SPF 3500-5000ES + AXE Lithium Battery
Off-Grid Energy Storage System
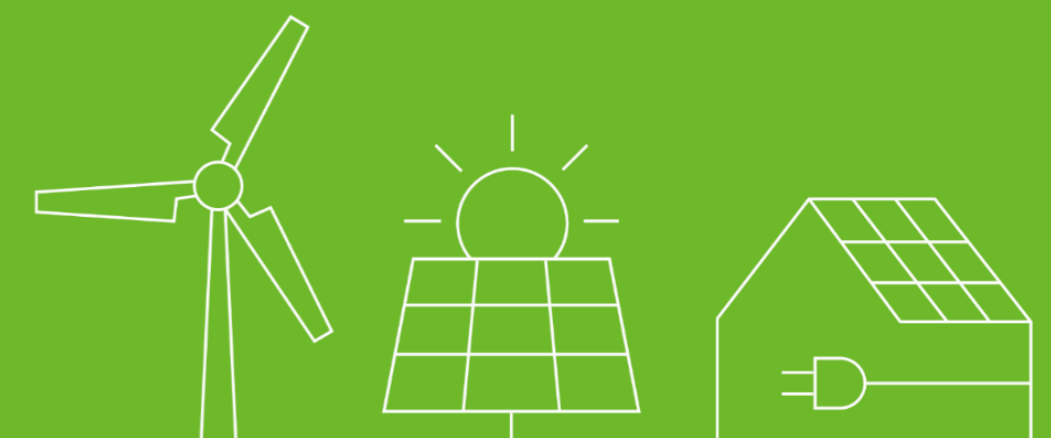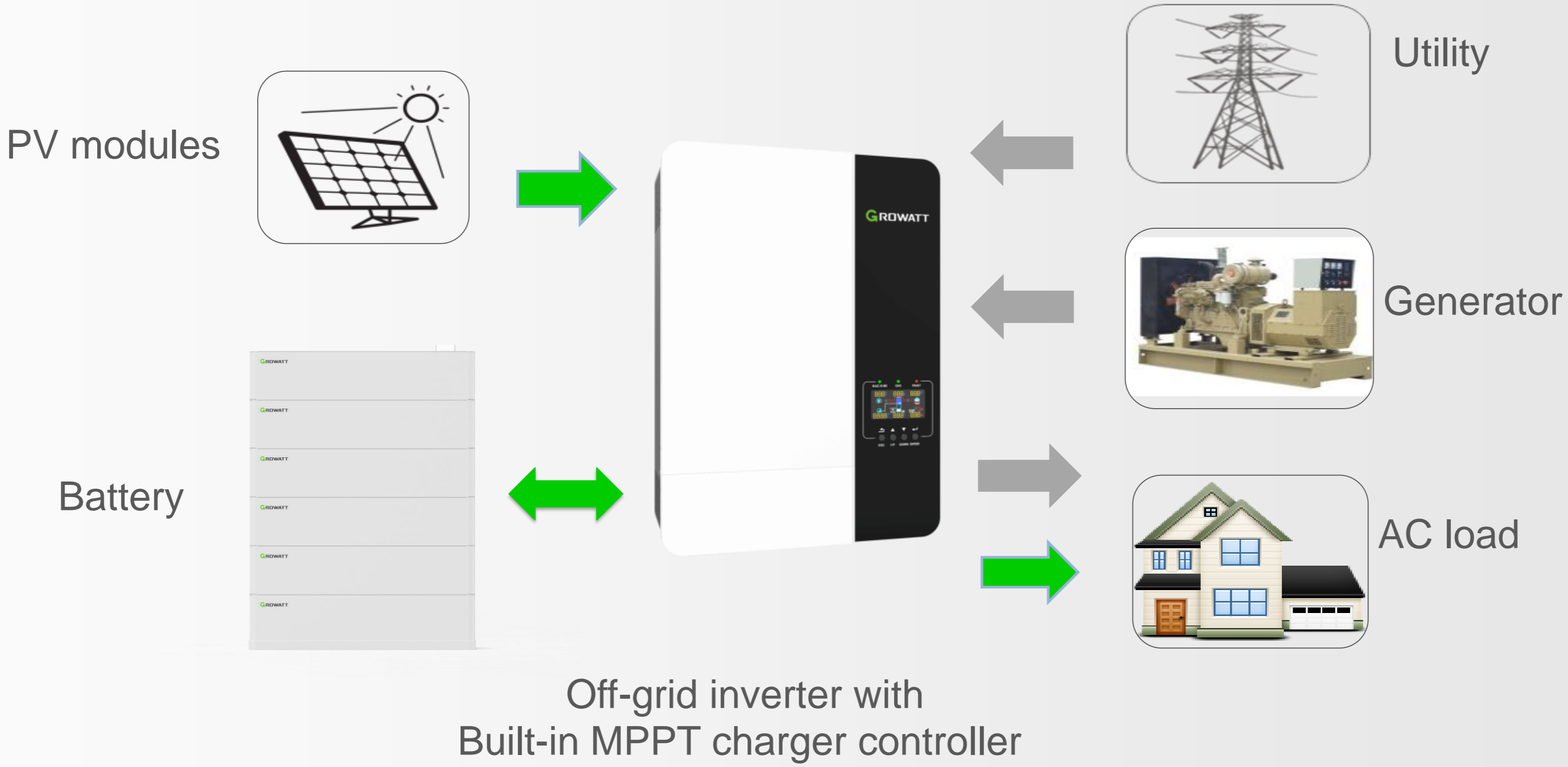
GROWATT

