AMO
AMOGREENTECH

AMO ESS

AMOGREENTECH
Energy Storage System

Green Earth with AMO

Energy saving & management

Eco-friendly environment

AMO Energy Storage System

AMO ESS HBS(Hybrid Battery System) - Overview

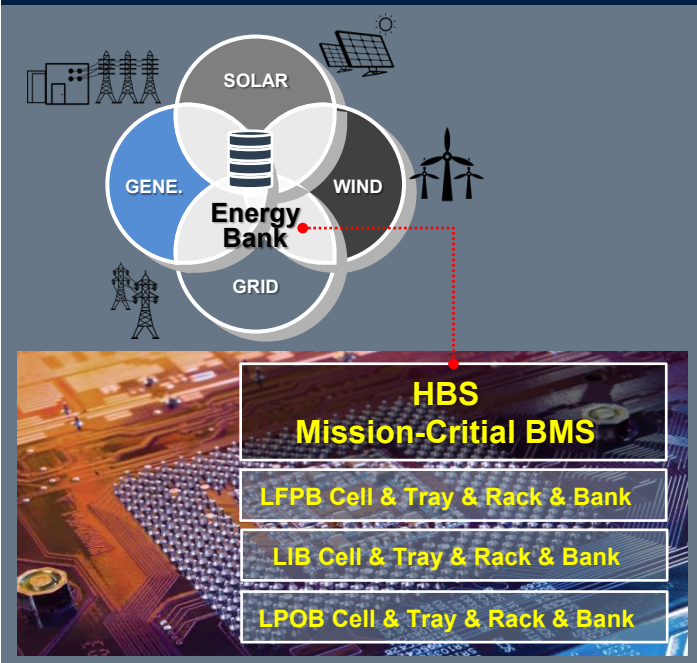
ENERGY:
Higher usable energy means
greater battery utilization and lower cost

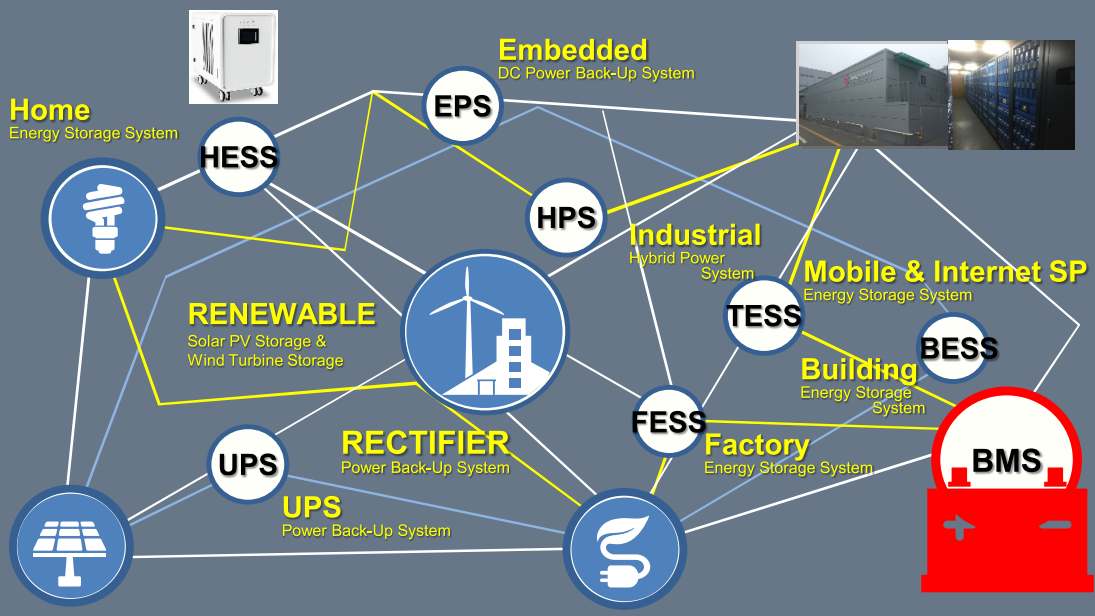
POWER:
Superior power by weight or volume
in a cost effective solution

CYCLE:
Excellent calendar and cycle life with
consistent performance over extended use

AMO Industrial battery system with LiFePO4 storage battery has advantages like;

- **High efficiency discharge**
- **High energy density**
- **Long-life**
- **Free from harmful substances by using environment-friendly materials**
- **Effective utilization of space**
- **On-time external monitoring by LCD monitor and SNMP port**
- **Safe system by alarm for overcharge / overdischarge & cutoff for each cell & whole system**





AMO Energy Storage System

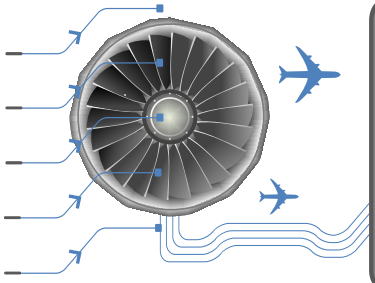
AMO ESS HBS - Core technology & competitiveness

AMG ESS Solution

Safety and Performance	Manufacturing & Quality Control	BMS & GUI	Response to Customer
Design system focusing on safety	Qualified factory in China	Design high-quality BMS	Optimized technical support
Precise protection functions for abnormal voltage, current, and temp.	Structure analysis design (earthquake, vibration resistance)	Focusing on protection function and power management section	Quick response to requirements
Safety Test according to international test standard (UL9540A, UL1974, etc.)	Thermal analysis design (cooling, convection heat transfer)	Cell balancing control algorithm	Local support by AMG business network
Long life-time with stable performance	Battery system design (internal structure, components)	User-friendly graphic user interface	Making successful business with customer together
Easily adjustable power performance	Detailed verification (assembly, performance, functions, safety, product quality)	Easily check the system status with great visibility	
		Easily adjustable protection parameters	

AMO Energy Storage System

AMO ESS HBS - Core technology & competitiveness



Core Technology Competitiveness

Know-How

Safety & Performanc Design

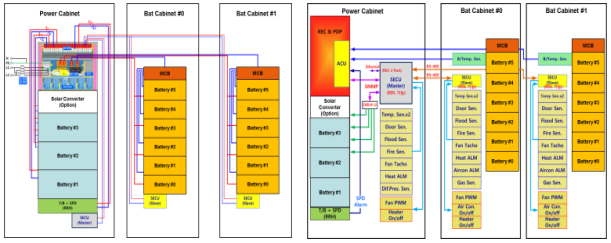
BMS(Battery Management System) Design

Know-Where

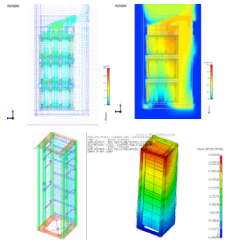
Strategic Outsourcing

Critical Firmware&Circuit Design	Critical Mechanical Design	Critical Mounting Design	Inspection & Verification
SFP : SaFety Protection Control	Structure Analysis Design (Quake resistant, durability, vibrant resistant...)	System Assembley, Terminal Block, Cabling... Design	Part Inspection & Verification
CCC : Critical Circuit Control	Thermal Analysis Design (Cooling, System requirement...)	System Power & Communication BUS Design	Application Unit Inspcetion & Verification
SOH : Status Of Health Control	System Design (Concept, Part Location...)	Mass Production Verification	Strategic Outsourcing & Management
SOC : Status Of Charge Control	System Mold Design		Specialized Business Networking
DOD : Depth Of Discharge Control			
BCB : Battery Cell Balancing Control			

Core Technology Units



[Core BMS Design & Packaging]



[Analysis for structure / heat / quake-proof]

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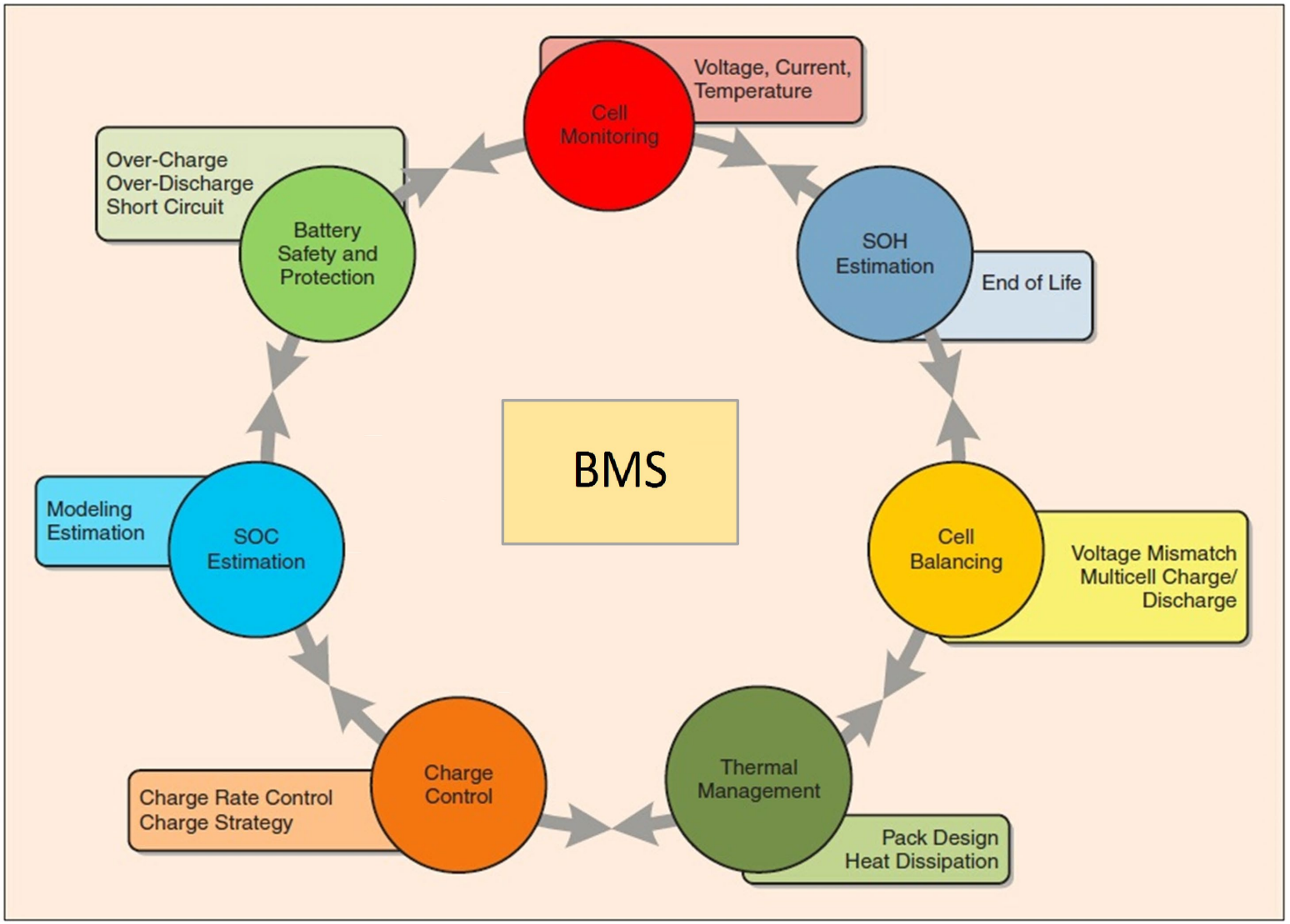
AMO ESS HBS - BMS key features



