



## e-STORAGE Power Block

### Utility Scale Energy Storage Solution

**e-STORAGE Power Block** is an integrated system solution, developed for utility-scale storage solutions, and stands at the core of a Battery Energy Storage System (BESS) optimized for cost, performance, and bankability. This best-in-class solution provides a direct medium voltage AC interface, MV transformer, inverter, battery enclosures, controls, and communication. These storage solutions are extremely versatile integrated energy storage system platforms.

The e-STORAGE Power Block can operate in grid-tied mode to perform peak demand reduction, PV peak shifting, and many other grid services. Units can be paralleled directly on the MV side to provide utility-scale power output to GWh scales. Our meticulous product design and stringent quality control ensure our products deliver high efficiency and reliability. Our accredited in-house testing facilities guarantee all components meet the highest quality standards possible.

#### KEY FEATURES

- Modular design options for flexible site layout and the highest energy density
- Vertically integrated solution with certified building block
- Comprehensive performance and availability guarantee
- Long Term Service Agreements and full Warranty Wrap
- Best fire safety with LiFePO4 battery
- Intelligent thermal management systems
- Rated at Medium Voltage Interface
- Outdoors rated (-30 to 55°C)

#### PRODUCT CERTIFICATIONS

UL9540, UL9540A, UL1741 SA-SB, UL1973, NFPA72, NFPA69, IEC62619, IEC61000, IEC62477, IEC62933, UN38.3, UN3536\*

\*Listed certifications are provided per requirements of specific market and project requirements

**ELECTRICAL SYSTEM OVERVIEW**

|                                    |  |
|------------------------------------|--|
| <i>Rated Duration</i>              | 1.5 to 4+ hours  |
| <i>Rated Useable Capacity (DC)</i> | From 2.8 MWh to 16.8+ MWh  |
| <i>Rated AC Output Voltage</i>     | 10/22/33/34.5 kV   |
| <i>Rated Output Frequency</i>      | 50/60 Hz   |
| <i>Power Factor</i>                | -1 to 1  |
| <i>Current THD</i>                 | <5%  |
| <i>AC Disconnection Type</i>       | Stick Operated Disconnected Standard<br>(RMU optional)                                   |
| <i>Topology</i>                    | Turnkey MV Skid<br>(Battery Enclosure, Inverter, MV Transformer, and AC Protection Skid) |
| <i>Round-trip Efficiency (AC)</i>  | 90% (BOL)<br>87% (Yr20)  |

**MECHANICAL SYSTEM OVERVIEW**

|                                    |  |
|------------------------------------|--|
| <i>Weight</i>                      | 24,400 – 30,000kg for each Battery Enclosure<br>13,000 – 16,000kg for each PCS+MV skid |
| <i>Protection Degree</i>           | Outdoor rated<br>Nema 3R (UL)  |
| <i>Cooling</i>                     | Liquid+Air Cooled Battery Enclosure<br>Forced Air Inverter                             |
| <i>Operating Temperature Range</i> | -20 – 50°C (Rated Power)<br>-20 – 55°C (w. derating)                                   |
| <i>Storage Temperature Range</i>   | -20 – 45°C   |
| <i>Operating Humidity</i>          | ≤95%   |
| <i>Operating Altitude</i>          | 2000m<br>(derating above 2000m)  |
| <i>Installation Type</i>           | Pad-mount  |

**CONTROL AND MONITORING**

|  |  |
|--|--|
| <i>Communication Protocol</i>            | Modbus TCP (Between components in e-STORAGE Power Block)   |
| <i>Communication Interface</i>           | Web-based local UI (Performance history, remote control, alerts)   |
| <i>Battery Management System (BMS)</i>   | Monitors battery status to cell level in real time, including temperature, voltage, power level, operating limits, faults and alarms   |
| <i>Battery Control Interface (BCI)</i>   | Control inverter and battery, coordinate behaviors between these components and support interface for control of individual Power Block  |
| <i>Energy Management System (EMS)</i>    | Monitors status of all BESS equipment, support monitoring, O&M, fault management, analysis<br><br>Allow service team to read and analyze operating data of the equipment, to optimize system health and identify issues from early stage |
| <i>Response Time</i>                     | 1s response time guaranteed as standard<br><br>Optional fast response time down to 150ms with fast metering  |
| <i>Utility Grid Dispatch Integration</i> | Configurable and customizable control and monitoring options for variety grid dispatch requirements  |