CONTENTS

01

Product Overview

Off-Grid System Overview

Off-grid energy storage system is generally consist of PV modules, off-grid inverter, battery, generator or utility power, monitoring devices and electrical appliances.

PV modules

Battery

Utility

Generator

AC load

Off-grid inverter with
Built-in MPPT charger controller

ES Series Features:

GROWATT

Key Feature

1. Compatible with Lithium battery

2. Wide PV input voltage range up to 450Vdc

3. SUB function to support solar and utility jointly power the load

4. Parallel for scalability or three phase operation up to 6 units

5. Work with or without battery

6. Support generator input

7. Equalization charging function for lead-acid battery

8. LCD display and WiFi/GPRS monitoring & smart control

SPF 3500-5000ES

AXE Battery Key Features
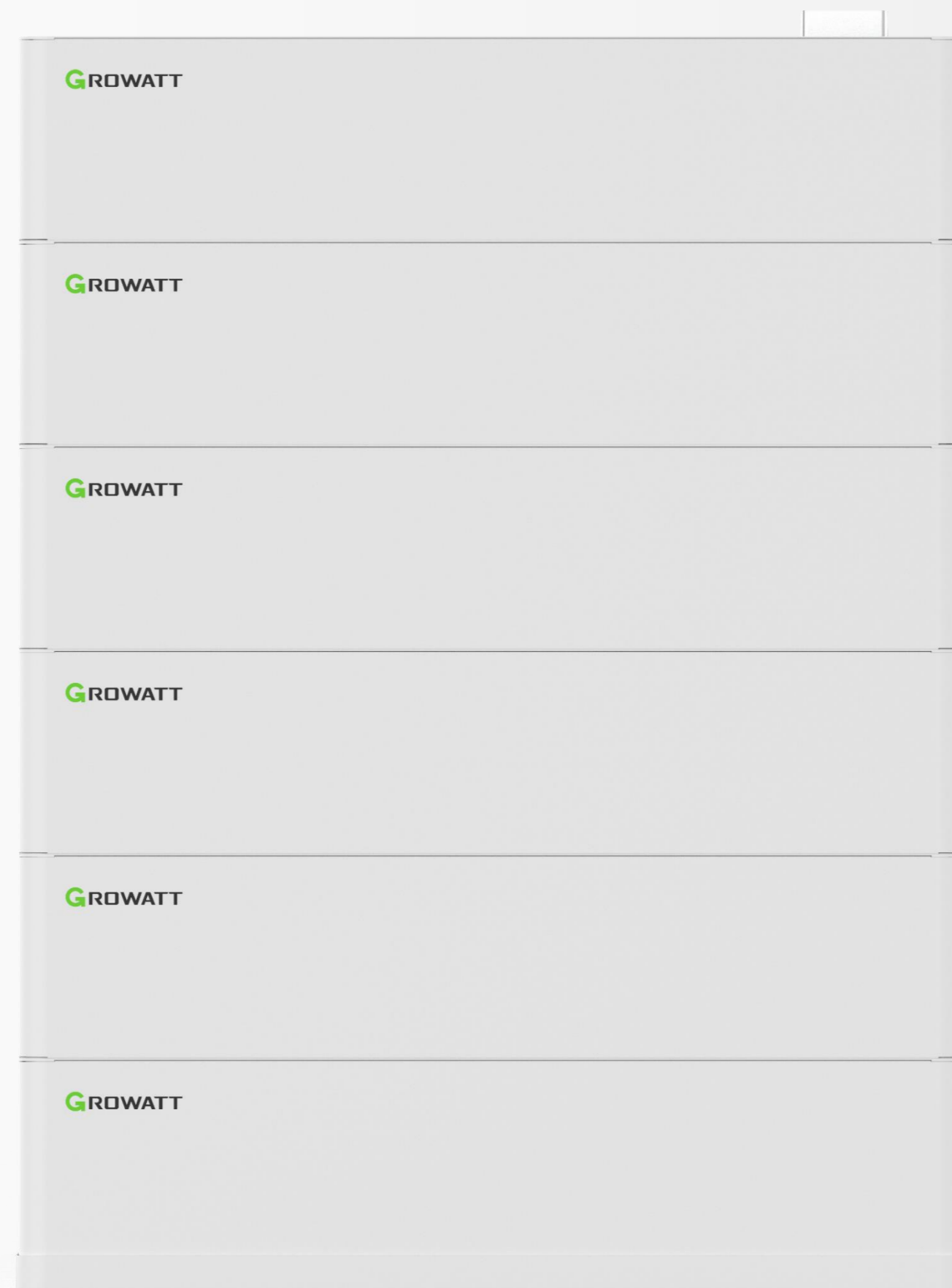
AXE Low Voltage Battery System

