

Li-Ion Battery Systems in Off-Grid Applications 2025

《锂离子电池系统在离网应用中的实践》

IEA PVPS Task 18 has published a new technical report, titled “Li-Ion Battery Systems in Off-Grid Applications” .

国际能源署 IEA PVPS Task18 最新发布技术报告《锂离子电池系统在离网应用中的实践》。

The report provides a comprehensive overview of how lithium-ion (Li-ion) batteries are reshaping off-grid PV systems and improving access to reliable, sustainable energy in remote regions. Today, around 770 million people worldwide still live without electricity, with off-grid and edge-of-grid PV systems emerging as key solutions for affordable and reliable electrification. As renewable generation expands, battery energy storage systems (BESS) have become central to ensuring reliability, resilience, and energy security.

该报告全面阐述了锂离子电池如何重塑离网光伏系统格局，并推动偏远地区获得可靠、可持续的能源保障。目前全球仍有约 7.7 亿人口无电可用，离网与弱网光伏系统正成为实现经济可靠电气化的关键解决方案。随着可再生能源发电规模的扩大，电池储能系统已成为保障供电可靠性、系统韧性及能源安全的核心要素。

This new IEA PVPS report presents a detailed analysis of Li-ion technology for PV-based off-grid systems, including technical performance, system classification, simulation studies, and operational recommendations. It also compares Li-ion and lead-acid technologies across a range of applications – from small solar home systems to large hybrid mini-grids.

本报告针对光伏离网系统中的锂离子技术展开深度剖析，涵盖技术性能指标、系统分类标准、仿真研究案例及运营维护建议。从小型太阳能户用系统到大型混合微电网的多应用场景对比，系统评估了锂离子电池与铅酸电池的技术差异。

Key highlights from the report:

1、Li-ion batteries are now economically viable for large off-grid PV systems in the megawatt range, offering higher efficiency, longer lifetimes, and lower total costs than lead-acid batteries.

兆瓦级大型离网光伏系统中，锂离子电池已具备经济可行性，相较铅酸电池具有效率更高、

寿命更长、总成本更低的综合优势。

2、System size determines the best technology: Li-ion performs best in very small and very large systems, while lead-acid can still be more economical in mid-sized applications.

系统规模决定技术选型：锂离子电池在超小型和超大型系统中表现最优，而铅酸电池在中型应用中仍具经济性。

3、Long-term success depends on proper design, monitoring, and maintenance, including trained local operators, remote system supervision, and lifetime service contracts.

长期成功运营取决于专业设计、实时监测与规范维护，需配套培训本地操作人员、建立远程监控体系及全生命周期服务合约。