

ATTACHMENT 2  
EQUIPMENT SPECIFICATIONS



# Eaton xStorage battery energy storage system (BESS)

## 250 to 1000 kWh usable stored energy

### Versatile energy storage for commercial and industrial applications

The demand for power, and variation in the demand, continues to increase due to end-user loads and electrification, including the proliferation of new machinery, DC charging and AI-based chips. Battery energy storage systems (BESSs) play an important part in creating a compelling next-generation electrical infrastructure that encompasses microgrids, distributed energy resources (DERs), DC fast charging, Buildings as a Grid and backup power free of fossil fuels for buildings and data centers. A BESS can store and supplement power needs to keep utility loads relatively uniform based on utility supply and end-user demand.

The xStorage BESS optimizes energy usage and enables energy transition with support for energy storage, EV integration and grid modernization. The ability to avoid peak usage rates from utilities helps reduce energy costs for businesses, government and military agencies, schools, industrial plants and healthcare facilities. If utility power is interrupted, the BESS can provide environmentally friendly backup to reduce dependence on generators.

### Key features

#### Versatile energy storage

- xStorage BESS holds 250 to 1000 kWh of usable stored energy (279 to 1117 kWh of installed energy).
- The BESS includes a control cabinet with auxiliary transformer, a power conversion system (PCS) and up to three battery cabinets (with six or eight battery modules in each cabinet).

#### Flexible installation

- Modular installation maximizes available space (control cabinet, PCS and battery cabinets can be individually placed).
- Enclosures mount directly onto an outdoor concrete pad without the need for an additional container and air conditioning.

#### Liquid-cooled PCS and battery cabinets

- PCS and battery cabinets have self-contained liquid cooling to deliver more precise temperature regulation than an air-cooled BESS.
- Lithium iron phosphate batteries are maintained within two to three degrees Celsius of their ideal operating temperature for minimal maintenance and improved reliability and uptime.

### Energy functions

#### Energy optimization

- Peak shaving – During times of peak demand, stored energy can be used to help avoid penalties from the utility.
- Time-of-use optimization – Energy consumption is shifted to avoid peak usage and optimize battery charge/discharge times. During the day, stored energy is used to offset peak demand, saving money on utility fees. Batteries charge at night when demand is lower and utility power is less expensive.

#### Uninterrupted operation

- Backup power – Enables islanding capability to protect against downtime due to utility outages.
- Solar self-consumption – Allows efficient use of on-site generation sources, like solar panels, and storage of the excess energy for later use.

#### Grid stabilization

- Demand response – If the utility company requests a reduction in power use, stored energy can replace utility power to avoid penalties.
- Aggregation services – The BESS can be aggregated with other distributed energy resources and managed by a higher-level site controller to optimize energy usage and gain financial benefits from participating in energy markets.

### Why choose xStorage BESS?

#### Specialized management features maximize system uptime

- Embedded Global Stored Energy Controls (GSEC) hardware provides mission-critical accuracy to optimize energy usage.
- Eaton's Brightlayer software suite enables remote monitoring and management.
- The xStorage BESS is optimized for predictive 24x7 monitoring and management service to proactively identify component risks, reduce downtime and expedite critical alarm response.

#### Expert service and support

Full support is available from quotation to startup and beyond.

- 24x7 call center support with dispatch
- Service plans from extended warranty to response-time-based agreements
- National network of 300+ highly trained field service engineers to support startup and provide technical support, maintenance and service
- Service engineer vehicles stocked with common spare parts
- Centralized spare parts warehouse with overnight shipping capability



Powering Business Worldwide

## Technical specifications



Control cabinet with 480/208V auxiliary transformer



Power conversion system (PCS)



Battery cabinet



Battery cabinet (interior view with 8 battery modules)

BESS rating	
Power rating	250 to 1000 kW
Energy rating	250 to 1000 kWh
AC characteristics	
Nominal voltage (+/- 10%)	480 VAC 3Ph/3W
Aux power	208 VAC 1Ph
Max fault current allowed from AC source	180 kAIC
Power factor	100% active to 100% reactive
Input current distortion	<3%
Peak efficiency	98.8%
Overload (@ 40°C (104°F) and >65% full load)	116% for 5 min.; 120% for 3 sec.
DC characteristics	
DC voltage (nominal)	761 to 1200 VDC
DC voltage (maximum)	720 to 1500 VDC
Minimum battery voltage	1.65 x nominal VAC
Max fault current allowed from DC source	180 kAIC
Battery cabinet (each)	
Battery type	Lithium iron phosphate
Battery voltage	1165 to 1498 VDC
Rated energy	373 kWh
General characteristics	
Ambient temperature (operating)	-20°C to 50°C (-4°F to 122°F), derating >40°C (104°F)
Ambient temperature (storage)	-40°C to 60°C (-40°F to 140°F)
Humidity	5 to 95% non-condensing
Protection	NEMA type 3R (IP54)
Cooling (PCS/Battery cabinets)	Liquid cooled (self-contained)

