battery together. AC coupling gives the battery its own inverter and connects it alongside the existing PV inverter.

Efficiency

DC coupling converts energy fewer times: solar DC charges the battery directly, reaching round-trip efficiencies of up to 97-98%. AC coupling converts DC->AC->DC->AC, typically landing around 90-94%. Over 15 years, that gap is real money.

Retrofit reality

If the site already has solar, AC coupling wins almost every time: the battery bolts on beside the existing inverter with no rewiring of the PV array. DC-coupling an existing plant usually means replacing the inverter - expensive and disruptive.

Flexibility and redundancy

AC-coupled systems mix inverter brands, place the battery far from the array, and keep producing solar power even if the battery inverter fails. DC-coupled systems are simpler, cheaper for new builds, and excel off-grid where every efficiency point matters - but the single hybrid inverter is a single point of failure.

The decision

- New build, maximum efficiency, off-grid? -> DC coupling.
- Retrofit, brand flexibility, site constraints? -> AC coupling.
- Large C&I or utility scale? -> containerized AC-coupled blocks dominate for their modularity and maintainability.

Need help choosing? MARWELL SOLAR's engineering team models both architectures against your load profile and tariff, then delivers the pre-integrated system that fits - AC block, DC block or hybrid.

Ready to discuss your project? Contact us: info@marwellsolar.com