5.0kWh / Module

Single Cluster: 5.0kWh ~ 50kWh

Max. 8 clusters up to 400kWh

LFP battery, extreme safe

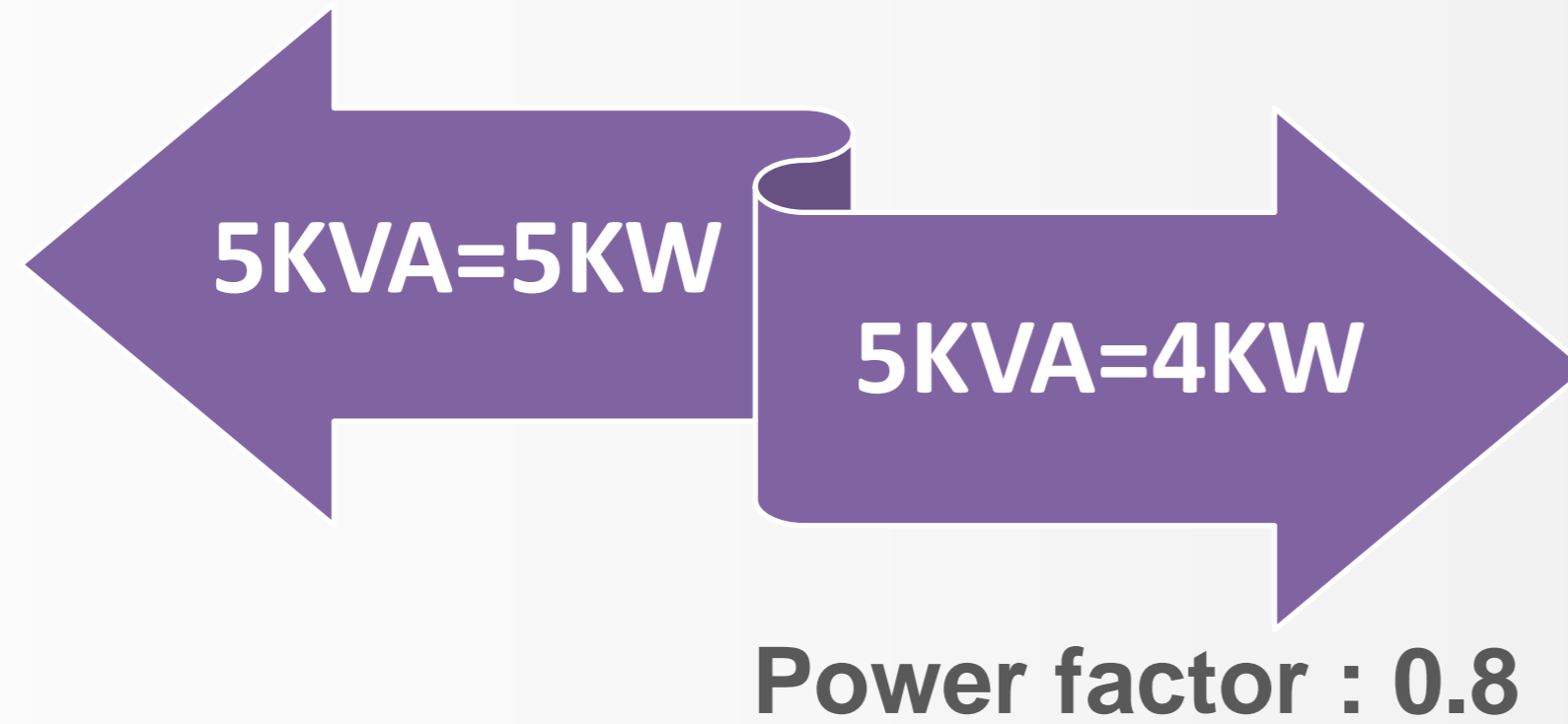Internal plug connection, easy installation

