PVEL
MAKE DATA MATTER.

Energy Storage Product Qualification Program (PQP)

The Energy Storage PQP reduces project risk, assesses operational asset performance, and provides crucial system-level data to ensure project life and economic expectations are met.

Storage PQP Benefits

- Identifies and validates battery-based energy storage solutions for specific applications.
- Offers a consistent and robust approach for assessing commercially available technologies, chemistries, and capabilities of energy storage solutions.
- Provides optimal battery management system (BMS) limits to promote the lifetime needs of the product.
- Supports data-driven procurement strategies of project developers, system integrators and asset owners.

Who We Are

PVEL is the leading independent test lab of the downstream solar and energy storage industry. Our bankability testing and data-driven reports connect manufacturers with a global network of PV and storage equipment buyers and investors that represent over 30 GW of annual buying power.

What are PQPs?

As the latest addition to our flagship PV module and inverter PQPs, PVEL's storage program provides equipment buyers, system integrators and power plant investors with independent, consistent reliability and performance data to support implementation of an effective supplier management process. It also offers unbiased recognition of battery cell manufacturers' product quality and durability. The comprehensive program consists of both cell-level and system-level testing, ensuring a thorough evaluation and validation of reliability and performance.

The test matrix has been adapted from the automotive industry and incorporates tests specifically aligned with the degradation modes of today's commercially available products. We continually improve our test program so that it addresses evolving technologies and field behavior of batteries and energy storage solutions.

Factory Witness and Test Sequence

Factory witness is a key component of every PVEL PQP, including storage. All bills of materials (BOMs) submitted for testing are witnessed and thoroughly documented in production.

Once the BOMs arrive at our laboratories after factory witness, they are tested in the same manner, using consistently calibrated equipment in controlled laboratory environments. The PVEL Storage PQP matrix consists of a series of cyclic and calendar aging tests at the battery cell and system level.

The cell matrix comprises 40 individual tests to characterize performance, as well as degradation caused by:

- Charge rate
- Differential depth of discharge
- Average resting state of charge
- Temperature
- Throughput

The system-level evaluation includes 18 tests designed to map system response across a wide range of operational conditions. Tests focus on the battery, inverter and BMS to evaluate system capabilities. The testing assesses behaviors such as:

- Product derating
- Cycle fatigue and cell balancing
- Validation of cell exposure
- Inverter interactions
- System-level functionality

Capacity tests and detailed monitoring are also conducted to track trending field performance.

Why PQP Matters

Each test sequence in our PQP replaces assumptions about battery and energy storage system degradation, performance and reliability with empirical data that can help buyers optimize revenue and energy yield models.

Additional Storage Testing Services

Supplementary to the storage PQP, PVEL offers inverter and storage system field testing (ITC compliance and commissioning oversight), burn and safety testing (UL 9540A and UL 1973, small- and large-scale destructive), failure analysis (investigation and root cause), and customized product-specific evaluations.

For more information about Storage PQP and other testing, contact:
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