



ENERGY STORAGE UNITS CONTAINER TYPE

Factors creating the need to use energy storage devices

Electrifying everything - moving towards electricity as the main source of energy

Industrial growth and population growth lead to increased demand for electricity

An ever-growing number of electric vehicles can increase peak loads, putting more strain on the electrical grid

Growth of electricity consumption growth



Transport electrification

Renewable energy growth



Diffusion of Smart Grid Technology

Energy systems and industry are moving towards generating electricity from renewable energy sources such as solar and wind

Energy sources dependent on external factors reduce the stability of the grid

Smart Grid - an electrical grid that collects, distributes and uses information about the behavior of all components to improve the efficiency, reliability, economy and sustainability of electricity services

Bi-directional energy flow requires coordination between supply and demand

POWER SYSTEM STATE

Energy storage increases the efficiency of the power system at every level



Accumulation of energy obtained during peak generation for use during periods of peak consumption



Smoothing the output voltage parameters and controlling the power ramp rate (MW / min or kW / min)



Ensuring smooth integration of renewable energy sources into the grid by reducing variability in the distribution of generation and consumption peaks



Reducing consumption peaks, thereby reducing the load on generating and network equipment



Providing infrastructure support as the load increases with electric vehicles



Autonomous power supply of fast EV charging stations



Maintaining the balance of generation and consumption



Support for commercial and residential loads during power outages



Power system resource monitoring, Smart Grid implementation



Compensation of peaks and dips in the contact network of electric vehicles

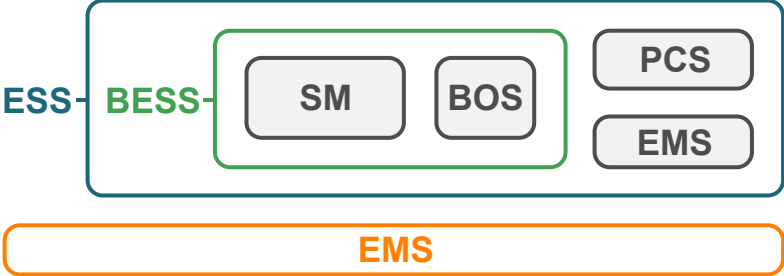


Grid support function

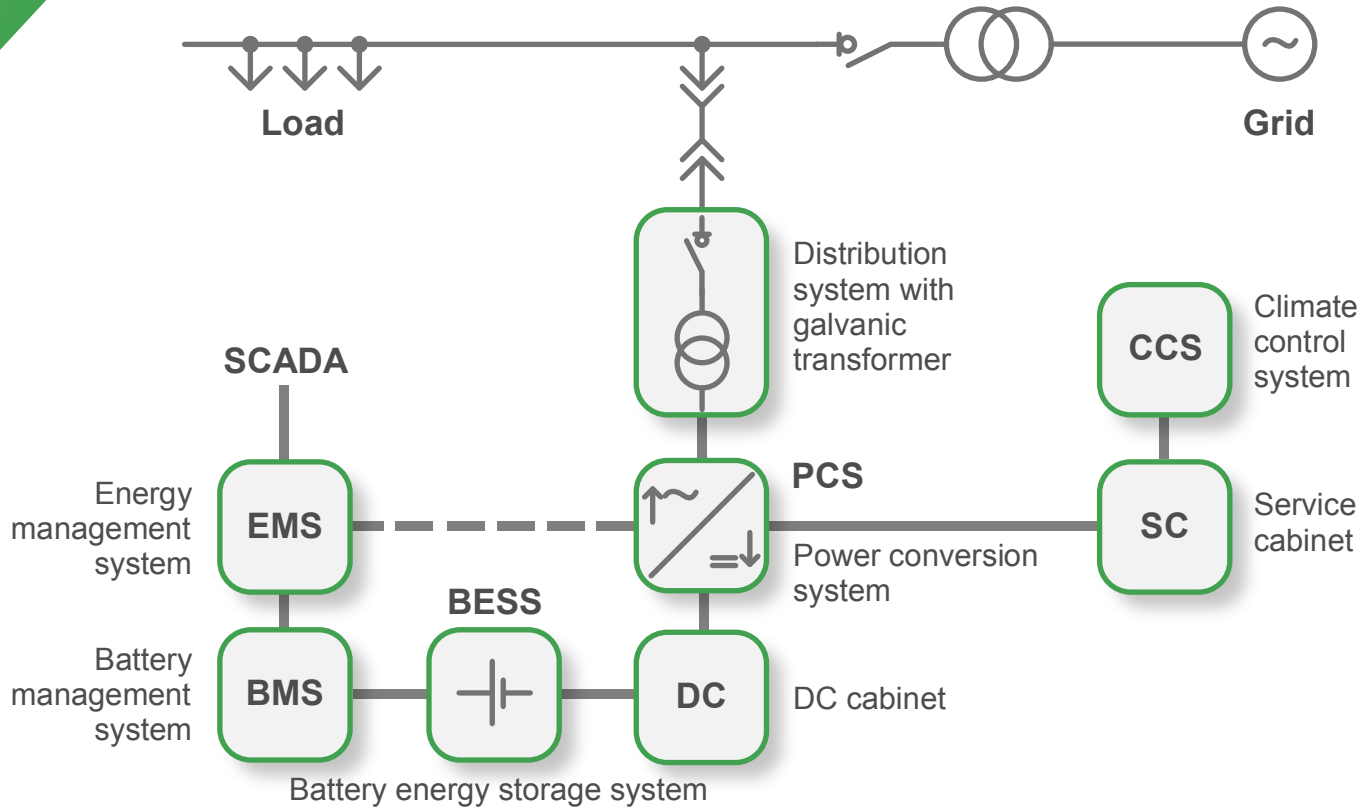
Symbols and abbreviations

Abbreviation	Explanation
AC	Alternating current
BC	Battery cabinet
BESS	Battery energy storage system
BMS	Battery management system
BOS	Balance of system
CCS	Climate control system
DB	Distribution board
DC	Direct current
DMS	Data management system
EMS	Energy management system
ESS	Energy storage system
FSS	Fire safety system
HVAC	Heating, ventilation and air conditioning
IC	Incomer cabinet
INV	Inverter module
MDB	Main distribution board
OFC	Outgoing feeder cabinet
PCS	Power conversion system
PLC	Programmable logic controller cabinet
SC	Service cabinet
SCADA	Supervisory control and data acquisition
SM	Storage module

Solution structure



Functional diagram of energy storage





Standard container
(10/20/40-feet)

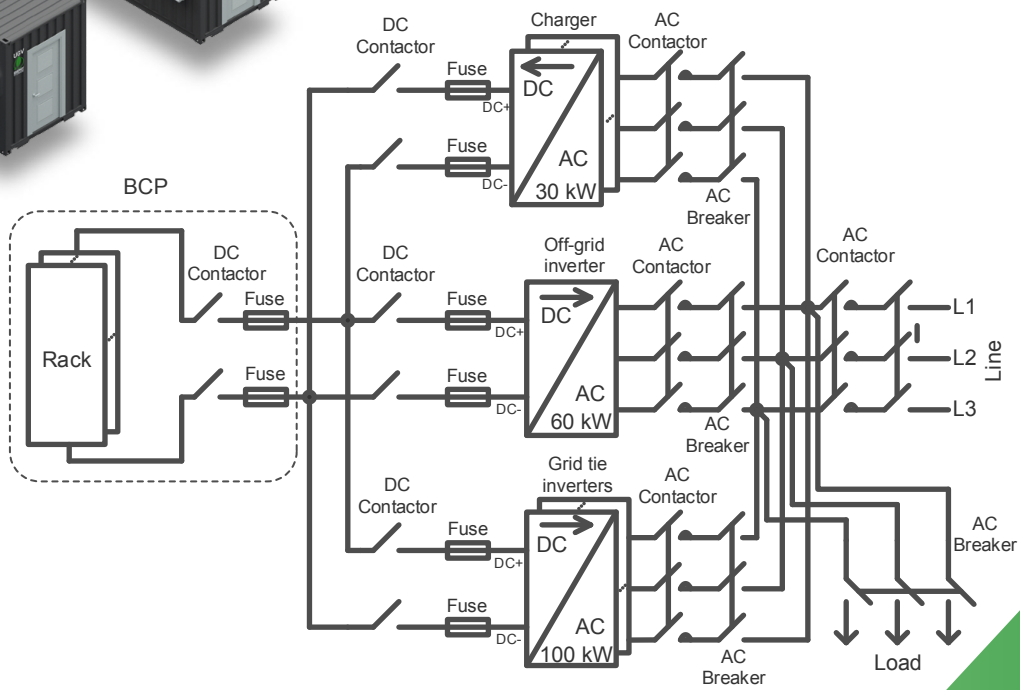
Reliable
inverter
modules

Lithium-ion
Battery
Modules

Control system
with PLC and
operator panel

Switching and
distribution
cabinet

Cooling and fire
extinguishing
system



Typical electrical diagram of the solution

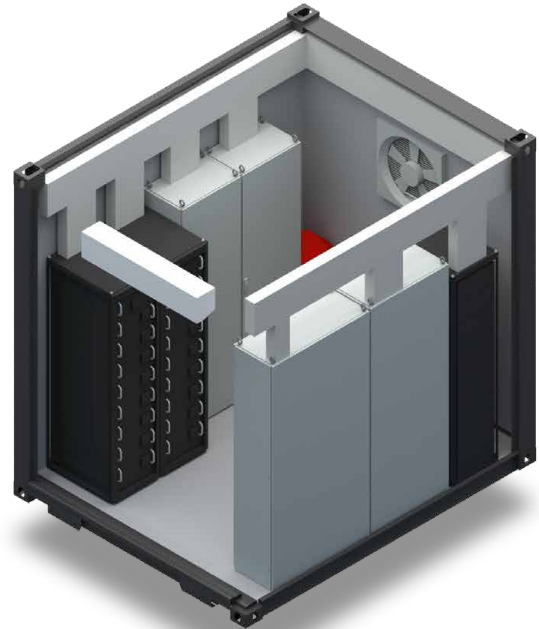
Energy storage container type with rated power up to PCS200kW / BESS213 kWh



Properties of the system

- from 100 to 200 kW system power and up to 213 kWh energy reserve in batteries in a 10-foot container

- Containerized system solution including control system and batteries
- Installation flexibility and minimal footprint
- Suitable for peak switching, frequency regulation and microgrid applications



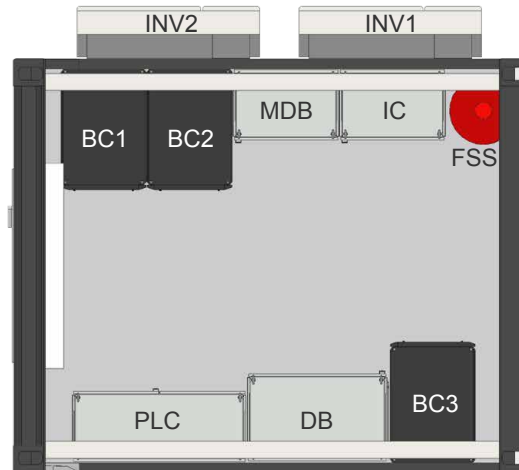
Formation of order number

Sample order number		ESS-	200	-	2	-	3	-	2	-	1	-	1
Frame size (maximum power PCS)	200 kVA (50 Hz)		200										
PCS power (discharge)	0 kVA				0								
	100 kVA				1								
	200 kVA				2								
BCP capacity	71 kWh						1						
	142 kWh						2						
	213 kWh						3						
PCS power (charge)	40 kVA								1				
	80 kVA								2				
Off Grid mode	without										0		
	20 kVA										1		
	Other power (special order)										Z		
DC load connection	without the possibility of connecting to the DC tire												0
	with the ability to connect to the DC tire												1