General characteristics (continued)	
Cooling (Control cabinet)	Air cooled (self-contained)
Audible noise	<75 dBA @ 3 m
Altitude (max)	1000 m @ 40°C (104°F) without derating
Installation	Pad mount or skid mount
Dimensions and weight (480V system)	
Control cabinet	53.5" w x 58.5" d x 68.9" h / 1014 lb.
PCS	39.9" w x 64.6" d x 87.6" h / 3173 lb.
Battery cabinet (each)	50.9" w x 51.6" d x 89.8" h / 7830 lb.
Available modes of operation	
Peak shaving, time-of-use optimization, demand response, backup power, islanding, solar self-consumption, aggregation services	
References	
System	UL 9540
Power conversion system	UL 1741 SA, SB
Battery	UL 1973, UL 9540A
Other	ISO9001
Communications	
Modbus TCP/IP	
Service	
Startup	Standard
24x7 dispatch call center for service needs	Standard
User remote monitoring and control	Standard
Service plans (remote or onsite)	Optional
Predictive analytics remote monitoring and service	Future

Due to continuous improvement programs, all specifications are subject to change without notice.

For more information, visit [Eaton.com/xStorageBESS](https://Eaton.com/xStorageBESS) or contact your Eaton sales representative.



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# xStorage battery energy storage system (BESS) FAQs

- **What kind of upstream isolation transformer is recommended?**

A 480V-480V double-shielded isolation transformer with Wye (primary) – Delta (secondary) is recommended. The transformer is required to meet IEEE 1547.4 standards for maintaining the grounding scheme on an island system, preventing or limiting conducted emissions and reducing noise transmission for DC ground fault detection.

- **Can xStorage BESS function as a UPS and generator replacement?**

The BESS can perform intentional islanding (i.e. maintaining the load when disconnected from the grid). However, BESS systems are open transition and do not provide fast switching in the way that UPS systems do and should not be viewed as a UPS replacement. If uninterrupted power is required, a UPS should be used in conjunction with the BESS to support the critical loads.

- **Can the BESS handle load management based on the discharge percentage of the battery?**

There is no ability to set or change the peak shaving limit based on the battery state of charge (SoC). However, this could be supported through Modbus map if a higher-level control system can read the SoC from the BESS and modify the peak shaving limit.

- **Can I monitor the state of discharge (SoD) so load management can be performed through a third party or Eaton microgrid controller?**

Yes

- **If there is an outage, how does the BESS get control power?**

There is an internal UPS in the control cabinet to provide backup to the communication and monitoring functions if utility power is lost.

- **Can I monitor each battery cell through an energy management system (EMS)? What data is available?**

Right now only aggregate information for the system is available. Details can be found in the Modbus map.

- **What capabilities does the xStorage BESS offer for logging operational alarms, alerts and operational events, both locally and in the cloud?**

The xStorage BESS logs all faults, warnings and events of the system locally and displays immediate alarms and current operational events in the customer's remote monitoring web interface. The local storage has a running 6 GB capacity and will hold more than a week's worth of data, or even multiple weeks of data, depending on the number of battery racks.

- **Is xStorage BESS seismic rated?**

xStorage BESS is seismic certified to AC156 Sds @ 2.0 G by seismic analysis.

- **What design features are available to mitigate fire issues related to NFPA 855? What related alarms are available?**

In the very unlikely event of an emergency causing battery thermal runaway or smoke or fire detection, the system has the following protections:

- The control cabinet has an integral fire area control panel. The panel is programmed to initiate the battery's fire suppression system when it receives critical alarms detecting gas or smoke. The fire suppression system releases a fire suppression agent (Novec 1230 Fire Protection Fluid), which protects the battery cabinet from thermal runaway.
- The fire alarm mounted to the control cabinet is wired to the fire control panel and automatically signals when critical alarm contacts are energized.
- Upon receiving a critical alarm signal from the batteries (smoke/fire detection), the system will immediately notify a pre-determined contact at a local fire station and send a notice to the customer through the remote monitoring web interface.

- **What monitoring systems are in place to sense emergencies and automatically shut down the BESS?**

The inverter and battery racks independently monitor and self-protect in the event of a critical fault or warning. The stored energy controller adds a layer of monitoring and protection that will shut down the BESS upon loss of signal, fault or critical battery failures (smoke/fire detection). The system inherently cannot operate without a "heartbeat" signal from the components, so loss of communication will shut down the system and will NOT cause blind energy services. The system has local disconnect methods as well, including an emergency E-stop on the front door of the inverter that terminates all energy services and prevents power flow.

- **Does xStorage BESS meet Buy America?**

The control cabinet and PCS are Buy America compliant. The BESS integrated system is TAA compliant (the batteries are sourced from outside the United States).

- **What is the BESS battery life expectancy?**

The xStorage BESS system has a design life of 10 years. A 100% to 5% depth of discharge at one cycle daily will result in 12+ years of life. For multiple partial discharges per day, ambient temperature and depth of discharge will affect battery degradation. Life expectancy of the system will vary based on usage scenarios.

For more information, visit [Eaton.com/xStorageBESS](https://Eaton.com/xStorageBESS) or contact your Eaton sales representative.

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