

Phocos Any-Cell ESS-L-5kWh-48V Third Party Testing

Testing Data



Phocos Product: Any-Cell-ESS-L-5kWh Energy Storage system

Chemistry: LiFeP04

Test Laboratory: ReJoule Energy

Test Standard: IEC 61427 Part 1 Batteries For Renewable Energy Storage - Off-Grid Application

Test Temperature: 40 °C

Testing Period: January – July 2022

Summary

Third party testing to international standards are an important method for manufacturers to independently validate the real-world performance of their products. By proactively testing products under the challenging operating conditions associated with an off-grid solar electric system, manufacturers can confidently offer their customers greater overall product and system reliability.

Phocos enlisted ReJoule Energy to test and confirm the Any-Cell-ESS-L-5kWh Energy Storage system's rated capacity after undergoing simulated off-grid cycling conditions at high ambient temperatures in order to assure customers of the products anticipated performance in the field.

The Testing Process

The purpose of the test was to accelerate the cycling of the Phocos Any-Cell-ESS-L-5kWh battery and simulate the conditions of typical battery operation in an off-grid solar system application. The test plan was based on the IEC 61427-1 standard which determine the impact on capacity after cycling at an elevated temperature of 40°C. The series of charge-discharge cycles simulate real-world off-grid solar applications. ReJoule Energy applied these duty cycles to the battery consistently with minimal rest time according to the IEC standard.

ReJoule also conducted Reference Performance Tests (RPTs) at regular intervals in order to monitor changes in the rated battery capacity over time. The RPTs were performed every 50 cycles according to the IEC 61427-1 test standard.

To meet to the IEC 61427-1 testing standard, a battery needs to be at or above 80% of the original rated battery capacity after 3 IEC standard cycles.

One IEC Standard Test Cycle is meant to simulate one year of service life in an off-grid solar application by subjecting the battery to a mix of cycles at both high and low SOC.

One IEC Standard Cycle = one series of stage A cycles at low SOC + one series of stage B cycles at high SOC

Each testing phase described above consisted of 50 Stage A cycles and 100 Stage B cycles.

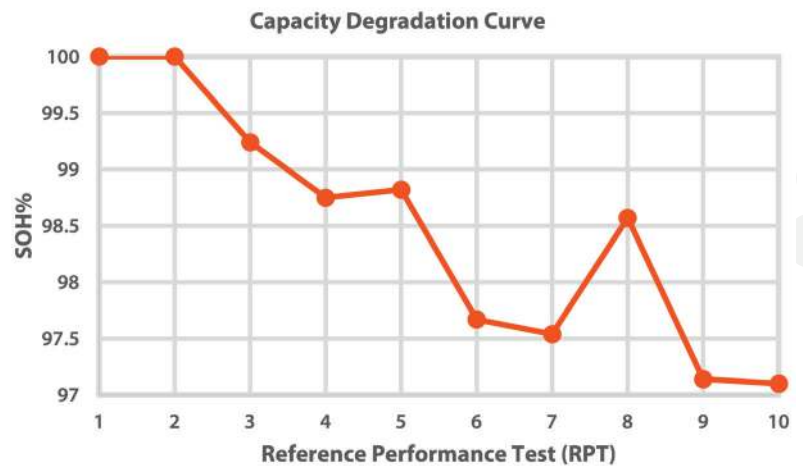
- **Stage A** is a succession of charge and discharge cycles between 40% - 10% State Of Charge (SOC).
- **Stage B** is a succession of charge and discharge cycles between 100% - 75% SOC.

Stage A Low State Of Charge Cycling			
Step	Discharge Time (hrs)	Charge Time (hrs)	Current (A)
(a)	9		I_{10}
(b)		3	$1.03 I_{10}$
(c)	3		I_{10}
Repeat steps (b) and (c) 49 times, then proceed to Phase B			

Stage B High State Of Charge Cycling			
Step	Discharge Time (hrs)	Charge Time (hrs)	Current (A)
(a)	2		$1.25I_{10}$
(b)		6	I_{10}
Repeat steps (a) and (b) 99 times more			

Results

To meet the IEC 61427-1 standard a battery must provide 80% of its original rated capacity left at the end of the testing process. The test results show the degradation of the Any-Cell-ESS-L-5kWh is relatively linear at 2.9% total capacity reduction after completing (3) IEC Standard Cycles according to the IEC 61427-1 standard.



Conclusion

After 3 standard IEC cycles, the Phocos Any-Cell-ESS-L-5kWh maintained 97% of the original rated capacity, far surpassing the IEC testing standard minimum requirement of 80%.

ReJoule Energy's results verify that the Phocos Any-Cell-ESS-L-5kWh Energy Storage System has minimal degradation under extreme operating conditions, offering Phocos customers long service life.