Energy storage container type with rated power up to PCS200kW / BESS213 kWh

Equipment placement

example at maximum filling



№	Parameter	Value
DC side		
1	Total energy reserve BESS (Battery Energy Storage System) (kWh)	71...213
2	DC voltage limits (V)	614 - 803
3	Cell capacity (Ah)	100
4	Energy reserve in the cell, (kWh)	8.88
5	Cell rated voltage (V)	88.8
6	Number of cells in a rack (pcs)	8
7	Rack Energy (kWh)	71
8	Number of racks (pcs)	1...3
9	BMS communication protocol	CAN2.0A
AC side		
10	Rated power PCS (Power Conversion System) (kW)	100...200
11	Maximum power (kW)	100...220
12	Rated current (A)	160...352
13	Rated voltage (V)	380
14	Rated frequency (Hz)	50
15	Operating frequency limits (Hz)	45 - 55
16	Operating voltage limits (V)	342 - 418
17	Adjustable range of power factor	0.8 leading ... 0.8 lagging
18	Max. Total Harmonic Distortion (%)	< 3
Charger		
19	Charger power (kVA)	40...80
20	Charging time (h)	2...3
General information		
21	Battery life (h)	до 10
22	Protection class	IP54
23	Fire alarm	Provided
24	System overall dimensions (WxHxD) (mm)	2438x2591x2991
25	System weight (t), including container, gross	5
26	Control system protocols	CAN2.0A, Ethernet, RS485, PROFINET
27	System cooling type	Forced air
28	Max. height above sea level (m)	2000
29	Ambient operating temperature (°C)	-25 ... +50
30	Ambient temperature during transport and storage (°C)	-50 ... +80
31	Operating relative atmospheric humidity (%)	0 - 95

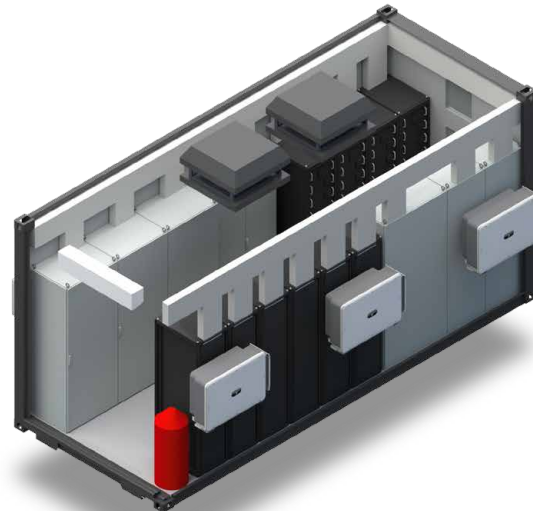


Energy storage container type with rated power up to PCS600kW / BESS639 kWh

Properties of the system

- Installation flexibility and minimal footprint
- Suitable for peak switching, frequency regulation and microgrid applications

- from 100 to 600 kW system power and up to 639 kWh energy reserve in batteries in a 20-foot container
- Containerized system solution including control system and batteries



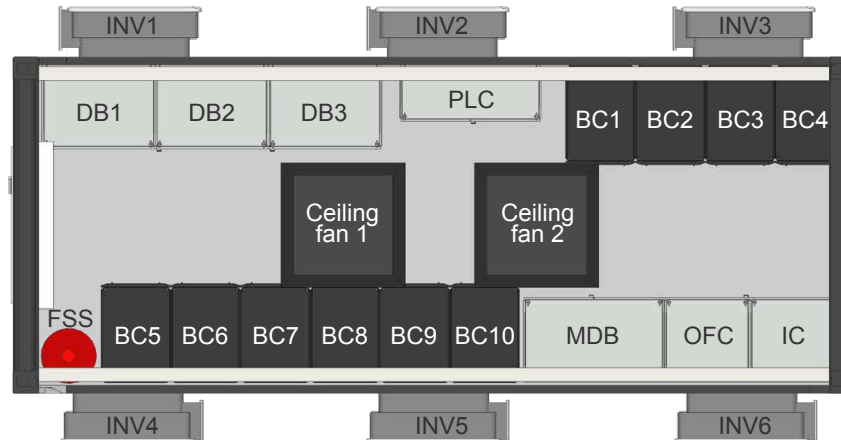
Formation of order number

Sample order number	ESS-	600	-	6	-	9	-	6	-	1	-	1
Frame size (maximum power PCS)	600 kVA (50 Hz)	600										
PCS power (discharge)	0 kVA											
	100 kVA											
	200 kVA											
	300 kVA											
	400 kVA											
	500 kVA											
Capacity BESS	600 kVA											
	213 kWh											
	426 kWh											
	639 kWh											
PCS power (discharge)	710 kWh											
	40 kVA											
	80 kVA											
	120 kVA											
	160 kVA											
	200 kVA											
	240 kVA											
Other power (special order)												
Off Grid mode	without											
	20 kVA											
	Other power (special order)											
DC load connection	without the possibility of connecting to the DC tire											0
	with the ability to connect to the DC tire											1

Energy storage container type with rated power up to PCS600kW / BESS639 kWh

Equipment placement

example at maximum filling



No	Parameter	Value
DC side		
1	Total energy reserve BESS (Battery Energy Storage System) (kWh)	71...710
2	DC voltage limits (V)	614 - 803
3	Cell capacity (Ah)	100
4	Energy reserve in the cell, (kWh)	8.88
5	Cell rated voltage (V)	88.8
6	Number of cells in a rack (pcs)	7
7	Rack Energy (kWh)	71
8	Number of racks (pcs)	1...10
9	BMS communication protocol	CAN2.0A
AC side		
10	Rated power PCS (Power Conversion System) (kW)	100...600
11	Maximum power (kW)	100...620
12	Rated current (A)	160...993
13	Rated voltage (V)	380
14	Rated frequency (Hz)	50
15	Operating frequency limits (Hz)	45 - 55
16	Operating voltage limits (V)	342 - 418
17	Adjustable range of power factor	0.8 leading ... 0.8 lagging
18	Max. Total Harmonic Distortion (%)	< 3
Charger		
19	Charger power (kVA)	40...240
20	Charging time (h)	3...7
General information		
21	Battery life (h)	до 35
22	Protection class	IP54
23	Fire alarm	Provided
24	System overall dimensions (WxHxD) (mm)	2438x2591x6058
25	System weight (t), including container, gross	7
26	Control system protocols	CAN2.0A, Ethernet, RS485, PROFINET
27	System cooling type	Forced air
28	Max. height above sea level (m)	2000
29	Ambient operating temperature (°C)	-25 ... +50
30	Ambient temperature during transport and storage (°C)	-50 ... +80
31	Operating relative atmospheric humidity (%)	0 - 95

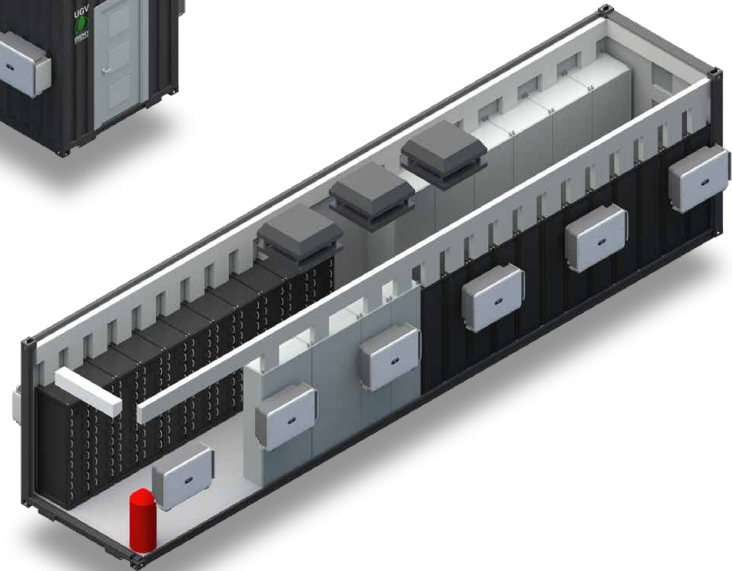
Energy storage container type with rated power up to PCS1200kW / BESS1704 kWh



Properties of the system

- from 100 to 1200 kW system power and up to 1704 kWh energy reserve in batteries in a 40-foot container

- Containerized system solution including control system and batteries
- Installation flexibility and minimal footprint
- Suitable for peak switching, frequency regulation and microgrid applications



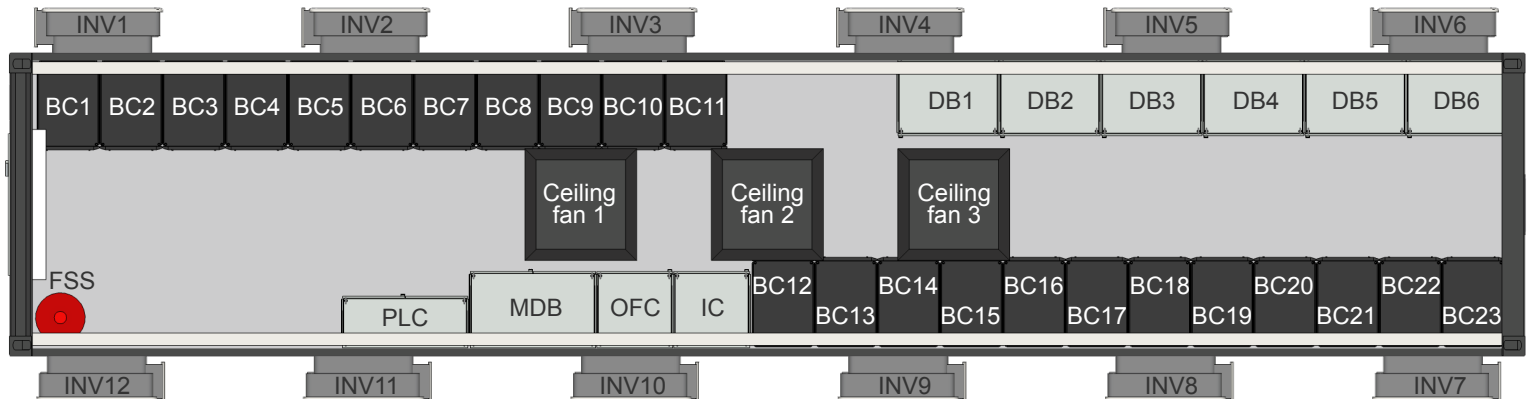
Formation of order number

Sample order number	ESS-	1200	-	C	-	D	-	6	-	1	-	1
Frame size (maximum power PCS)	1200 kVA (50 Hz)	1200										
PCS power (discharge)	0 kVA			0								
	100 kVA			1								
	200 kVA			2								
	300 kVA			3								
	400 kVA			4								
	500 kVA			5								
	600 kVA			6								
	800 kVA			8								
	1000 kVA			A								
1200 kVA			C									
Capacity BESS	284 kWh					4						
	568 kWh					8						
	854 kWh					A						
	1136 kWh					B						
	1420 kWh					C						
1704 kWh					D							
PCS power (discharge)	40 kVA							1				
	80 kVA							2				
	120 kVA							3				
	160 kVA							4				
	200 kVA							5				
	240 kVA							6				
	Other power (special order)							Z				
Off Grid mode	without									0		
	20 kVA									1		
	Other power (special order)									Z		
DC load connection	without the possibility of connecting to the DC tire											0
	with the ability to connect to the DC tire											1

Energy storage container type with rated power up to PCS1200kW / BESS1704 kWh




Equipment placement







example at maximum filling



No	Parameter	Value
DC side		
1	Total energy reserve BESS (Battery Energy Storage System) (kWh)	71...1704
2	DC voltage limits (V)	614 - 803
3	Cell capacity (Ah)	100
4	Energy reserve in the cell, (kWh)	8.88
5	Cell rated voltage (V)	88.8
6	Number of cells in a rack (pcs)	7
7	Rack Energy (kWh)	71
8	Number of racks (pcs)	24
9	BMS communication protocol	CAN2.0A
AC side		
10	Rated power PCS (Power Conversion System) (kW)	1200
11	Maximum power (kW)	1220
12	Rated current (A)	1921
13	Rated voltage (V)	380
14	Rated frequency (Hz)	50
15	Operating frequency limits (Hz)	45 - 55
16	Operating voltage limits (V)	342 - 418
17	Adjustable range of power factor	0.8 leading ... 0.8 lagging
18	Max. Total Harmonic Distortion (%)	< 3
Charger		
19	Charger power (kVA)	240
20	Charging time (h)	8
General information		
21	Battery life (h)	до 85
22	Protection class	IP54
23	Fire alarm	Provided
24	System overall dimensions (WxHxD) (mm)	2438x2591x12192
25	System weight (t), including container, gross	20
26	Control system protocols	CAN2.0A, Ethernet, RS485, PROFINET
27	System cooling type	Forced air
28	Max. height above sea level (m)	2000
29	Ambient operating temperature (°C)	-25 ... +50
30	Ambient temperature during transport and storage (°C)	-50 ... +80
31	Operating relative atmospheric humidity (%)	0 - 95



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