02

Higher Yield

Power Factor 1.0

GROWATT

Power factor : 1.0

5KVA=5KW

5KVA=4KW

Power factor : 0.8

More Powerful
Output power factor: 1.0 (5KVA & 5KW)

Inverter 100% load, still work normally
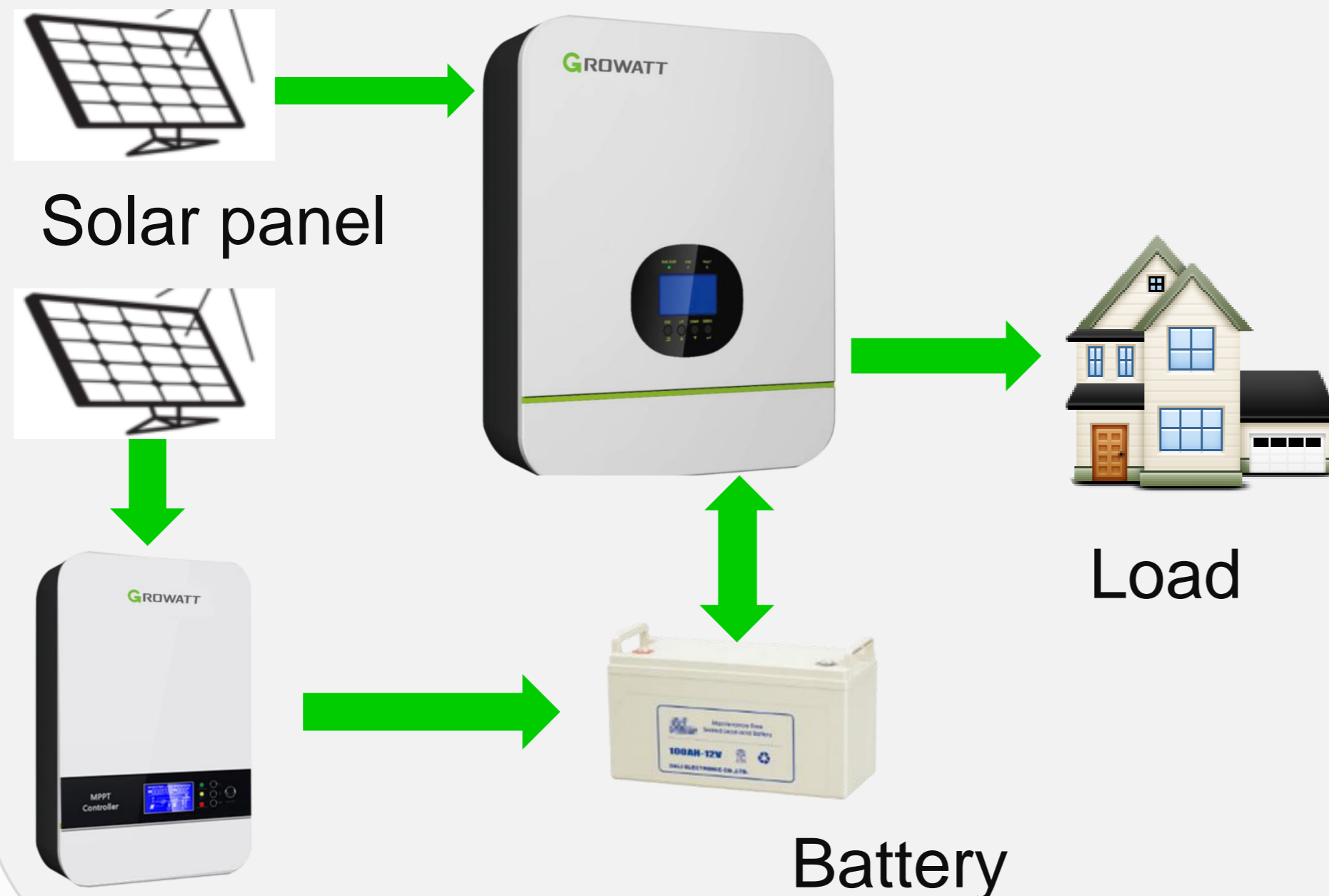
Over-load 125%, inverter stop working

