

Microgrid

Energy Time Shift & Energy Capacity Expansion



Image shown may not reflect actual configuration.

Cat[®] Energy Time Shift (ETS) & Energy Capacity Expansion (ECE)

570 – 1000 kW
1518 – 9108 kWh
60 Hz 480 & 600 Volt
50 Hz 400 Volt

The Cat[®] ETS and ECE modules are scalable and rapidly deployable energy storage system. The energy storage system integrates with solar or other renewable sources to store energy from the overproduction of the renewable source for use when the renewable source is not available. Cat energy storage systems provide temporary backup power to facilities in the event of a power outage.

FEATURES

Reliable, Modular and Scalable

The Cat ETS and ECE modules are robust and consist of pre-engineered containers that are easily installed on site. Multiple energy storage modules may be operated in parallel to provide increased power output and/or increase the battery energy capacity. Installed modules allow optimized genset operation.

Renewable Integration

The energy storage modules are designed to work with an array of renewable systems, including solar and wind. Seamless integration with the Cat[®] Microgrid Master Controller (MMC) allows for maximum renewable penetration and full asset control. The onboard multi-mode Cat[®] Bi-Directional energy storage inverter is capable of grid forming allowing generator set(s) to be completely switched off, further reducing fuel consumption and operating costs.

Grid Stabilization

The ETS module also protects against many typical power problems, voltage sags/surges, and under/over frequency conditions.

Cat Bi-Directional Energy Storage Inverter

The Cat BDP1000 inverter is the core to the energy storage system. Based on technology developed for Cat electric drive machines, the Cat BDP provides exceptional reliability, durability and features that include:

- Controls for the charging and discharging of the energy storage equipment.
- 2 per unit fault current capability
- Static VAR compensator
- Four-quadrant output power factor control

- Dual parallel control of two inverter halves
- Patented nonlinear droop for tight control of voltage and frequency
- Seamless mode transfer
- Automatic anti-islanding
- Grid forming, grid firming, and grid following modes
- Autonomous mode or Remote-Control mode
- Parallel ready – multiple modules may be used in parallel to increase total output up to 100+MW

Energy Storage

- Advanced lithium-ion batteries provide energy density, high discharge/recharge efficiency, and long cycle life

Standard Equipment

- Cat BDP1000 bi-directional energy storage inverter
- Energy storage batteries
- Color HMI touchscreen
- CSC certified ISO High Cube container
- Remote communications via Modbus TCP
- HVAC system to maintain optimal interior temperatures
- Convenience receptacles
- Fire suppression system

Applications

- Time shifting of energy from renewables, genset or utility
- Renewable smoothing
- Peak shaving
- Grid firming/grid stabilization
- Generator set transient assist
- Facility backup
- Reserve power capacity










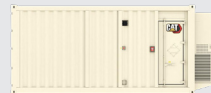
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Product Scalability

The ETS1500 contains the Cat BDP1000 bi-directional energy storage inverter with a fixed number of batteries and support equipment. The ETS1500 may be installed

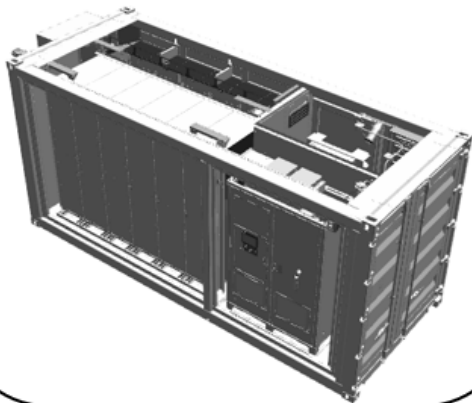
and operated alone or in combination with up to three (3) ECE1500, ECE2000 or ECE2500 modules for increased energy capacity and discharge duration.

Total Energy Capacity	Continuous Power Rating	Energy Time Shift (ETS)	Energy Capacity Expansion (ECE)		
1.5 MWh	570 kW	ETS1500 			
3.0-4.0 MWh	1 MW	ETS1500 	ECE1500/2000/2500 		
4.5-6.5 MWh	1 MW	ETS1500 	ECE1500/2000/2500 	ECE1500/2000/2500 	
6.0-9.1 MWh	1 MW	ETS1500 	ECE1500/2000/2500 	ECE1500/2000/2500 	ECE1500/2000/2500 

Modular Configuration

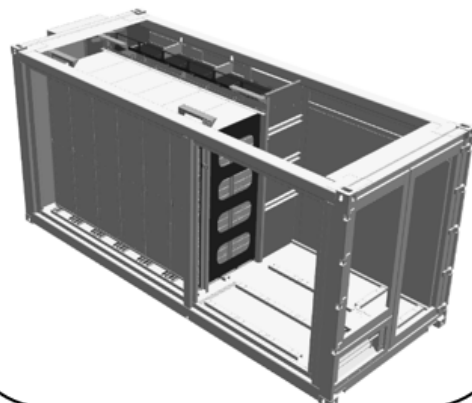
Energy Time Shift (ETS)

- BDP Inverter with liquid cooling
- 6 Racks of batteries
- HVAC for batteries
- Fire suppression
- Transformer



Energy Capacity Expansion (ECE)