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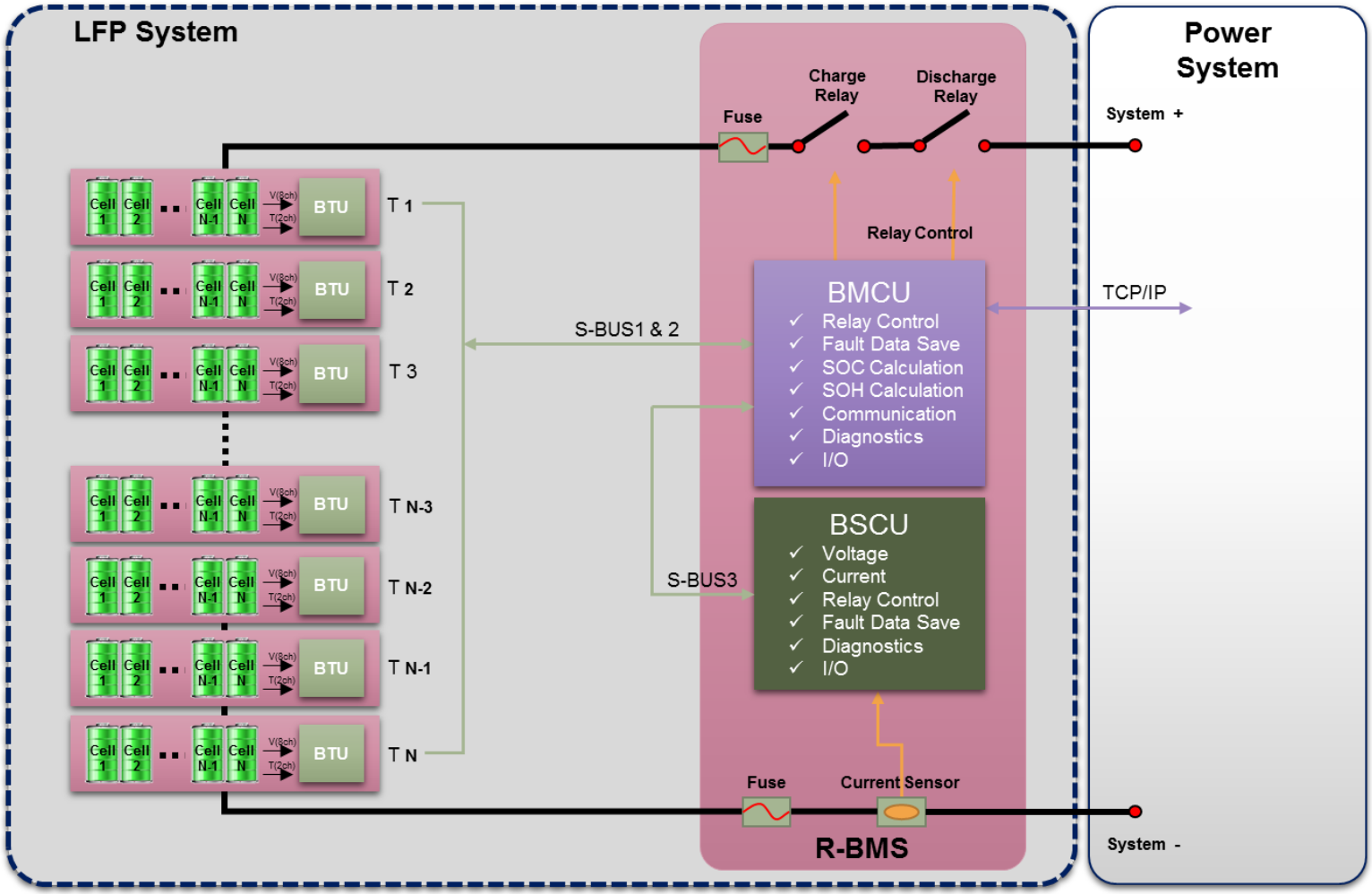
AMO ESS HBS - BMS block diagram



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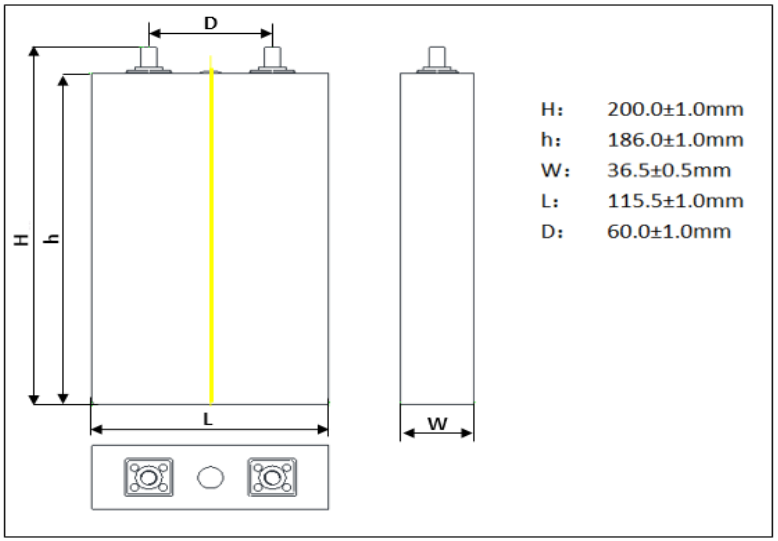
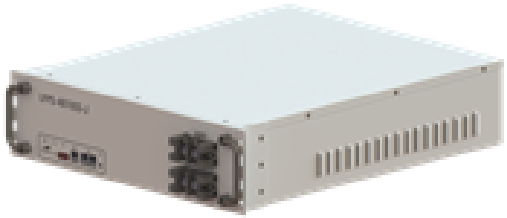
AMO ESS HBS - End cell design

- Terminal : M6 L14mm bolt
- Pressure relief : Through vent





AMO Energy Storage System

Comparison – Battery cell

Item		Lead storage battery	Lithium-ion from "S"	Lithium-polymer	AMO LiFePO4
Anode(Material)		PbO2	Carbon	Carbon	**Carbon**
Cathode(Material)		Pb	3 elements material (LiCo1/3Ni1/3Mn1/3O2)		**Lithium iron phosphate**
Separator(Material)		Glass fiber(AGM)	PP/PE	PP/PE	**PP/PE**
Electrolyte		H2SO4	LiPF6	LiPF6	**LiPF6**
Nominal voltage		2	3.7	3.7	**3.2**
Energy density [Wh/kg]		50	250	200	**150**
Life cycle(DOD 80%)		**500**	3000	1500	**5000**
Temperature	Charge	-15 ~ 45℃	-10 ~ 45℃	-10 ~ 45℃	**-20 ~ 45℃**
	Discharge	-20 ~ 45℃	-20 ~ 60℃	-20 ~ 60℃	**-20 ~ 60℃**
Safety		Good	Low	Normal	**Excellent**
Eco-friendliness		Low	Normal	Low	**Excellent**
Economic feasibility (As per manufacturing cost)		High	Low	Normal	**High**
Internal impedance		Average	Good	Good	**Good**
Charging voltage(V)		2.23	4.2	4.2	**3.7**
Max. charging current		/	1.5C	1.5C	**5C**
Cut-off discharge voltage(V)		1.6	3.0	3.0	**2.5**
Max. discharging current		3C	5C	5C	**10C**
Safety device		Safety valve	Safety valve & protection circuit	Safety valve & protection circuit	**Safety valve & protection circuit**

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Comparison – System & Economical feasibility

Item		Lead storage battery	Lithium-ion from "S" (380V 100AH)	**AMO LiFePO4 (380V 100Ah)**
Specification		2.0V 200AH	NCM 3.6V 2AH	**LFP 3.2V 50AH**
System configuration		192S1P	102S26P X 2	**120S1P X 2**
Energy(kWh)		76	38.19	**38.4**
Nominal capacity(Ah)		200	104	**100**
Nominal voltage(V)		384	367.2	**384**
Cut-off discharging voltage(V)		307.2	280.5	**240**
Nominal charging voltage(V)		428.16	428.4	**444**
Rated charging current(A)		20A(0.1C)	52A(0.5C)	**50A(0.5C)**
Max. charging current(A)		/	104A(1.0C)	**100A(1.0C)**
Max. discharging current(A)		200A(1C)	312A(3C)	**300A(3C)**
Cycle Life		300 (DOD80%)	1500 (DOD80%)	**3000 (DOD80%)**
Temperature	Charging	-15 ~ 45℃	0 ~ 45℃	**0 ~ 45℃**
	Discharging	-20 ~ 45℃	-20 ~ 60℃	**-20 ~ 60℃**
Size(W X D X H)		2,350 X 1,300 X 1,500	1,400 X 750 X 2,000	**1,360 X 700 X 2000**
Weight(kg)		3,000	≤ 840	**≤ 900**
Upside energy density (kWh/㎡)		25.1	34.9	**40.3**
Energy density(Wh/kg)		25.3	45.5	**42.6**
No. of pack (EA)		-	34	**40**
No. of cell (EA)		192	5304	**240**
Protection circuit and monitoring device		Not included	Included	**Included**
Independent operation (System operation by minimum unit)		Poor	Average	**Excellent**
Installation & maintenance		Poor	Poor	**Excellent**
Total cost (380V 300Ah)		**1**	**1.82**	**1.66**

AMO Energy Storage System

Comparison – System energy density

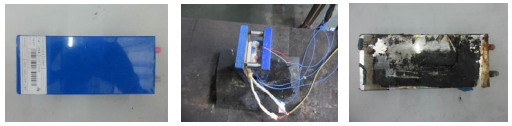
	Vendor		Samsung SDI			AMOTECH			
	Models		E2-R068	E2-R084	E2-R091	AMOS-LFPR-768102	Type 1 (AMO)	Type 2 (AMO)	Type 3 (AMO)
	Energy [Wh]		68492.16	83712.64	91322.88	78336	112320	138240	146880
	Capacity [Ah]		94	94	94	102	150	150	150
	Configuration		22 cells 9 mds	22 cells 11 mds	22 cells 12 mds	32 cells 30 mds	18 cells 13 mds	18 cells 16 mds	18 cells 17 mds
	Nominal Voltage [V]		728.64	890.56	971.52	768	748.8	921.6	979.2
	Voltage Range [V]		633.6 821.7	774.4 1004.3	844.8 1095.6	600 876	655.2 830.7	806.4 1022.4	856.8 1086.3
Energy Rack	Dimension [mm]	W	442	442	442	760	760	760	760
		D	702	702	702	800	690	690	690
		H	1792	2124	2290	2300	1830	2060	2290
	Weigth [Kg]	Module	55	55	55	24.6	75	75	75
		System	560	675	730	1000	1100	1300	1400
	Energy Density(Wh/L)	Density	123.18	127.02	128.52	56.02	117.04	127.97	122.31
		Rate	1.00	1.00	1.00	0.45	0.95	1.01	0.95
	Energy Density (KWh/m2)	Density	220.74	269.79	294.32	128.84	214.19	263.62	280.09
		Rate	1.00	1.00	1.00	0.58	0.97	0.98	0.95
	Shape								

AMO Energy Storage System

Key features of AMO ESS

Safety

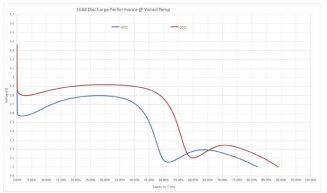
Low risk of
fire or explosion



UL9540A clause 6 (cell level) thermal runaway test passed
(Report no. 4355403.50)

Performance at low temperature

Usable even at -30℃

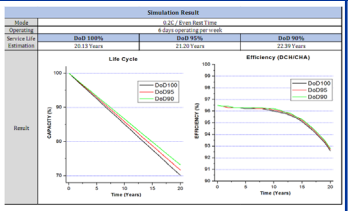


No lithium metal deposition even at low temperature
Repeated charging and discharging at -30℃ available

Long life

Cycle life of
5,000~6000
times or more

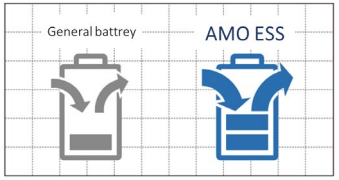
Battery System Specification	
Voltage Range	672 ~ 852 Vdc
Efficiency	≥ 95% (@25±5 ℃)
Type	Li-FePO4
C-rate	0.2C
Operating Temperature	25±5 ℃
Operating Humidity	0 ~ 80%
Charge method	CC-CV
Discharge method	CC
Life-Cycle	≥ 5000 (DoD 100% @25±5 ℃, EOL 70%)
Configuration Item	Cell, Module, Rack, BMS, DC PDP



The capacity remains at 60% or more
even after 5,000 times of charging/discharging.

High input/output

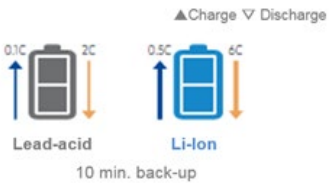
Large current
for both input and output



AMO ESS can store large regenerative energy generated during deceleration of railways and automobiles and can supply large current for starting the motor.

Rapid charging

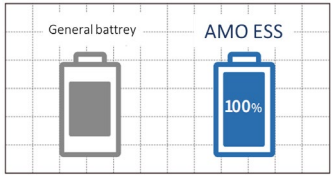
Rapid charge to 80% capacity
in **10** minutes



The favorable anode charging characteristics provide rapid charging to 80% of the capacity in 10 minutes.

Wide effective SOC range

SOC range
0 to 100%
Available



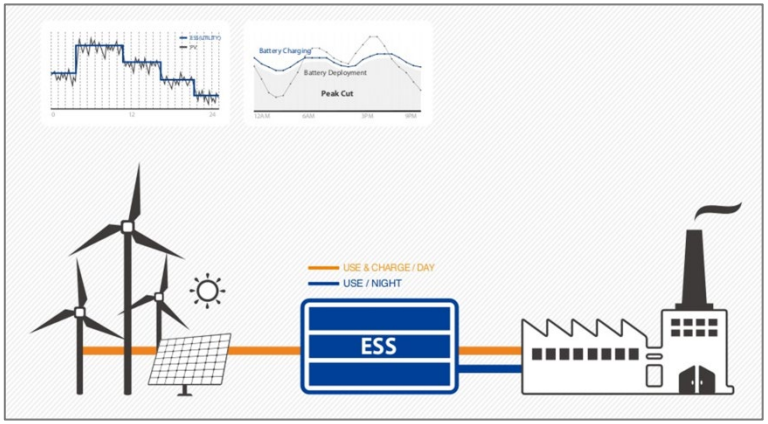
AMO ESS wide SOC range makes it possible to reduce the nominal battery capacity or amount of batteries necessary for a system.

AMO Energy Storage System

Main applications of AMO ESS

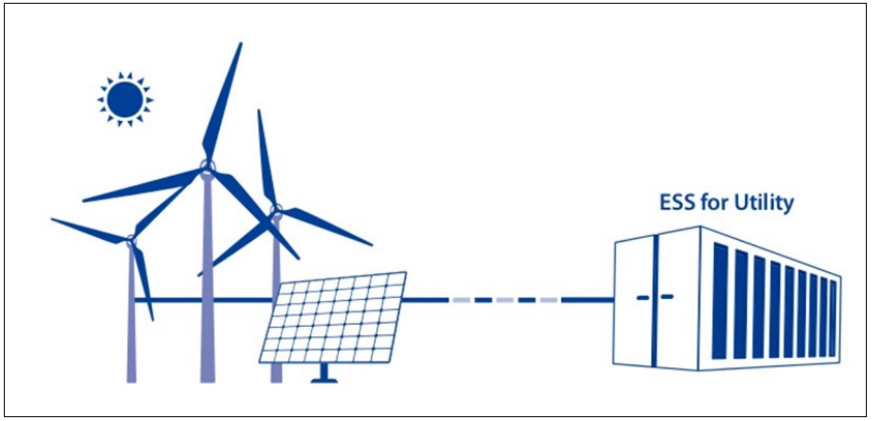
FESS

Factory Energy Storage System



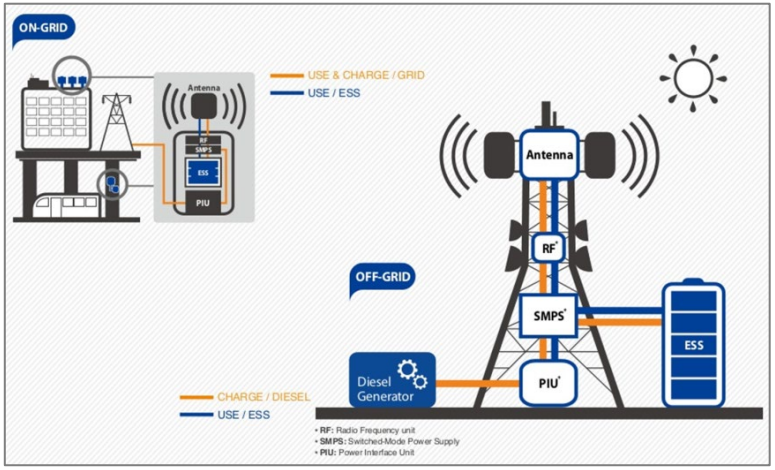
RESS

Renewable Farm Energy Storage System



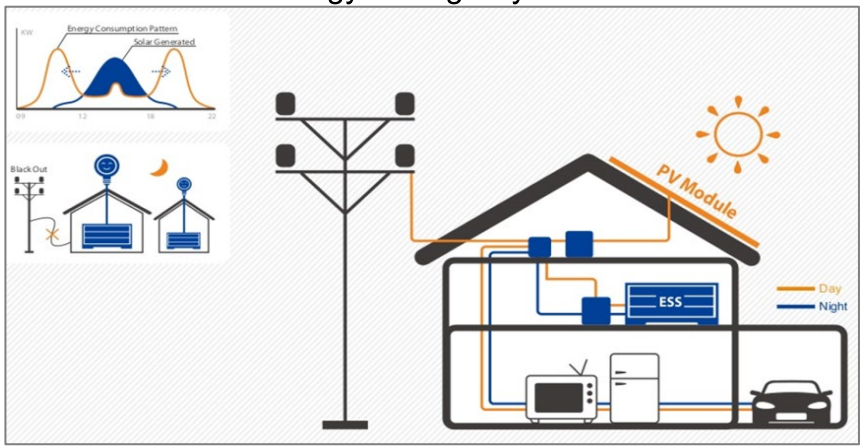
TESS

Telecommunication Energy Storage System



HESS

Residential ESS Energy Storage System



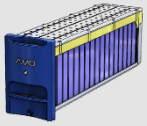
AMO Energy Storage System

AMO ESS HBS – Product line-up

AMO ESS HBS Product Line-Up

FESS

Cell
LFP3.2V25, 50Ah



Tray
25.6V 102Ah

Unit Rack
768V102Ah

ESS for industrial complex & factories UPS back-up, peak-cut, DR, FR with solar/wind power or grid

RESS

Cell
LFP3.2V 70,100, 150Ah

Tray
57.6V 150Ah

Unit Rack
806, 921V 150Ah

ESS for large scale power plant, SmartGird, energy independent island with solar/wind power

TESS

Cell
LFP 3.2V 20~100Ah

Shelf
48V 20~100Ah

Unit Rack
48V 1000Ah

ESS / UPS back-up system for network IT system & telecom sites – IDC, Base station, Relay station, etc.

HESS

Cell
LFP 3.2V 25~50Ah

Residential BESS
5KW~10KW

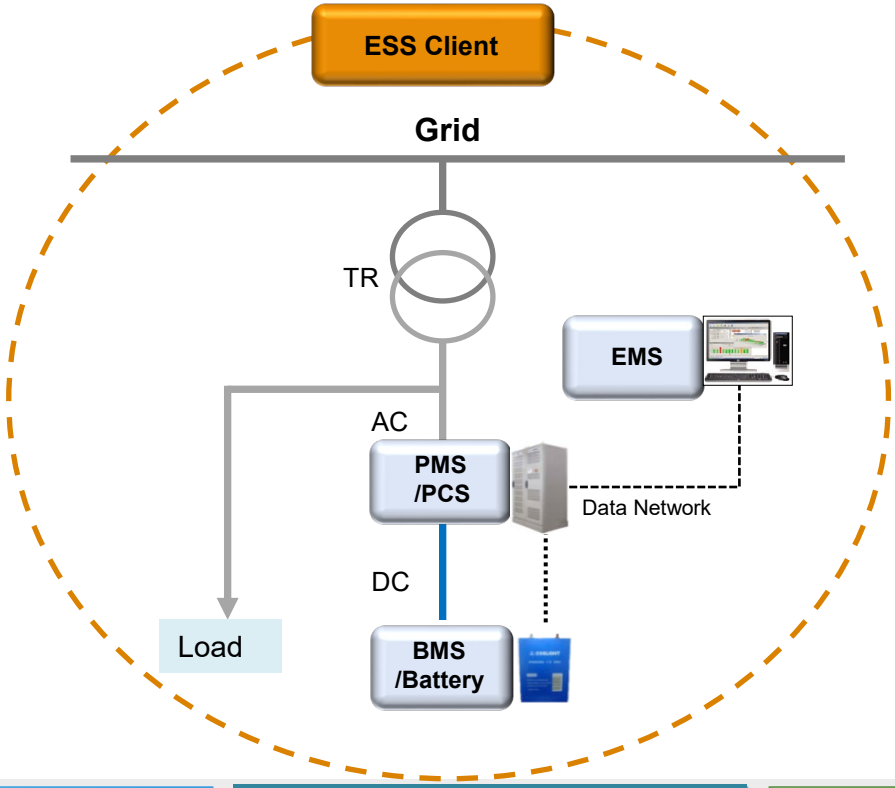
Energy saving HESS for home and small offices

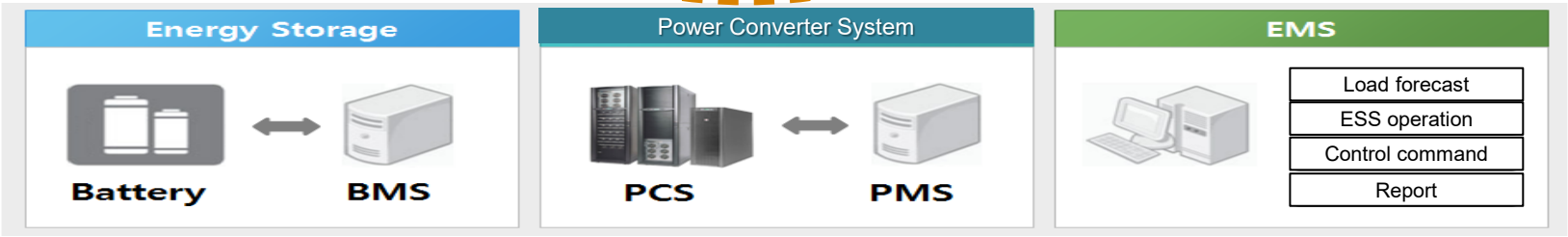
AMO ESS HBS

- Is convenient for maintenance by providing the in shelf & rack type which allows easy internal circuit monitor.
- Provides reliability by RACK frame made of cold rolled steel sheet to meet mechanical and electrical standard.
- Provides durability by earth-quake resistant design.
- Provides thermal stability during charging / discharging by thorough thermal analysis
- Shuts off momentary over-current through end cell connection(in a cell pack), cell pack connection(in battery system) and connection point.
- Is convenient for installation with its shelf and rack structure.

AMO Energy Storage System

AMO ESS HBS - Battery system block diagram





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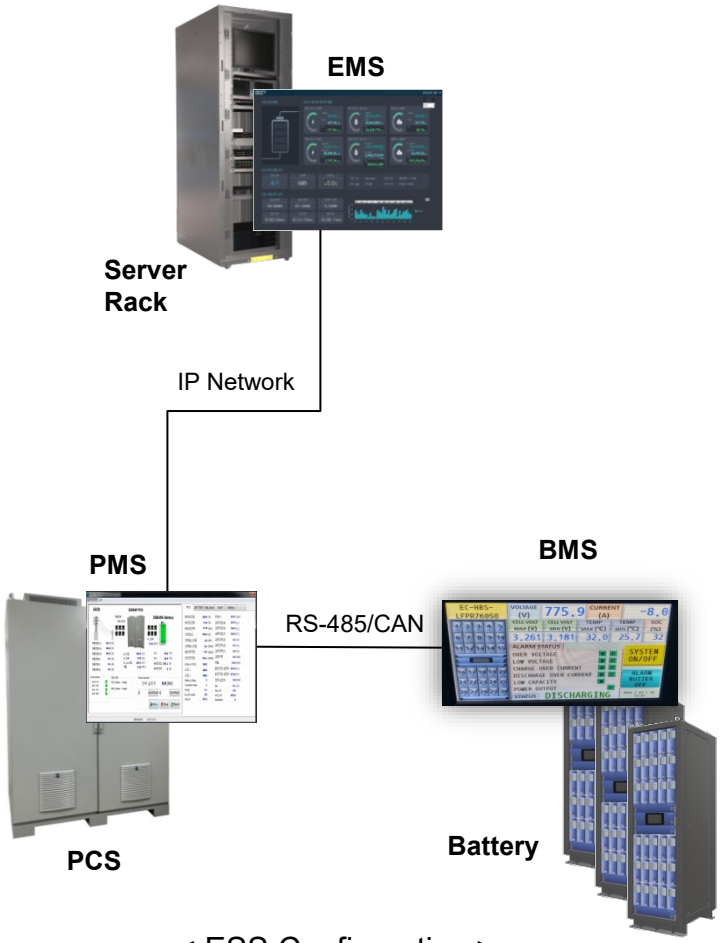
AMO ESS HBS – ESS configuration

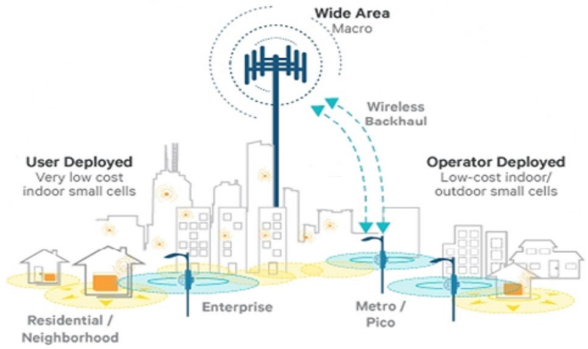


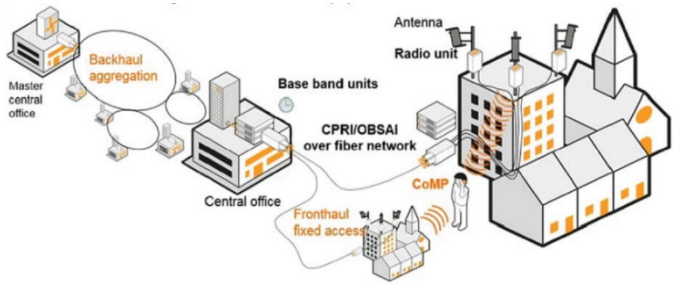
< ESS Configuration >

Item		Features
EMS	UI S/W	▪ ESS control ▪ Batch processing for main information : Dash Board ▪ Editing available for Consumer's equipment system
	Rack Server	▪ Duplex configuration of server ▪ UPS installation & configuration ▪ KVM installation & configuration
PMS	PMS	▪ PCS control by EMS control order (charge, discharge, stand-by) ▪ PCS operating condition and protection level set-up ▪ Automatic cutoff function in case of malfunction during charge/discharge
	PCS	• SGSF-04-2012-07 Test report for technical standard of PCS
BMS	BMS	▪ Battery condition display(voltage, temperature) ▪ Separate operation of each rack ▪ Forced shut-off if emergency shutdown is necessary
	Battery	• Suitable for low & high temperature condition (Operating temp. : 25℃~65℃) • Safe & big unit capacity for huge ESS • KBIA-10104-01 / KBIA-10104-02 technical standard

AMO Energy Storage System

AMO Telecommunication ESS Application (TESS)





Internet Data Center

CELL 25/100/150Ah

Module 25.6V100Ah
/ 57.6V150ah

Rack 768/819/979V

Central equipment shelter

CELL 50/100Ah

Shelf 48V50Ah
48V100Ah

Rack 48V50~1,000Ah

Base Station (Man less equipment shelter)

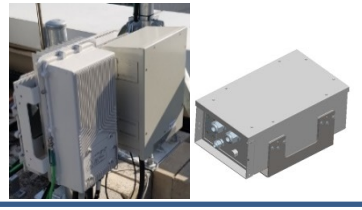
CELL 30/50/70/100Ah

Shelf 48V30Ah
⋮
48V100Ah

Relay Station

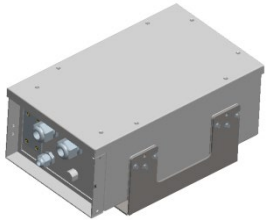
CELL 5/10/20/30Ah

Case
48V5Ah
48V10Ah
48V20Ah
48V30Ah



AMO Energy Storage System

AMO ESS HBS – 48V system for TESS

Model Name	LFPS-4805	LFPS-4810	LFPS-4820	LFPM-4825
Energy [KWh]	0.24	0.48	0.96	1.2
Rated Capacity	5Ah (15S1P) (@0.2C, Discharge 5hr)	10Ah (15S1P) (@0.2C, Discharge 5hr)	20Ah (15S1P) (@0.2C, Discharge 5hr)	25Ah (15S1P) (@0.2C, Discharge 5hr)
Rated Voltage	48V(Cell Voltage 3.2V)	48V(Cell Voltage 3.2V)	48V(Cell Voltage 3.2V)	48V(Cell Voltage 3.2V)
End of Discharge Voltage	42V(Cell Voltage 2.8V)	42V(Cell Voltage 2.8V)	42V(Cell Voltage 2.8V)	42V(Cell Voltage 2.8V)
Floating Charge Voltage	53.5V(Cell Voltage 3.56V)	53.5V(Cell Voltage 3.56V)	53.5V(Cell Voltage 3.56V)	53.5V(Cell Voltage 3.56V)
End of Charge Current	0.01C (0.05A)	0.01C (0.1A)	0.01C (0.2A)	0.01C (0.25A)
Standard Charge Current	0.2C (1.0A)	0.2C (2.0A)	0.2C (4.0A)	0.2C (5.0A)
Max Discharge Current	3.0C (15A)	3.0C (30A)	3.0C (60A)	1.0C (25A)
Operating Temperature	Charge: -5 ~ 90℃ Discharge: -30 ~ 90℃			
Shape				
Structure	Outdoor pole mount type, IP54			Outdoor pole mount type, IP65
Communication	CAN, RS-485			CAN x 2
Function	Heater			
Protection	OVP, UVP, OC, HT, LT			
Dimension(mm)	W:220 x D:145 x H:380	W:220 x D:145 x H:380	W:290 x D:145 x H:455	W:300 x D:120 x H:431
Weight	8.9±0.3Kg	11.2±0.3Kg	15.7±0.3Kg	18.9±0.3Kg
Energy Density(Wh/L)	19.8	39.6	50.18	77.34

AMO Energy Storage System

AMO ESS HBS – 48V system for TESS

Model Name	LFPS-4850	LFPS-4875	LFPS-48100	LFPR-48300, 800, 1000
Energy [KWh]	2.4	3.6	4.8	14.4 / 38.4 / 48
Rated Capacity	50Ah (15S1P) (@0.2C, Discharge 5hr)	75Ah (15S1P) (@0.2C, Discharge 5hr)	100Ah (15S2P) (@0.2C, Discharge 5hr)	300Ah / 800Ah / 1000Ah (15S1P 100Ah Shelf Parallel Connection, @0.2C, Discharge 5hr)
Rated Voltage	48V(Cell Voltage 3.2V)	48V(Cell Voltage 3.2V)	48V(Cell Voltage 3.2V)	48V(Cell Voltage 3.2V)
End of Discharge Voltage	42V(Cell Voltage 2.8V)	42V(Cell Voltage 2.8V)	42V(Cell Voltage 2.8V)	42V(Cell Voltage 2.8V)
Floating Charge Voltage	53.5V(Cell Voltage 3.56V)	53.5V(Cell Voltage 3.56V)	53.5V(Cell Voltage 3.56V)	53.5V(Cell Voltage 3.56V)
End of Charge Current	0.01C (0.5A)	0.01C (0.75A)	0.01C (1A)	0.01C (3 / 8 / 10A)
Standard Charge Current	0.1C (5.0A by limited charge function)	0.2C (15.0A)	0.1C (10.0A by limited charge function)	0.1C (30 / 80 / 100A by limited charge function)
Max Discharge Current	1.0C (50A)	1.0C (75A)	1.0C (100A)	1.0C (300 / 800 / 1000A)
Operating Temperature	Charge: 0 ~ 55℃ Discharge: -20 ~ 65℃			
Shape				
Structure	19” 3U Shelf Type			19” Shelf & Rack Type
Communication	CAN x 2			Ethernet, can
Function	Status led (Run, Alarm, SOC)			(Option7” TFTLCD, Buzzer)
Protection	OVP, UVP, OC, HT, LT			
Dimension(mm)	W:483 x D:550.5 x H:127	W:483 x D:425 x H:132	W:483 x D:550.5 x H:127	Different by Structure
Weight	30.75kg±2Kg	33.0kg±2Kg	48.3kg±2Kg	Different by Structure
Energy Density(Wh/L)	71.07	132.86	142.15	Different by Structure

AMO Energy Storage System

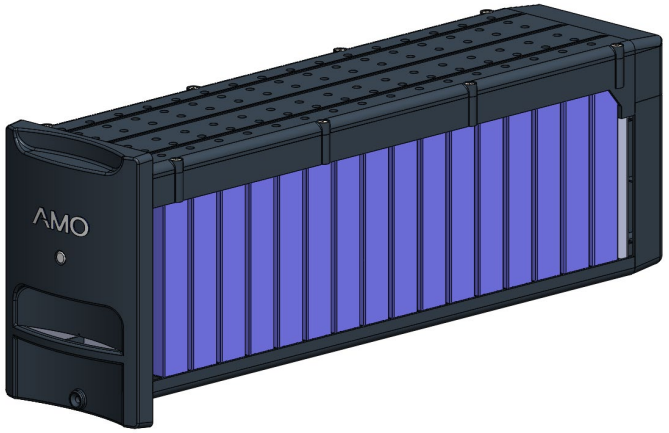
AMO ESS HBS – UPS back-up LFP system for TESS

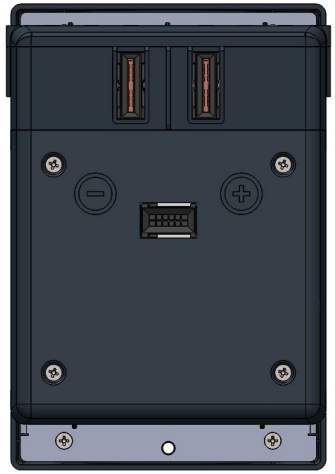
Model Name	LFPS-4810	LFPS-9610	LFPS-19210	KEB-1215
Energy [KWh]	0.48	1.024	2.048	0.144
Rated Capacity	10Ah (15S1P) (@0.2C, Discharge 5hr)	10Ah (32S1P) (@0.2C, Discharge 5hr)	10Ah (64S1P) (@0.2C, Discharge 5hr)	12Ah (60S1P) (@0.2C, Discharge 5hr)
Rated Voltage	48V(Cell Voltage 3.2V)	102.4V(Cell Voltage 3.2V)	204.8V(Cell Voltage 3.2V)	12.8V(Cell Voltage 3.2V)
End of Discharge Voltage	42V(Cell Voltage 2.8V)	89.6V(Cell Voltage 2.8V)	179.2V(Cell Voltage 2.8V)	11.2V(Cell Voltage 2.8V)
Floating Charge Voltage	53.5V(Cell Voltage 3.56V)	113.92V(Cell Voltage 3.56V)	227.84V(Cell Voltage 3.56V)	14.24V(Cell Voltage 3.56V)
End of Charge Current	0.01C (0.1A)	0.01C (0.1A)	0.01C (0.1A)	0.01C (0.12A)
Standard Charge Current	0.2C (2.0A)	0.2C (2.0A)	0.2C (2.0A)	0.33C (4A)
Max Discharge Current	2.0C (20A)	2.0C (20A)	2.0C (20A)	1.0C (12A)
Operating Temperature	Charge: 0 ~ 45℃ Discharge: -20 ~ 60℃	Charge: 0 ~ 45℃ Discharge: -20 ~ 60℃	Charge: 0 ~ 45℃ Discharge: -20 ~ 60℃	Charge: 0 ~ 40℃ Discharge: -20 ~ 60℃
Shape				
Structure	19” Shelf & Desk Top Type	19” Shelf & Desk Top Type	19” Shelf & Desk Top Type	19” Shelf & Desk Top Type
Communication	RS-485	RS-485	RS-485	-
Function	4.3” TFTLCD	4.3” TFTLCD	4.3” TFTLCD	LED
Protection	OVP,UVP,COC,DOC,CHT, DHT	OVP,UVP,COC,DOC,CHT, DHT	OVP,UVP,COC,DOC,CHT, DHT	OVP,UVP,COC,DOC,CHT, DHT
Dimension(mm)	W:438 x D:370 x H:100	W:438 x D:370 x H:100	W:438 x D:548 x H:200	W:480 x D:44 x H:250
Weight	≤ 11.6Kg	≤ 18.2Kg	≤ 41.8Kg	≤ 5Kg
Energy Density(Wh/L)	29.6	63.18	42.66	27.3

AMO Energy Storage System

AMO ESS HBS – 51.2V 50Ah module for Utility back-up

Item	Parameters	Remark	Reference
Model	LFPM-51050	16S2P	
Rated Voltage(V)	51.2		
Typical Capacity(Ah)	50	25℃ 0.5C discharge	
Typical Capacity(kWh)	2.56	25℃ 0.5C discharge	
Standard Charge Voltage(V)	56.8	Voltage per Cell 3.55V	
Standard Charge Current(A)	25	0.5C	
Standard Discharge Current(A)	50	1.0C	
Maximum Charge Current(A)	100	Continuous (150A: 10sec)	
Maximum Discharge Current(A)	100	Continuous (200A: 30sec)	
Communications	TBD		
Temperature Range of Charge(℃)	0 ~ 45		
Temperature Range of Discharge(℃)	-20 ~ 55		
Dimensions (mm)	155.5(width) * 610(depth) * 195(height)		
Weight (kg)	≤ 26		

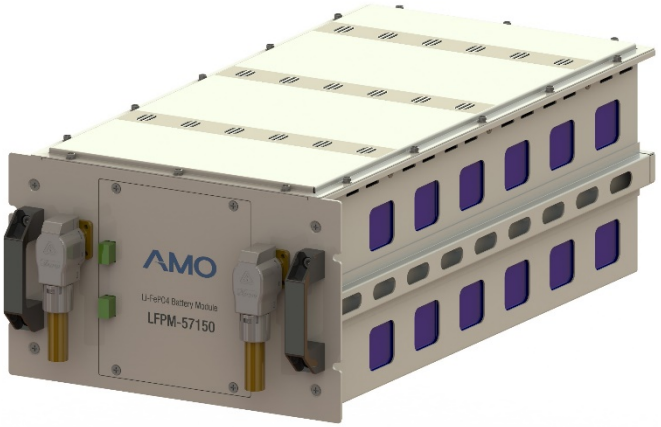




AMO Energy Storage System

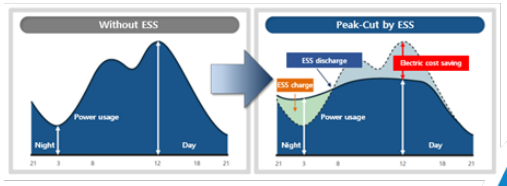
AMO ESS HBS – 57.6V 150Ah module for Utility back-up

Item	Parameters	Remark	Reference
Model	LFPM-57150	18S1P	
Rated Voltage(V)	57.6		
Typical Capacity(Ah)	150	25℃ 0.5C discharge	
Typical Capacity(kWh)	8.64	25℃ 0.5C discharge	
Standard Charge Voltage(V)	63.9	Voltage per Cell 3.55V	
Standard Charge Current(A)	75	0.5C	
Standard Discharge Current(A)	75	1.5C max.	
Maximum Charge Current(A)	150		
Maximum Discharge Current(A)	150		
Communications	CAN	CAN 2.0	
Temperature Range of Charge(℃)	0 ~ 55		
Temperature Range of Discharge(℃)	-20 ~ 60		
Energy Density (kWh/L)	186.14		
Dimensions (mm)	303(width) * 720(depth) * 192.9(height)		
Weight (kg)	≤ 75		



AMO Energy Storage System

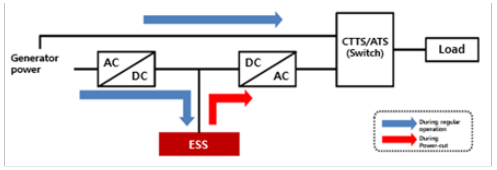
AMO Renewable ESS application (RESS)



- Back-up againt black-out

Emergency Power System

Demand Response & Peak-Cut



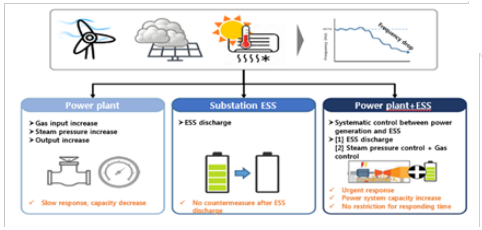
- Energy storage at night & discharge at day time for effective power usage

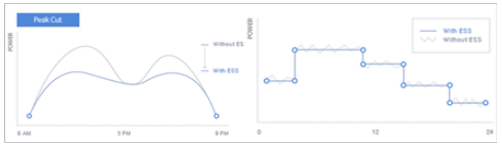
- Power balance management by real time charge/discharge against irregular frequency(60Hz)

Frequency Regulation

Energy Storage for solar/wind power plant

- Energy storage at day time or windy time to use electricity at sunless or windless time





AMO Energy Storage System

AMO ESS HBS – 345V 150Ah

Item		Specification	Reference
Model		HVDC-LFPR-345150	
Energy(KWh)		51.8	
Typical Capacity(Ah)		150	
Rated Voltage(V)		345.6	
Standard Charge Voltage(V)		383.4	
Standard End Voltage(V)		302.4	
Standard Charge Current(A)		75	
Standard Discharge Current(A)		75	
Maximum Charge Current(A)		150	
Maximum Discharge Current(A)		150	
Communications		CAN	
Temperature of Charge(℃)		0 ~ 55	
Temperature of Discharge(℃)		-20 ~ 60	
Energy Density	**(Wh/L)**	99.06	
	(kWh/m2)	99.06	
Dimensions (WxDxH) (mm)		760 x 673 x 973	
Weight (kg)		≤ 550	

AMO Energy Storage System

AMO ESS HBS – 345V 300Ah

Item		Specification	Reference
Model		HVDC-LFPR-345300 (1P180S X 2)	
Energy(KWh)		51.84 x 2	
Typical Capacity(Ah)		150 x 2	
Rated Voltage(V)		345.6	
Standard Charge Voltage(V)		383.4	
Standard End Voltage(V)		302.4	
Standard Charge Current(A)		75 x 2	
Standard Discharge Current(A)		75 x 2	
Maximum Charge Current(A)		150 x 2	
Maximum Discharge Current(A)		150 x 2	
Communications		CAN, ETHERNET	
Operating Temperature(℃)		-20 ~ 60	
Energy Density	**(Wh/L)**	101.39	
	(KWh/m2)	197.71	
Dimensions (WxDxH) (mm)		760 x 690 x 1950	
Weight (kg)		≤ 1054	

AMO Energy Storage System

AMO ESS HBS – 806, 921V 150Ah

Item		Specification		Reference
Model		LFPR-806150	LFPR-921150	
Energy(KWh)		**120.9**	**138.2**	
Typical Capacity(Ah)		150		
Rated Voltage(V)		**806.4**	**921.6**	
Standard Charge Voltage(V)		**894.6**	**1022.4**	
Standard End Voltage(V)		**705.6**	**806.4**	
Standard Charge Current(A)		75		
Standard Discharge Current(A)		75		
Maximum Charge Current(A)		150		
Maximum Discharge Current(A)		150		
Communications		CAN		
Temperature of Charge(℃)		0 ~ 55		
Temperature of Discharge(℃)		-20 ~ 60		
Energy Density	**(Wh/L)**	**122.63**	**125.05**	
	(kWh/m2)	**230.66**	**263.62**	
Dimensions (WxDxH) (mm)		760 x 690 x 1881	760 x 690 x 2108	
Weight (kg)		≤ 1150	≤ 1300	

AMO Energy Storage System

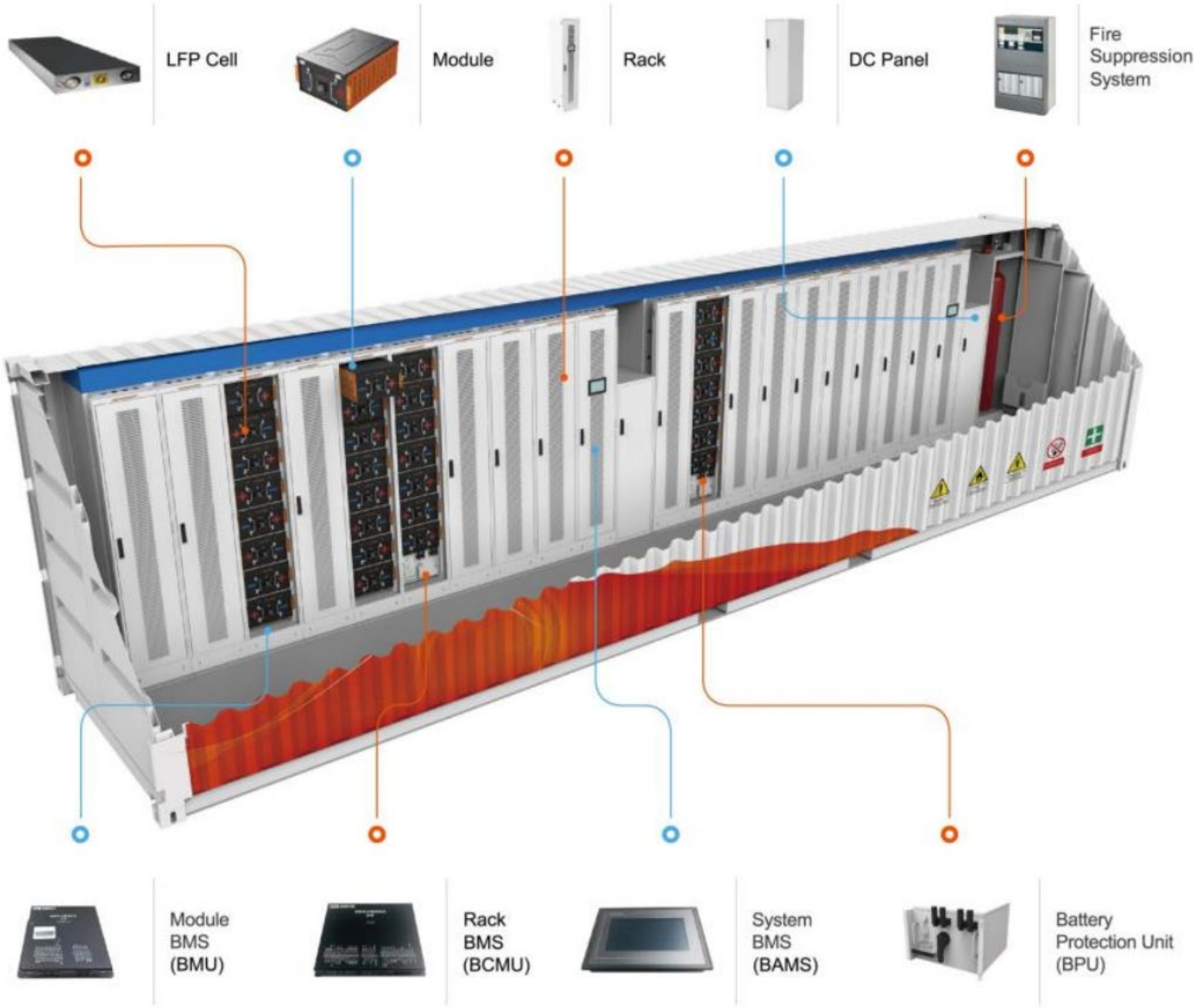
AMO ESS HBS – 844.8V 200Ah

Item		Specification
Model		768100169
Energy(KWh)		169
Typical Capacity(Ah)		200
Rated Voltage(V)		844.8
Standard Charge Voltage(V)		950.4
Standard End Voltage(V)		739.2
Standard Charge Current(A)		200
Standard Discharge Current(A)		200
Maximum Charge Current(A)		400
Maximum Discharge Current(A)		400
Communications		CAN / RS485
Operating Temperature(℃)		-20 ~ 60
Energy Density	**(Wh/L)**	96.84
	(KWh/m2)	180.12
Dimensions (WxDxH) (mm)		500 x 938 x 1860 (2P)
Weight (kg)		≤ 1848.5

Reference

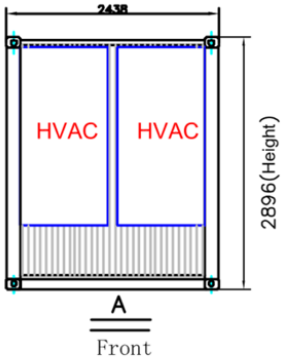
AMO Energy Storage System

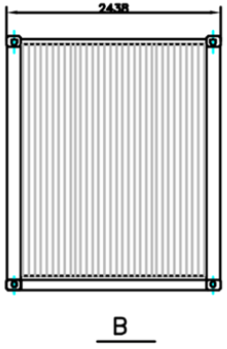
AMO ESS HBS – Integrated System

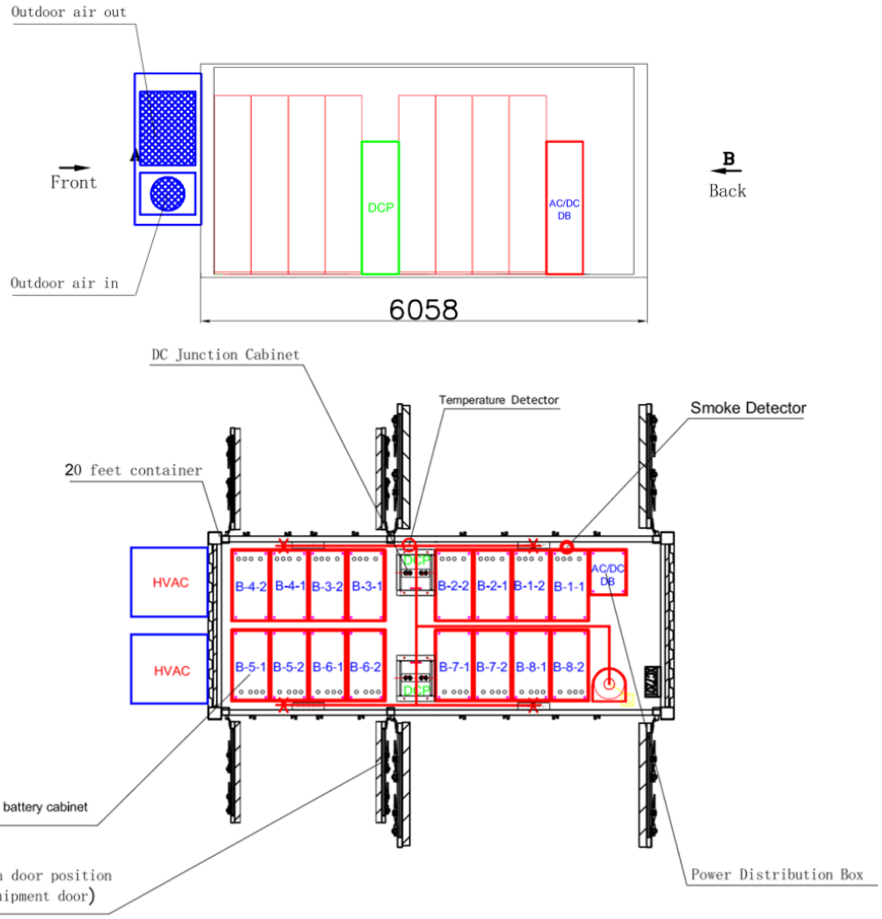


AMO Energy Storage System

AMO ESS HBS – Integrated System Layout (20ft Container)



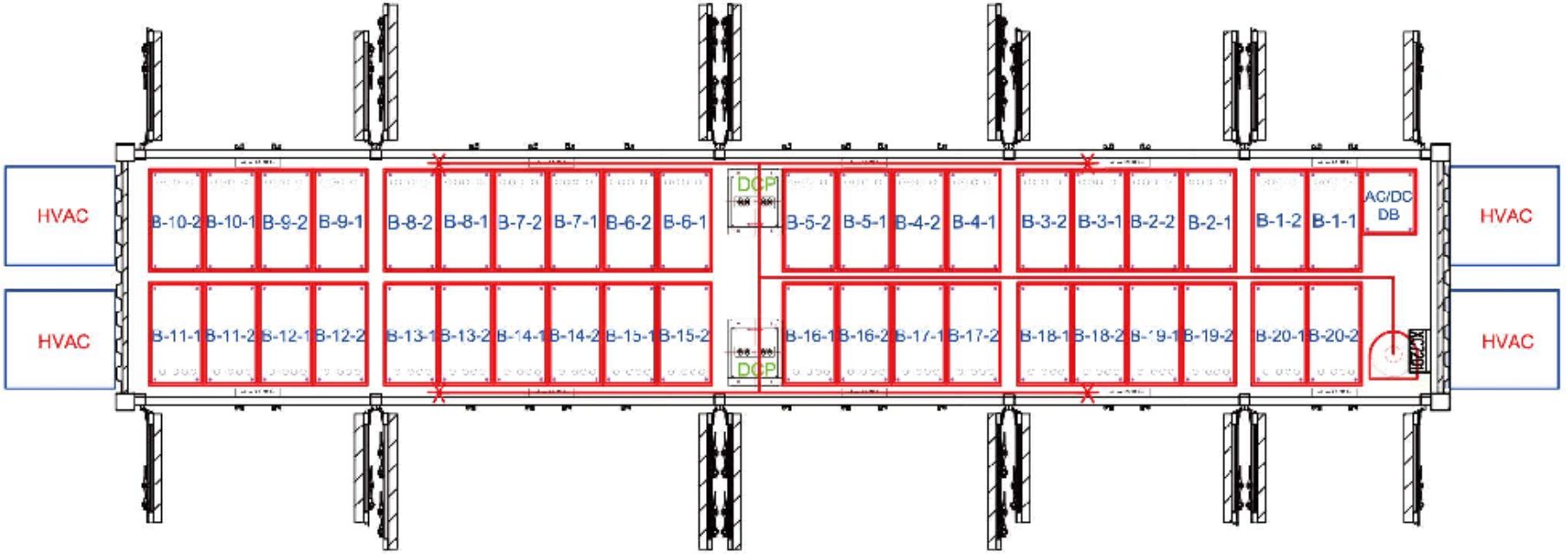




1.0C
20ft IOS HC Container
External mounted HVAC
Max. Rack Capacity 230KWh
Max. Container Capacity 2.3MWh

AMO Energy Storage System

AMO ESS HBS – Integrated System Layout (40ft Container)



1.0C
40ft IOS HC Container
External mounted HVAC
Max. Rack Capacity 230KWh
Max. Container Capacity 4.61MWh

AMO Energy Storage System

AMO ESS HBS – PCS for Integrated System

Item	100KW (DETF-100TI3)	250KW (DETF-250L)	500KW (DETF-500L)
DC			
Rated Power(KW)	100	250	500
Max. Input Voltage(Vdc)	1100	1100	1100
Rated Voltage(Vdc)	650	650	650
Voltage Range(Vdc)	575~1,100	575~1,100	600~1,100
Rated Current(Adc)	154	440	880
AC			
Rated Power(KW)	100.0	250.0	500.0
Rated Voltage(Vac)	380	380	380
Rated Current(Aac)	152	380	760
Rated Frequency(Hz)	50/60		
Number of Grid Phases	3P 4W (transformer type)	3P 3W (transformer-less)	
Power Factor(%)	>98		
THD(%)	Total within 5% / each difference within 3%		
Efficiency			
Max. Efficiency(%)	>98 (>96% Rated, including transformer)	>98 (>98% Rated)	
Mechanical Specification			
Display	7” Touch Screen		
Communication	RS485, OPTICA(MODBUS)		
Dimension(WxHxD) (mm)	910 x 1750 x 1000	700 x 2050 x 900	1430 x 2050 x 900
Weight(kg)	800	660	1300
Environmental Limits			
Ambient Temp. (℃)	-20 ~ +60 / 0 ~ +40		
Storage Temp. (℃)	-20 ~ +60 / 0 ~ +40		
Protection Class	IP 20		
Cooling Method	Forced Air Cooling		

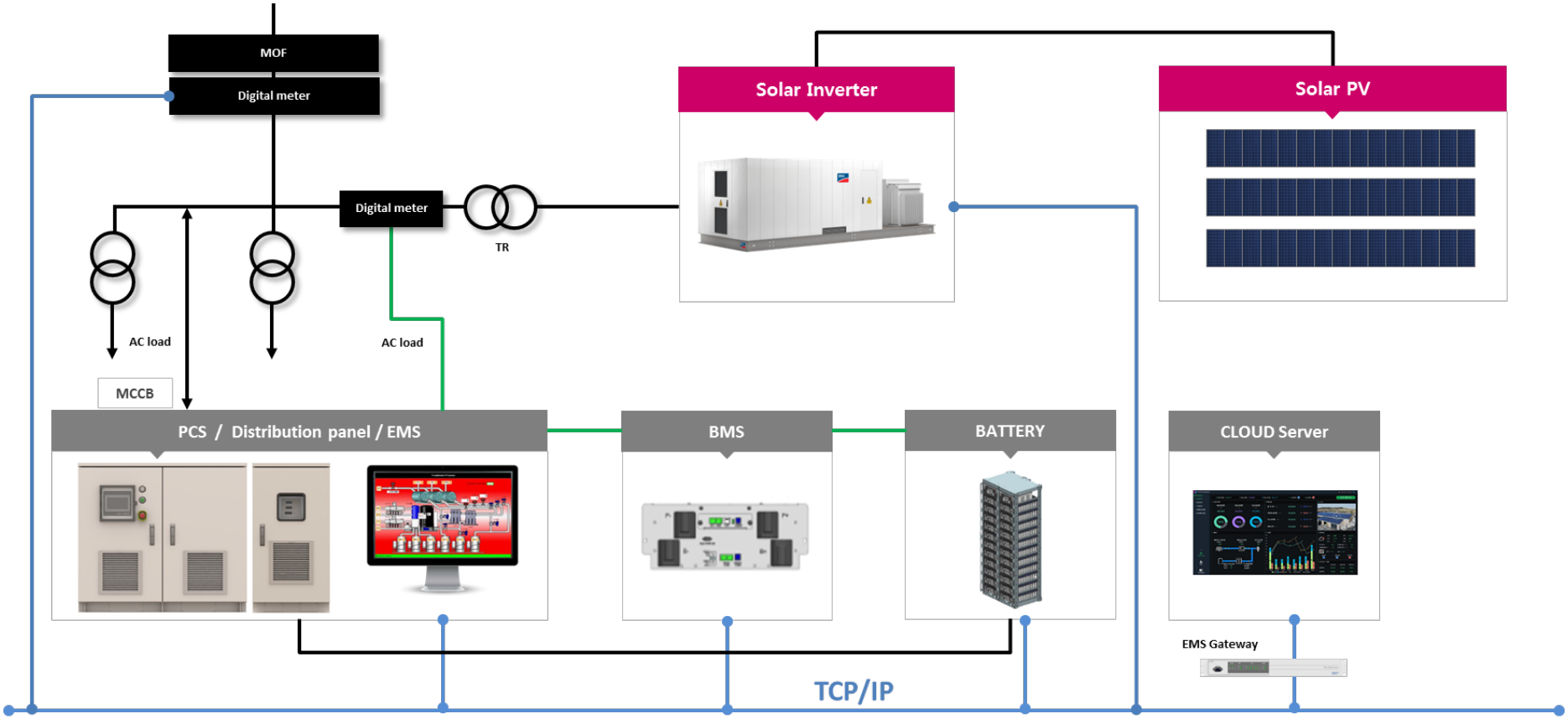
AMO Energy Storage System

AMO ESS HBS – HVAC for Integrated System

Item	Specification
Working Environment(℃)	‘35 ~ +50
Input Power	3~AC 415V/50Hz
Cooling Capacity (50/60Hz) (KW)	25
Heating Capacity (50/60Hz) (KW)	15
Cooling Power (50/60Hz) (KW)	10.1
Heating Power (50/60Hz) (KW)	16.9
Refrigerant	R407C
Indoor Air Flow(㎥/h)	7500
Indoor Air-out Static Pressure(Pa)	250
Size (WxDxH) (mm)	1000*900*2052 (No installation flange)
Color	RAL7035
Protection	IP55
Noise(dB, A)	78

AMO Energy Storage System

AMO ESS HBS – Renewable ESS system configuration



AMO Energy Storage System

AMO ESS HBS – Wall-mountable home ESS with 5KW inverter + 5~20KWh ESS (HESS)

◈ **Features**

❖ **High Yield**

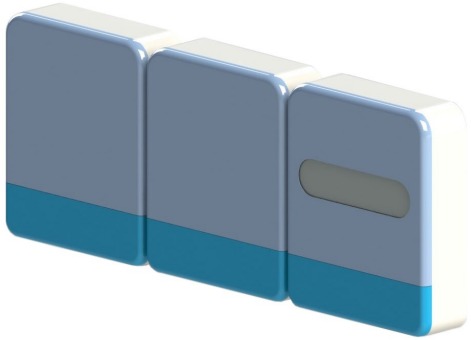
- **Max efficiency 97.6%, European efficiency 97.3%**
- **Max. Charge/Discharge Current 100A**
- **Reasonable energy control to increase the proportion of spontaneous use**

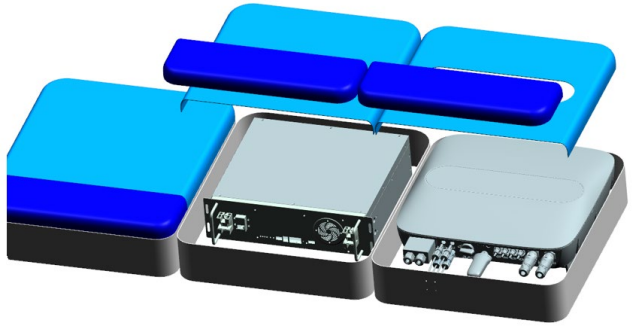
❖ **High Reliability**

- **With BMS system to ensure high battery life**
- **Natural cooling design**

❖ **Intelligent Maintenance**

- **Compatible with lead-acid batteries and lithium battery energy storage systems**
- **Remote configuration and upgrade**





AMO Energy Storage System

AMO ESS HBS – Wall-mountable home ESS with 5KW inverter + 5~20KWh ESS (HESS)

◈ Inverter

Model	**HESS-3000-5KS-IN60**	
Efficiency		
Max. Efficiency(PV to Grid)	97.6%	
European Efficiency	97.3%	
Max. Efficiency(Battery to Load)	97.6%	
Input (PV)		
Max. Input Voltage	580V	
Rated Input Voltage	360V	
Max. Input Current	11A	
Max. Short Circuit Current	12A	
Start Input Voltage	125V	
MPPT Operating Voltage Range	125V-550V	
Max. Number of PV Strings	2	
No. of MPPTs	2	
Input(Battery)		
Battery Type	Lithium-ion/Lead-Acid	
Nominal Battery Voltage	48V	
Battery Voltage Range	40-58V	
Max. Charge/Discharge Current	70A	100A
Lithium-ion Battery Charge Curve	Self-adaption to BMS	
Lead-Acid Battery Charge Curve	3 stages	

AMO Energy Storage System

AMO ESS HBS – Wall-mountable home ESS with 5KW inverter + 5~20KWh ESS (HESS)

◈ Inverter

Output(Grid)	
Rated AC Active Power	5000W
Max. AC Active power	5500W
Rated AC Voltage	220V/230V
AC Voltage Range①	179.7V-262.8V(AU Grid Code)
Rated Grid Frequency	50Hz/60Hz
Grid Frequency Range②	50Hz/60Hz±5%
Max. AC Current Output to Utility Grid (A)	22.8A
THDI	<3% (Rated Power)
Power Factor	Adjustable 0.8 Leading - 0.8Lagging
Output(EPS)	
Nominal Output Power	4600VA
Nominal Output Voltage	220V
Nominal Output Frequency	50Hz/60Hz
THDV	<3% @100% R Load
Switching Time(Typical)	< 20ms
Protection	
DC switch	Support
Anti-islanding protection	Support
AC overcurrent protection	Support
AC short circuit protection	Support
DC reverse connection	Support
Surge Arrester	AC Type III, DC Type III (optional)
Insulation detection	Support
Leakage current protection	Support
Anti-islanding protection	Support

AMO Energy Storage System

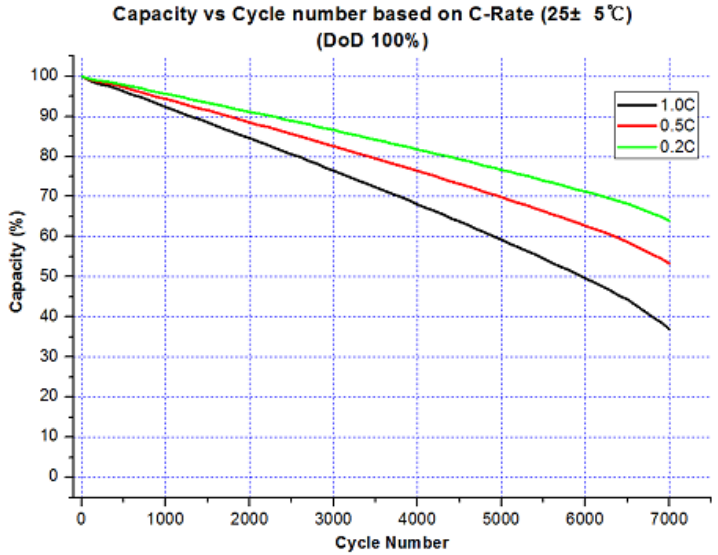
AMO ESS HBS – Wall-mountable home ESS with 5KW inverter + 5~20KWh ESS (HESS)

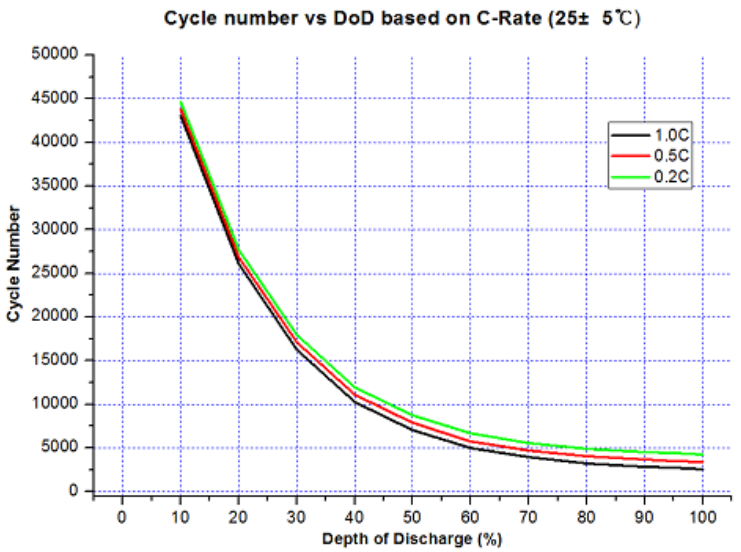
◈ Inverter

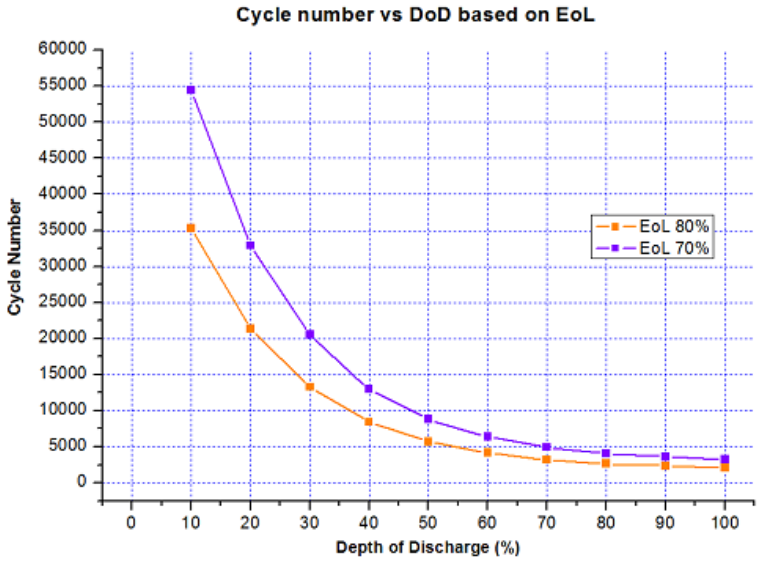
General	
Topology	High Frequency Isolation
IP Rating	IP65
Cooling	Natural cooling
Operating Temperature Range	-25℃-60℃
Relative Humidity Range	0-100%
Max. Operating Altitude	2000m
Noise(Typical)	<30dB
Dimensions (W*H*D)	650*168*560mm (Outer Case)
Weight	25Kg
HMI & COM	
Display	LED&APP
Communication	RS485,CAN, WIFI/GPRS/4G(optional)
Certification	
Safety	IEC62109-1&2, IEC62040-1
Grid Code	AS/NZS 4777.2:2015, IEC 61727/62116, VDE4105-AR-N, EN 50549
Warranty	5 Years/10 Years(Optional)

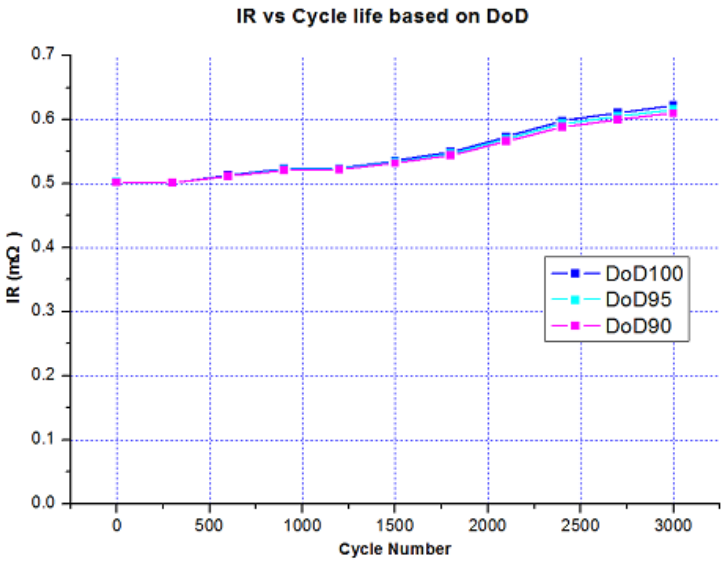
AMO Energy Storage System

AMO ESS HBS – Life-time simulation (11.43MWh)





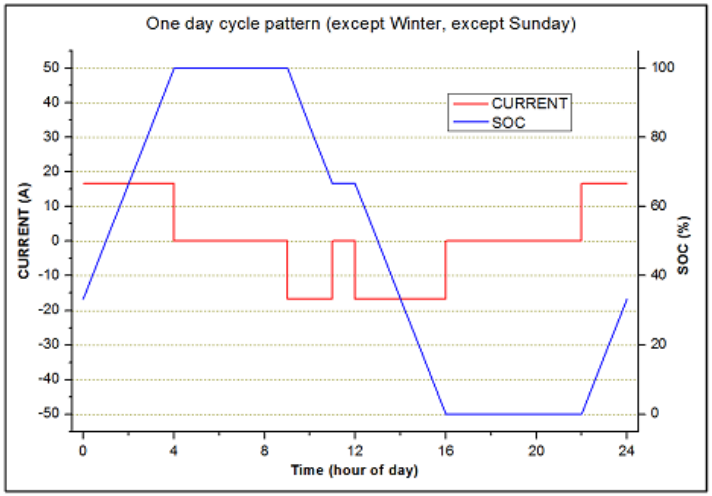


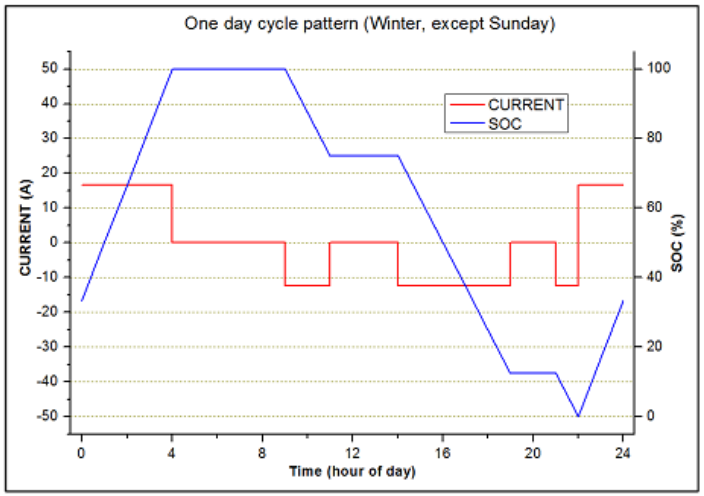


AMO Energy Storage System

AMO ESS HBS – Life-time simulation (11.43MWh)

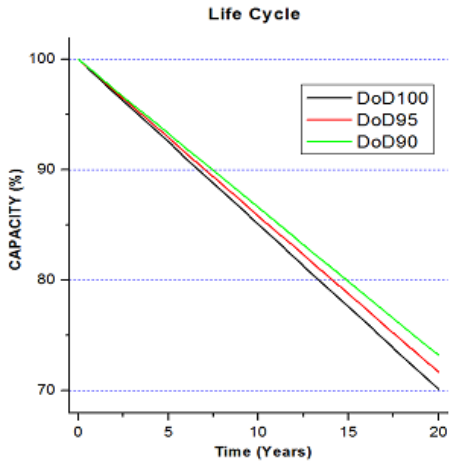
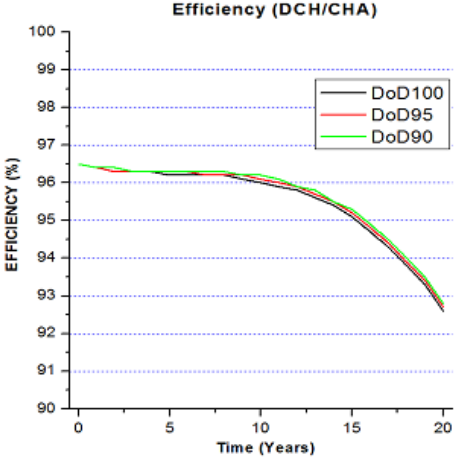
Battery System Specification	
Voltage Range	672 ~ 852 Vdc
Efficiency	≥ 95% (@25±5 ℃)
Type	Li-FePO4
C-rate	0.2C
Operating Temperature	25±5 ℃
Operating Humidity	0 ~ 80%
Charge method	CC-CV
Discharge method	CC
Life Cycle	≥ 5000 (DoD 100% @25±5 ℃, EOL 70%)
Configuration Item	Cell, Module, Rack, BMS, DC PDP





Degradation rate						
Year	Capacity (%)			Capacity(MWh)		
	DoD100	DoD95	DoD90	DoD100	DoD95	DoD90
0	100.0%	100.0%	100.0%	11.43	11.43	11.43
1	98.5%	98.6%	98.7%	11.26	11.27	11.28
2	97.0%	97.2%	97.3%	11.09	11.11	11.12
3	95.5%	95.8%	96.0%	10.92	10.94	10.97
4	94.0%	94.3%	94.6%	10.75	10.78	10.82
5	92.5%	92.9%	93.3%	10.58	10.62	10.66
6	91.0%	91.5%	92.0%	10.41	10.46	10.51
7	89.6%	90.1%	90.6%	10.24	10.30	10.36
8	88.1%	88.7%	89.3%	10.06	10.14	10.21
9	86.6%	87.3%	87.9%	9.89	9.97	10.05
10	85.1%	85.9%	86.6%	9.72	9.81	9.90
11	83.6%	84.4%	85.3%	9.55	9.65	9.75
12	82.1%	83.0%	83.9%	9.38	9.49	9.59
13	80.6%	81.6%	82.6%	9.21	9.33	9.44
14	79.1%	80.2%	81.2%	9.04	9.17	9.29
15	77.6%	78.8%	79.9%	8.87	9.00	9.13
16	76.1%	77.4%	78.6%	8.70	8.84	8.98
17	74.6%	75.9%	77.2%	8.53	8.68	8.83
18	73.1%	74.5%	75.9%	8.36	8.52	8.67
19	71.6%	73.1%	74.5%	8.19	8.36	8.52
20	70.1%	71.7%	73.2%	8.02	8.20	8.37

Year	Efficiency		
	DoD100	DoD95	DoD90
0	96.5%	96.5%	96.5%
1	96.4%	96.4%	96.4%
2	96.3%	96.3%	96.4%
3	96.3%	96.3%	96.3%
4	96.3%	96.3%	96.3%
5	96.2%	96.3%	96.3%
6	96.2%	96.3%	96.3%
7	96.2%	96.2%	96.3%
8	96.2%	96.2%	96.3%
9	96.1%	96.2%	96.2%
10	96.0%	96.1%	96.2%
11	95.9%	96.0%	96.1%
12	95.8%	95.9%	95.9%
13	95.6%	95.7%	95.8%
14	95.4%	95.5%	95.5%
15	95.1%	95.2%	95.3%
16	94.7%	94.8%	94.9%
17	94.3%	94.4%	94.5%
18	93.8%	93.9%	94.0%
19	93.3%	93.4%	93.5%
20	92.6%	92.7%	92.8%

Simulation Result			
Mode	0.2C / Even Rest Time		
Operating	6 days operating per week		
Service Life Estimation	DoD 100%	DoD 95%	DoD 90%
	20.13 Years	21.20 Years	22.39 Years
Result			

Thank you

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