5KW Power Appliances

High DC/AC Ratio up to 1.2

GROWATT

6KW PV input support the full load output and additional energy to charge the battery.
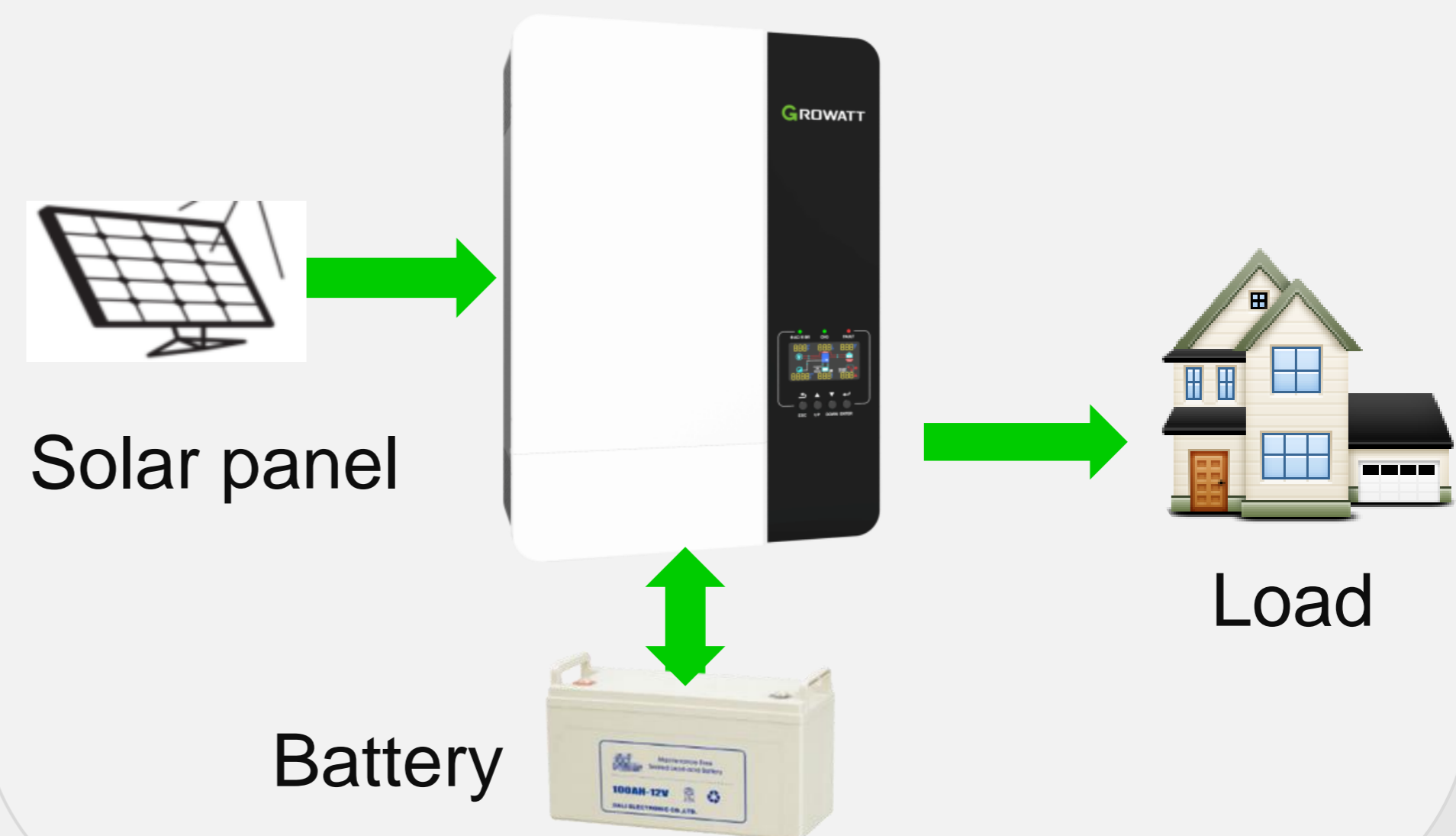
General 5KVA inverter