- 6, 8 or 10 Racks of Batteries
- HVAC for batteries
- Fire suppression



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Technical Specifications*

Model		ETS1500		ECE1500	ECE2000	ECE2500
Module Output						
Maximum Continuous at 1.0 PF Energy (Nameplate Start of Life)	kW kWh	‡570 15 18	1000	– 1518	– 2024	– 2530
Number of Battery Racks	qty	6		6	8	10
Energy Type		Li-Ion – Energy		Li-Ion – Energy		
Battery Chemistry		NMC		NMC		
Type		High Energy		High Energy		
Inverter Model		BDP1000		–		
Number of Inverters		1		–		
Isolation Transformer	Pri/Sec	r-Delta/Y-Wye		–		
Number of Transformers		1		–		
Output Voltage	50 Hz 60 Hz	400 VAC 480 & 600 VAC		– –		
Output Voltage THD		<3%		–		
Ambient Temperature Capability	°C	-25 to +40 (+50 with power de-rate/ rest period)**		-25 to +40 (+50 with power de-rate/ rest period)**		
Altitude	mASL	2000**		2000**		
Average Parasitic Load						
At 0°/40°C in Standby Operation (0% Load)	kW	2.0/4.0	2.0/4.0	2.0/4.0	2.0/4.0	2.0/4.0
At 0°/40°C in Continuous Operation (0% Load)	kW	33.0/36.0	33.0/36.0	33.0/36.0	33.0/36.0	33.0/36.0
Shore Power Connection	V (50 Hz) V (60 Hz)	400V 50 Hz 480V 60 Hz		400V 50 Hz 480V 60 Hz		
Features						
Microgrid Stabilization		Yes		–		
Patented Non-Linear Drop Control		Yes		–		
Seamless Mode Transfer		Yes		–		
Islanding Detection		Yes		–		
Grid Forming		Yes		–		
Four Quadrant Power Factor Control		Yes		–		
Static VAR Compensator		Yes		–		
2 Per Unit Fault Current Capability		Yes		–		
Reserve Power Capacity		Yes		–		
Plug-and-Play Parallel Ready		Yes		–		
Energy Storage Management		Yes		–		
Human-Machine Interface		Yes		–		
Fire Suppression System		Yes		Yes		
Communications Protocols		Modbus TCP/IP		Modbus TCP/IP		

¥ – Ensure compatibility of all microgrid equipment by referring to A&I guides (or equivalent) for generator sets, BDP inverters, PV inverters, switchgear, and controls. Contact your local Cat dealer for assistance selecting compatible equipment.

‡ – Power is limited due to available energy content.

* – Consult factory for additional options such as additional voltages and cold weather operation.

** – Consult factory for power de-rate and rest period recommendation.

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Applicable Codes and Standards

- UL 1973
- UL 9540 Ed1
- UL 9540 Ed2 (pending)
- CSC Certified
- 2014/35/EU LVD
- 2014/30/EU EMC
- 2011/65/EU RoHS
- UN38.3
- EC60204-1

Note: Reference component spec sheets for additional codes. Codes may not be available in all model configurations. Please consult your local Cat Dealer for availability.

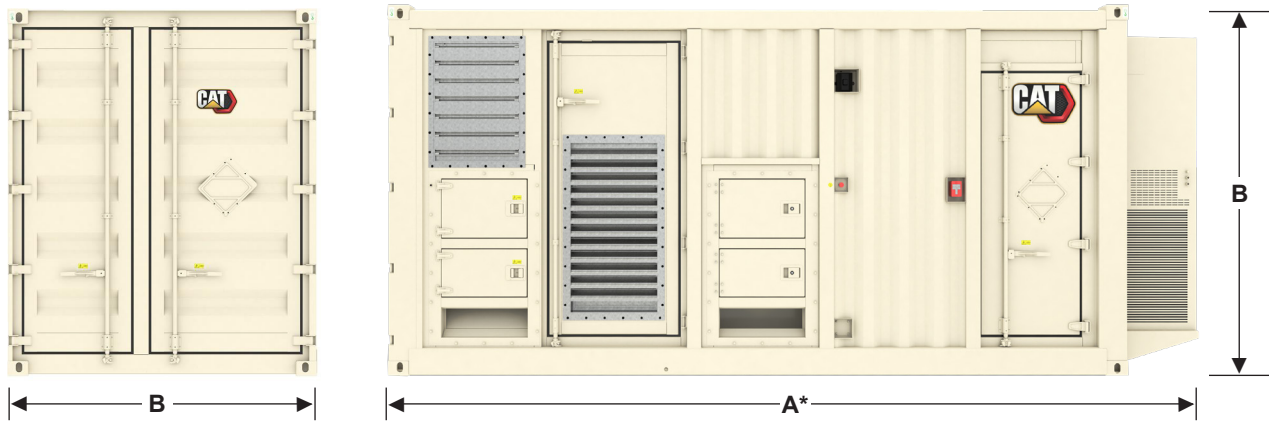
Remote Monitoring (Sold Separately)

The Cat® Connect telematic device and an active subscription to Cat Connect are required for battery warranty. The internet connection provides real time monitoring of the performance and health of the battery and installation. If an issue is detected, local technicians can be dispatched to resolve the problem.

Worldwide Product Support

- Cat dealers provide extensive post-sale support including maintenance and repair agreements.
- Cat dealers have over 1,800 dealer branch stores operating in 200 countries.

Weights and Dimensions



	ETS 1500	ECE1500	ECE2000	ECE2500
A – Length, m (ft)	6.75 (22.13)	6.75 (22.13)	6.75 (22.13)	6.75 (22.13)
B – Width, m (ft)	2.4 (8)	2.4 (8)	2.4 (8)	2.4 (8)
C – Height, m (ft)	2.8 (9.5)	2.8 (9.5)	2.8 (9.5)	2.8 (9.5)
Weight (Approximate), kg (lbs)	18,725 (41,282)	16,325 (35,990)	19,693 (43,416)	23,061 (50,841)

Note: Do not use for installation design. See general dimension drawings for detail. Dimensions are dependent on selected options.
* Without A/C module length 6.06 m or 19.87 ft.

www.cat.com/electricpower

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