Assessing the Reliability of Battery Systems in Solar Power Plants in Operation.
运行中光伏电站电池系统可靠性评估

As photovoltaic systems are increasingly combined with battery energy storage systems (BESS), understanding their long-term performance and reliability is becoming essential. A new report published by IEA PVPS Task 13 examines how the operational performance of PV + BESS can be assessed and monitored to support more reliable, efficient and cost-effective energy systems.
近日，国际能源署 IEA PVPS Task 13 最新发布的一份报告，研究了如何对光伏+电池储能系统（PV+BESS）的实际运行性能进行评估与监测，助力构建可靠性更高、效率更优且具备成本优势的能源系统。

The report, Assessing the Reliability of Battery Systems in Solar Power Plants in Operation, provides an overview of common battery technologies, typical PV + BESS applications and practical methods for evaluating system performance in operation. It also presents field experience from residential installations, demonstrating how operating conditions, system design and use case influence battery ageing and overall system performance.
该报告题为《运行中光伏电站电池系统可靠性评估》，系统概述了常见的电池技术、典型的 PV+BESS 应用场景，以及评估系统实际运行性能的实用方法。报告同时分享户用储能项目实地运行经验，阐明了运行条件、系统设计和应用场景如何影响电池老化及系统整体性能。

"PV + BESS performance in the field is driven by far more than battery chemistry alone. This report shows that system topology, inverter behaviour, control logic, operating profile, temperature and firmware all materially shape efficiency, degradation, end-of-life estimation and dispatch reliability." – Ulrike Jahn, IEA PVPS Task 13 Manager
“PV+BESS 的现场运行性能绝不仅由电池化学体系决定。该报告表明，系统拓扑结构、逆变器运行特性、控制逻辑、运行曲线、温度以及固件等因素，都会对系统效率、性能衰减、寿命终止时间估算和调度可靠性产生实质性影响。”——IEA PVPS Task 13 负责人 Ulrike Jahn

Key takeaways
主要结论

The performance, reliability and lifetime of PV+BESS depend on technology, use-case and environment. Battery chemistry and design, system topology, control strategy and duty jointly shape degradation behaviour and end-of-life outcomes.
PV+BESS 的性能、可靠性和使用寿命取决于技术类型、应用场景及运行环境。电池化学体系与设计、系统拓扑结构、控制策略和运行工况共同决定系统的老化特征及寿命终止状态。

A robust assessment of PV+BESS should be based on six core performance indicators. Capacity, power tolerance, internal resistance, round-trip efficiency, response time and standby losses provide a practical basis for state-of-health assessment, fault detection and ageing-aware operation.
对 PV+BESS 开展稳健评估，应以六项核心性能指标为基础。容量、功率容差、内阻、往返效率、响应时间和待机损耗，可为电池健康状态评估、故障检测以及充分考虑老化因素的系统运行提供切实可行的依据。

Field evidence shows substantial gaps between nominal and real-world performance of PV+BESS. Results from residential inspections and case studies reveal wide variation in efficiency, inverter losses, state-of-charge estimation, cell balancing quality and temperature or firmware effects. This underscores the need for harmonised monitoring, high-quality open data and validated ageing models to enable reliable, cost-optimal deployment of PV+BESS.
现场数据表明，PV+BESS 的标称性能与实际运行性能之间存在显著差距。户用项目巡检与案例研究结果显示，不同系统在运行效率、逆变器损耗、荷电状态估算、电芯均衡质量以及温度和固件影响等方面存在较大差异。这进一步凸显了建立统一协调的监测体系、获取高质量开放数据以及构建经过验证的老化模型的重要性，从而实现 PV+BESS 的可靠部署与全生命周期成本优化。