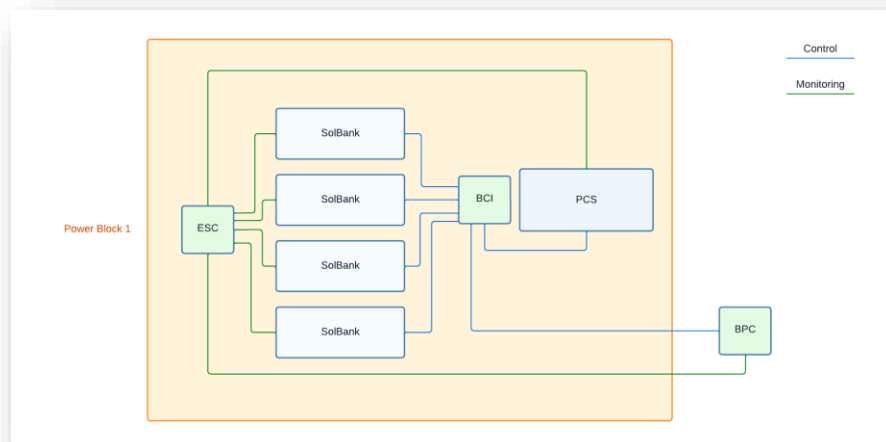


Figure 1 Power Block Communication Schematic Example

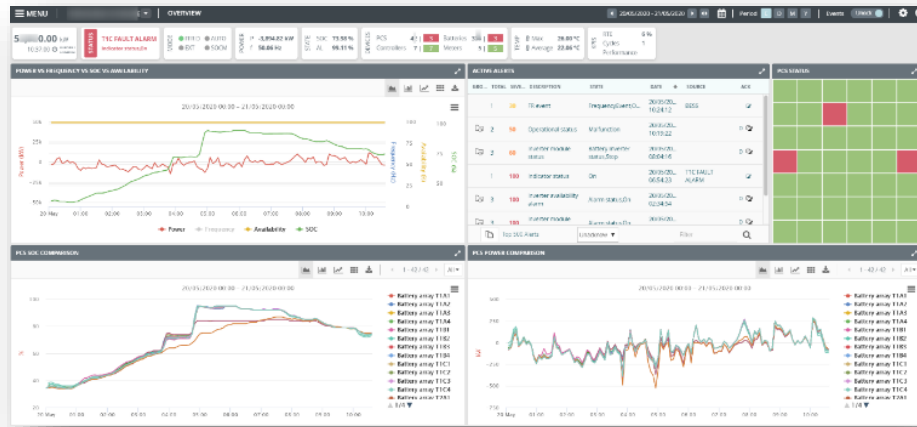


Figure 2 EMS Interface Example

**SITE LEVEL INTEGRATION AND SERVICES**

|                                       |  |
|---------------------------------------|--|
| <i>Optional EPC and EPCM Services</i> | Tailored for the most pragmatic and cost-effective contracting structure, act as the single point-of-contact |
| <i>Layout Design</i>                  | Customized site layout design  |
| <i>Size Study</i>                     | Project level size study optimizing number of equipment  |
| <i>BESS Integration</i>               | Proven integration with core BESS components passing integration test before                                 |
| <i>Load-Flow Study</i>                | Site level <i>load-flow study</i>  |
| <i>Short-Circuit Study</i>            | Site level AC and DC short-circuit study   |
| <i>Arc-Flash Study</i>                | Site level AC and DC arc-flash hazard study  |

**FIRE SAFETY DESIGNS**

|                                      |  |
|--------------------------------------|--|
| <i>Battery Enclosure Fire Safety</i> | Fire propagation verification from cell, module to unit level based on the latest UL 9540A                       |
| <i>Heat Flux Analysis (HFA)</i>      | Installation level Heat Flux Analysis (HFA) with CFD heat modeling for verification of layout per project design |

|   |  |
|---|--|
| <i>Battery Enclosure Explosion Prevention</i> | Gas detection, active ventilation per NFPA69 with CFD gas modeling evaluation. Linked action with BMS, battery system, inverter in Power Block   |
| <i>Fire Detection and Alarm</i>               | <p>Integrated multi-level fire detection, alarming, with smoke and heat sensors, for timely fire detection and linked actions with other system components</p> <p>Optional interface for quick connection with site level master fire alarm panel</p> <p>Optional 24*7 monitoring for early-stage fault detection and remote emergency support</p> |
| <i>Fire Safety Training</i>                   | Onsite and remote first responder training for AHJ and O&M teams   |

**CUSTOMIZABLE LONG-TERM SERVICE AGREEMENT (LTSA)**

|                                |  |
|--------------------------------|--|
| <i>Warranty Management</i>     | Wrapped product warranties of major equipment            |
| <i>Performance Guarantee</i>   | Track operations at BESS level                           |
| <i>Augmentation Scheme</i>     | Available and customizable to improve capacity over time |
| <i>O&amp;M Service</i>         | Dedicated 24/7 NERC/FERC compliant monitoring facility   |
| <i>Decommissioning Service</i> | Covering your project need towards end of life           |