

Selection Guide for Upgraded Active Photovoltaic Modules for Photovoltaic Power Plants



Article Overview

Selecting upgraded active PV modules requires balancing efficiency, reliability, cost, and integration with active power management systems to optimize long-term performance and energy yield.

Key Considerations for Module Selection

1. **Module Technology and Efficiency** Modern PV modules include heterojunction (HJT), bifacial, and tandem perovskite-silicon cells, with commercial efficiencies reaching up to 25% and laboratory demonstrations exceeding 34% . Bifacial modules can generate 10-20% additional energy by capturing reflected light, while HJT modules offer superior temperature performance and lower degradation rates. Selection should consider real-world performance, which typically achieves 75-90% of Standard Test Conditions (STC) ratings due to temperature effects, soiling, and irradiance variability . 2. **Quality Standards and Certification** Adherence to Solar Module Quality Standards (SMQS), such as VDE SPEC 90038-1, ensures modules meet technical, production, and documentation requirements . These standards provide checklists for production monitoring, testing procedures, and risk assessment, helping to minimize operational failures and ensure long-term reliability. 3. **Reliability and Manufacturer Verification** Modules for utility-scale plants are expected to last 25 years or more. Using modules from approved manufacturers listed in government or regulatory databases, such as the ALMM (Approved List of Models and Manufacturers), ensures...

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