



RTE (Round-Trip Efficiency) Test Report

Document Information

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1. Executive Summary

This report presents the results of Round-Trip Efficiency (RTE) testing conducted on a plug-and-play balcony energy storage system. The test was performed in accordance with international standards including IEC 62933-2:2022 and VDE-AR-E 2510-50 to ensure accuracy and compliance. The measured RTE value demonstrates the product's high energy efficiency under typical residential operating conditions.

2. Test Objective

The primary objective of this test is to accurately measure the AC-AC round-trip efficiency of the balcony energy storage product under typical household scenarios. Round-trip efficiency (RTE) is defined as the ratio of energy output during discharge to energy input during charging, expressed as a percentage:

$$\text{RTE} = (E_{\text{discharge}} / E_{\text{charge}}) \times 100\%$$

This metric is crucial for evaluating the economic viability and performance of energy storage systems, particularly for residential applications where energy arbitrage is a key benefit.

3. Reference Standards

The test procedure and reporting format adhere to the following internationally recognized standards:

Standard	Title
IEC 62933-2:2022	Electrical energy storage (EES) systems - Part 2: Unit parameters and testing methods
VDE-AR-E 2510-50:2021	Application rule for grid connection of plug-in electricity storage systems with rated power \leq 600 W
GB/T 36558:2018	General technical requirements for electrochemical energy storage system for power system

4. Test Equipment and Setup

All measurements were conducted using calibrated precision instruments in a controlled laboratory environment maintained at $23 \pm 2^\circ\text{C}$ and $50 \pm 10\%$ relative humidity.

Equipment	Specification
High-Precision Power Analyzer	Class 0.2S accuracy for energy measurement
Programmable AC Source/Load	0.5% accuracy, 2.4kW capacity

5. Test Procedure

The test procedure followed these key steps in accordance with IEC 62933-2:2022 Section 5.5.2:

1. Initial discharge of the unit to minimum allowable state of charge (SOC)
2. Rest period of 2 hours to stabilize internal battery conditions
3. Full charging cycle at rated power with energy measurement
4. 30-minute rest period after charging
5. Full discharging cycle at rated power with energy measurement
6. Calculation of RTE from measured energy values

6. Test Results

The following table summarizes the comprehensive results of the data from three charge-discharge cycle tests.

Cycle	Charge Energy (kWh)	Discharge Energy (kWh)	RTE (%)
1	0.454	0.363	79.96
2	0.699	0.587	83.98
3	1.186	1.028	86.68
4	1.670	1.454	87.06
5	2.374	2.042	86.02

Illustration:

