

# **PowerSaver**

**FS-HES-1.5KW**

**Hybrid Energy System for Telecom Outdoor BTS**

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# 1. System Description:

This manual describes the FS-HES-1.5KW, Hybrid Energy System’s main function, configuration, main components’ technical specifications, packaging and labeling.

This system’s power supply is from Solar, DG and Battery Bank, outputting maximum 1.5KW within continuous 24 hours/day for outdoors BTS of Telecom Operators.

Also one intellectually analysis service is optional for our customers,

## 1.1 Main functions:

The HES use Solar and DG AC as power source, Solar is the main power, the DG provide a backup power. By DC/DC conversion (solar) and AC/DC conversion (DG AC), the HES turn the input energy into 48V dc power which meet the requirement of communications equipment, to charge the 48V battery, and to supply the 48V communications equipment at the same time. 48V power supply is the main output of the HES, HES also provide 220Vac power output by using an inverter, and provide 12V DC power output by using a DC converter.

## 1.2 Composition of the System:

Main components include 3 assemblies:

**Energy Management Assembly** is consisted of monitoring module, solar charge modules, rectifiers, inverter, 12V charger (DC converter), cabinet assembly with distribution unit and the optional GPRS-DTU;

**Battery Bank Assembly** is optional within Sacred Sun’s full range of battery solutions;

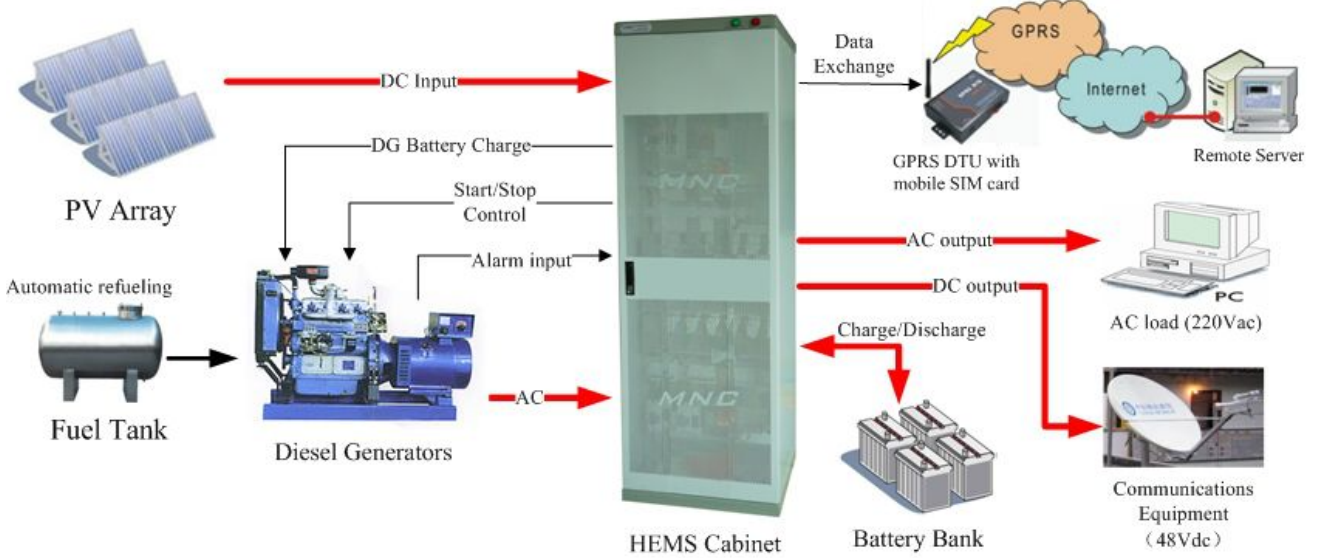
**PV Modules Assembly** is composed of solar panel, junction box, cable and installation rack (Optional).

## 1.3 Working condition

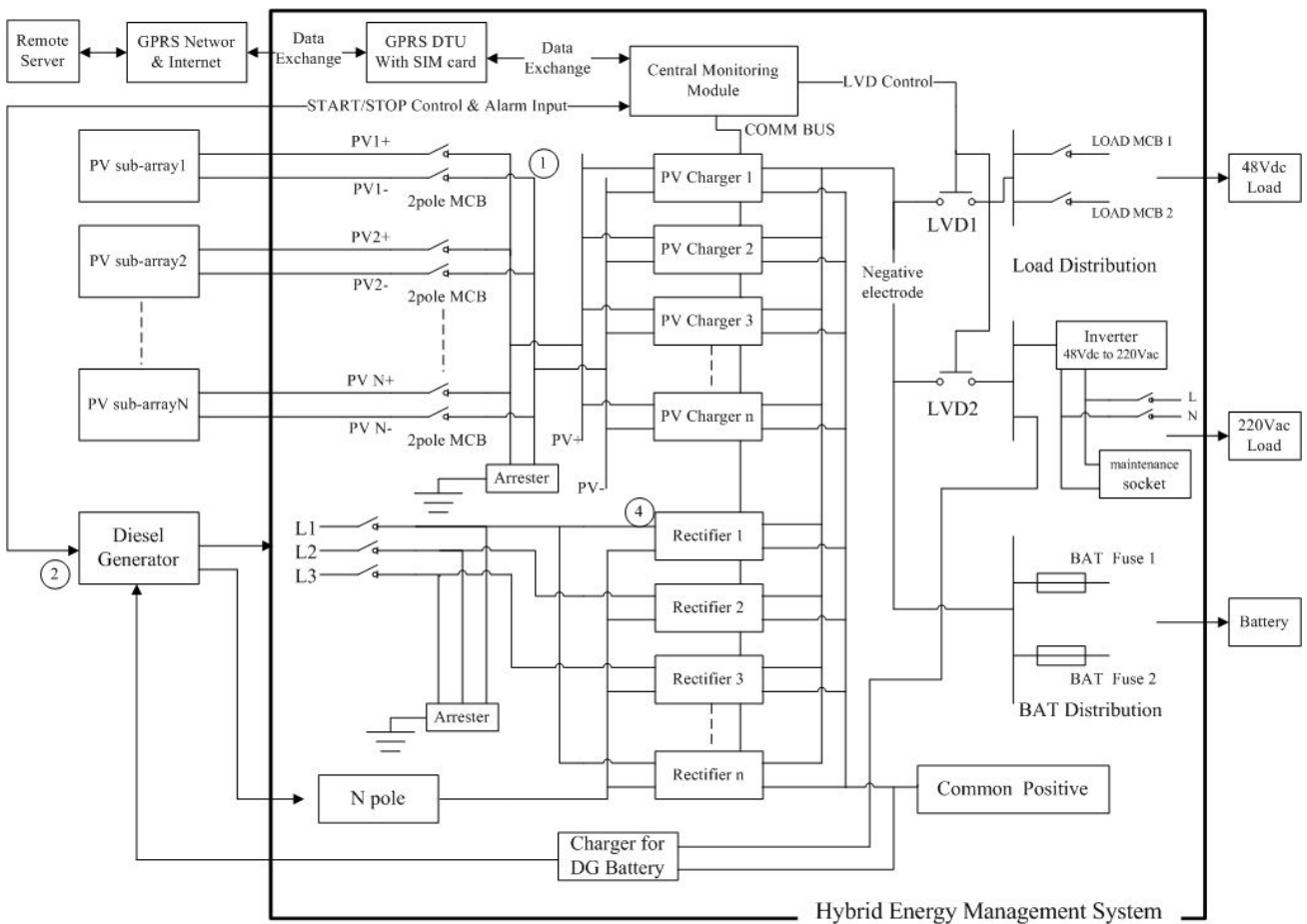
Parameter	Min	Typ	Max	Unit
Temperature	-20	---	40	°C
Humidity	0	---	95	%
Altitude	---	---	3000	m
Vibration	No severe vibration and shock , ≤5°vertical tilt			
Collide	150m/s <sup>2</sup> 、 11ms			
Shell protection (IP rating )	IP45 or IP55 (optional)			

## 2. Overall system solution

HES's electrical diagram in the power supply system is show as below:



HES's electrical wiring diagram is showed as below, (Energy Management Assembly inside the black bold lines):



### 3. Technical Specifications of Energy Management Assembly

#### 3.1 Modules Parameters

##### 3.1.1 Solar charger

Parameter	Min	Typ	Max	Unit
Single module capacity	---	---	3000	W
Number of modules	1	---	4	PCS
Total capacity	3000	---	12000	W

##### 3.1.2 Rectifier

Parameter	Min	Typ	Max	Unit
Single module capacity	---	---	3000	W
Number of modules	1	---	4	PCS
Total capacity	3000	---	12000	W

##### 3.1.3 Inverter

Parameter	Min	Typ	Max	Unit
Single module capacity	---	---	500/350	VA/W
Number of modules	0	---	1	PCS
Total capacity	0	---	500/350	VA/W

##### 3.1.4 DC converter

Parameter	Min	Typ	Max	Unit
Single module capacity	---	---	100	W
Number of modules	0	---	1	PCS
Total capacity	0	---	100	W

##### 3.1.5 Monitoring module

Parameter	Min	Typ	Max	Unit
Number of modules	0	---	1	PCS

##### 3.1.6 GPRS-DTU part (Optional)

Parameter	Min	Typ	Max	Unit
Number of modules	0	---	1	PCS

#### 3.2 Input

##### 3.2.1 Solar part

Parameter	Min	Typ	Max	Unit
Rated input voltage	---	272	---	Vdc
Input voltage range	0	---	400	Vdc

MPPT voltage range(full load)	200	---	400	Vdc
MPPT efficiency	97	---	99.9	%
PV input branch	---	4	---	Branch
PV input interface	---	MCB	---	---
Rated current of PV Input 1	---	16	---	A
Rated current of PV Input 2	---	16	---	A
Rated current of PV Input 3	---	16	---	A
Rated current of PV Input 4	---	16	---	A

### 3.2.2 Rectifier part

Parameter	Min	Typ	Max	Unit
Rated input voltage of system	---	380	---	Vac
Input voltage range of system	138	---	520	Vac
Rated input voltage of Rectifier	---	220	---	Vac
Input voltage range of Rectifier	80	---	300	Vac
Input AC frequency	45	50	60	Hz
System AC input branch	---	1	---	Branch
System AC input interface	---	MCB	---	---
Rectifier AC input	---	MCB	---	---
Rated current of system AC Input	---	40	---	A
Rated current of Rectifier Input	---	20	---	A

### 3.2.3 Inverter part

Parameter	Min	Typ	Max	Unit
Rated input voltage	---	48	---	Vdc
Input voltage range	30	---	58	Vdc
Rated input current	8.6	10	11.6	A
Input branch	---	1	---	Branch

### 3.2.4 12V charger part

Parameter	Min	Typ	Max	Unit
Rated input voltage	---	48	---	Vdc
Input voltage range	32	---	58	Vdc
Rated input current	---	2	---	A
Input branch	---	1	---	Branch

## 3.3 Output

### 3.3.1 48Vdc part

Parameter	Min	Typ	Max	Unit
Rated output voltage	---	48	---	V <sub>DC</sub>
Output voltage range	42	---	58	V <sub>DC</sub>
Rate output current of Solar	---	200	---	A
Rate output current of Rectifier	---	200	---	A

Rate output current of system (solar + rectifier)	---	400	---	A
<b>For load</b>				
Rated current of 48Vdc load	---	50	---	A
LVD steps	---	2	---	Steps
Load output branch at LVD1	---	2	---	Branch
Load output interface	---	MCB	---	---
Rated current of 48V Load output 1 ( for comm equipment )	---	32	---	A
Rated current of 48V Load output 2 ( spare )	---	16	---	A
Output interface for Inverter at LVD2	---	MCB	---	---
Output interface for 12V charger at LVD2	---	MCB	---	---
<b>For battery</b>				
Battery output branch	---	2	---	Branch
Battery output interface	---	FUSE	---	---
Rated battery output 1 current	---	250	---	A
Rated battery output 2 current	---	250	---	A

### 3.3.2 220Vac part (Inverter output)

Parameter	Min	Typ	Max	Unit
Rated output voltage	---	220	---	V <sub>ac</sub>
Rate output current	---	1.8	---	A
AC output branch	---	2	---	Branch
AC Output interface	---	1 pcs MCB 1 pcs IEC Socket	---	---
Rate current of AC output MCB	---	2	---	A
Rate current of IEC Socket	---	10	---	A

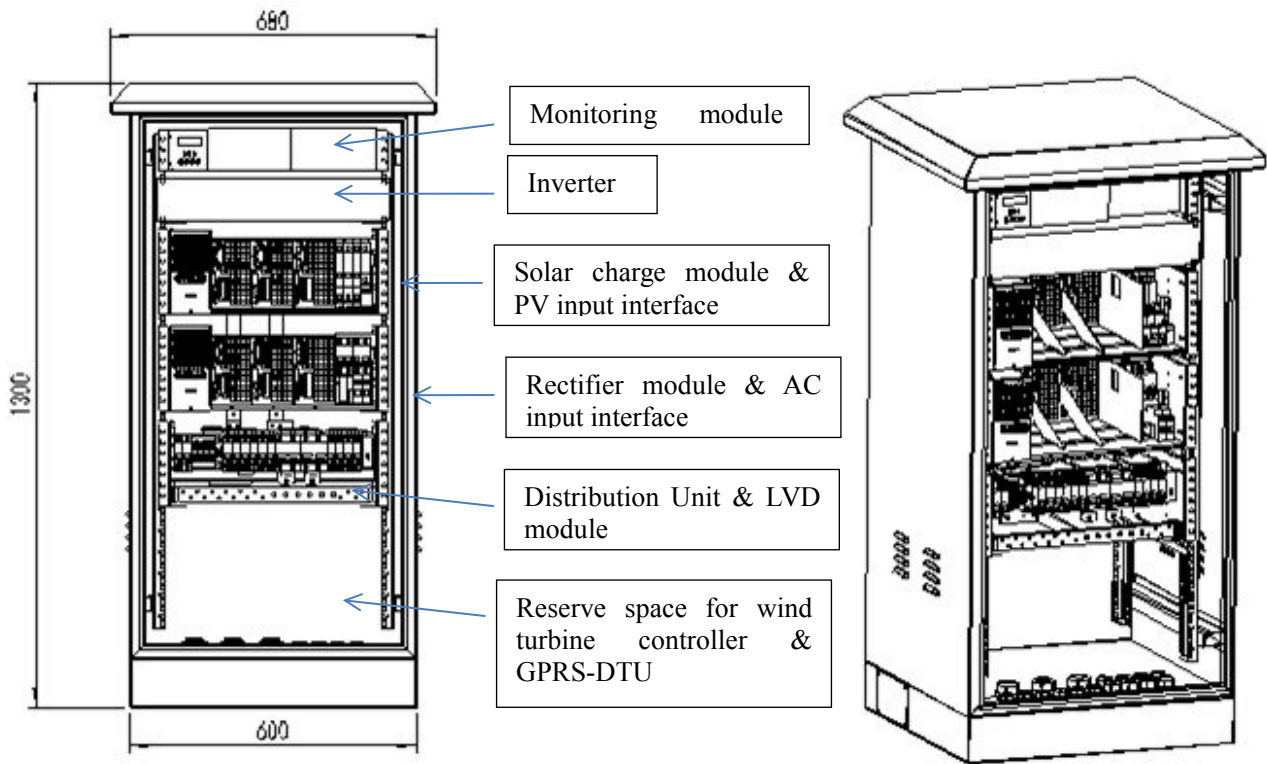
### 3.3.3 12V charger part

Parameter	Min	Typ	Max	Unit
Rated output voltage	---	12	---	V <sub>dc</sub>
Rate output current	---	8	---	A
Output branch	---	1	---	Branch
AC Output interface	---	MCB	---	---

## 3.4 Cabinet Assembly

Cabinet system include: outdoor cabinet shell, module slot, input and output distribution unit, circuit control equipment, surge protection device.

### 3.4.1 Cabinet internal layout



### 3.4.2 Specification

Type	Cabinet Size		
	Width(mm)	Depth(mm)	High(mm)
Energy Management Assembly	600±5	600±5	1700±5

Parameter	Min	Typ	Max	Unit
Type	---	Outdoor type	---	---
Door	---	1 front door	---	---
Degree of protection	---	IP55	---	---
Shell	---	Double steel shell, filled with insulation materials	---	---
Thermostat	---	Heat exchanger (Fan cooling for optional)	---	---
Weathering resistance	---	Moisture proof Anticorrosive Anti-salt spray UV	---	---
Cable access	---	Bottom	---	---
DC voltage drop	---	---	≤500	mV

### 3.4.3 Electrical Safety

The electrical safety of products should meet the following requirements.

Item	Conditions	Require	Scope
Insulation resistance	500VDC	≥10MΩ	Between the live circuit and ground point
Insulation Strength	2500VAC/50Hz	leakage current≤10mA,without breakdown and flashover within 1 minute	between two conductors of live circuit, between any one conductor and chassis ( or ground )
Ground-resistance	The product should have a neutral or protective grounding device	≤0.1Ω	between protective grounding point and chassis & door's grounding screw

### 3.4.4 Other requirements

Cabinet chassis manufacturing quality, the main circuit connections, secondary circuit wiring and electrical components installation shall meets the following requirements:

- a) Components installed in the cabinet shall meet their own technology requirement;
- b) The product's door can be flexibly opened and closed, and door open angle shall more than 90 °;
- c) Paint electroplating shall firm, smooth , uniform, non- flaking, no rust and cracks;
- d) Anti-loosening devices shall be used in all fastening position;
- e) Cabinet panel shall be smooth and symmetry. Printed texts and symbols shall correct, clear, clean, good looking;
- f) Labels, signs shall be complete and clear;
- g) The color of the cable, arrangement of copper bus shall meet the relevant standard.

### 3.5 System Protection

Item	Description
Battery protection	Over charge protection
	Over discharge protection
Module protection	High temperature output power limit
	Over-temperature protection
	Output current limit
	Output power limit
	Output short circuit protection
	Input under-voltage protection
	Input over-voltage protection
	Input low-voltage protection
	Input over-voltage protection
System protection	Solar input surge protection, C class, 40KA
	DG/AC input surge protection, C class, 40KA
	DC output surge protection, C class, 20KA



### 3.6 External control function

Item	Description
DG control	Start/Stop
Control signal	Dry contact

### 3.7 Measurement and Alarm

#### 3.7.1 Measurement and Calculation item

Item	Measurement	Calculation	Display
System output voltage	√		√
Solar input voltage	√		√
AC input voltage	√		√
Battery current	√		√
Load current		√	√
Solar charge current	√		√
AC charge current	√		√
Battery temperature	√		√
Solar power generation statistics		√	√
AC power generation statistics		√	√
Battery charge statistics		√	√
Battery discharge statistics		√	√
Load consumption statistics		√	√
Maximum battery voltage record		√	√
Minimum battery voltage record		√	√

### 3.8 Alarm

Alarm message will be displayed, can be specified separately to an output relay for providing dry contact signal.

Item	Description
Module input voltage fault	
Module output voltage fault	
Module current limit	
Module power limit	
Module over temperature	
Module comm fault	
Module fault	
SPD fault alarm	
Load fuse alarm	
Battery fuse alarm	
System output over-voltage	
System output low-voltage	
Cabinet Security alarm	It contains door access alarm, flooding alarm, smoke alarms
DG public alarm	It contains DG fault, mains fault

DG fuel level alarm	
DG running	

### 3.9 Reliability

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### 3.10 Packaging and labeling

The product are packaged by cartons and wooden pallets, the packing size is shown in the below table :

Model	The box size		
	Width(mm)	Depth(mm)	High(mm)
Energy Management Assembly	≥690	≥690	≥1870

Covered by cushioning material.

Alarm printing on the box: Handle with care, no exposure to rain and moisture.

## 4. Battery Bank Assembly

Refer to Sacred Sun’s battery manual.

## 5. PV Modules Assembly

Optional.

## 6. Intellectual Analysis Service

## 7. product image display

### 7.1 Outlook



7.2 Front





### 7.3 Panel