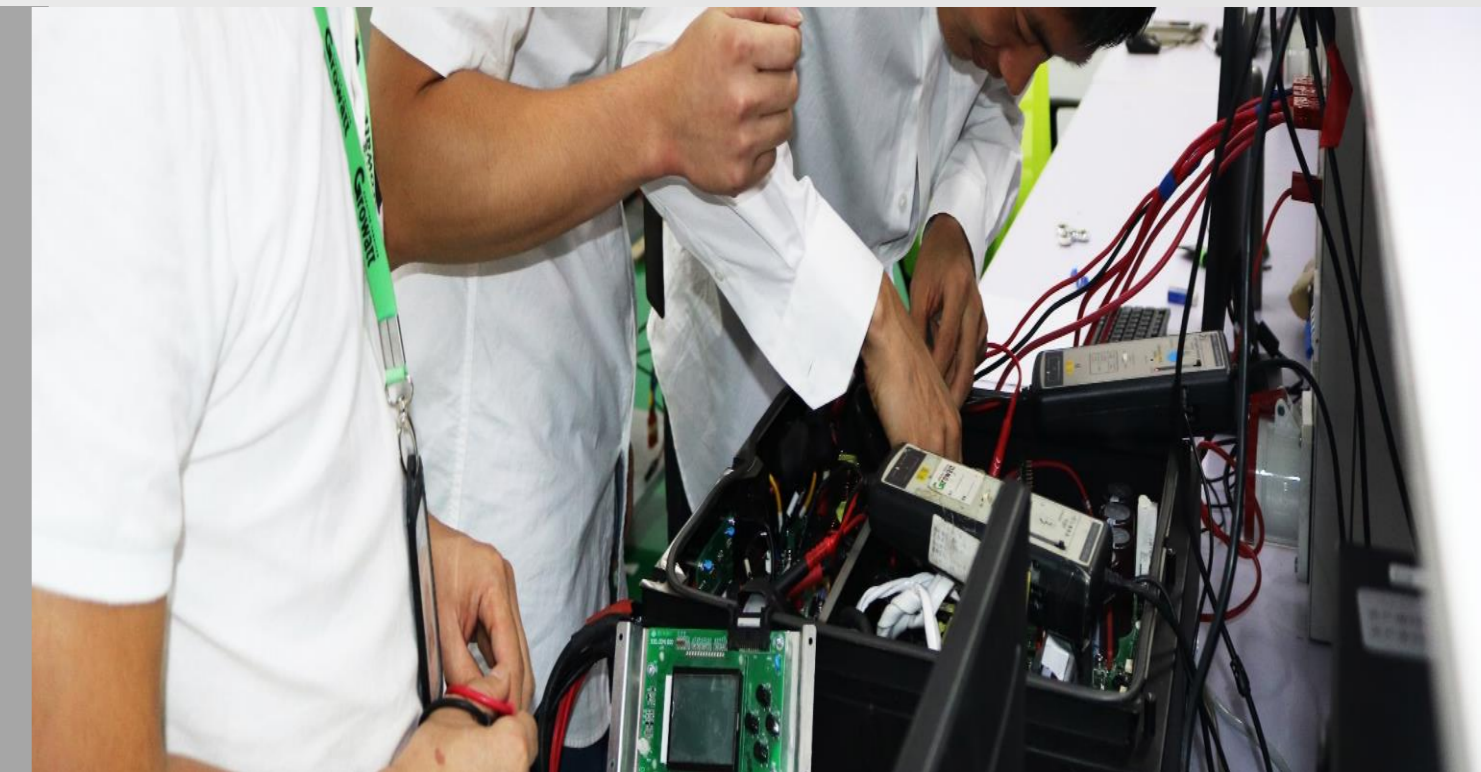Maximum 4500Wp PV input, need additional SCC for battery charging

Solar panel

Load

Battery

Solar Charger Controller (SCC)

SPF 5000ES
Maximum 6000Wp PV input, enough energy both for load and battery

Solar panel

Load
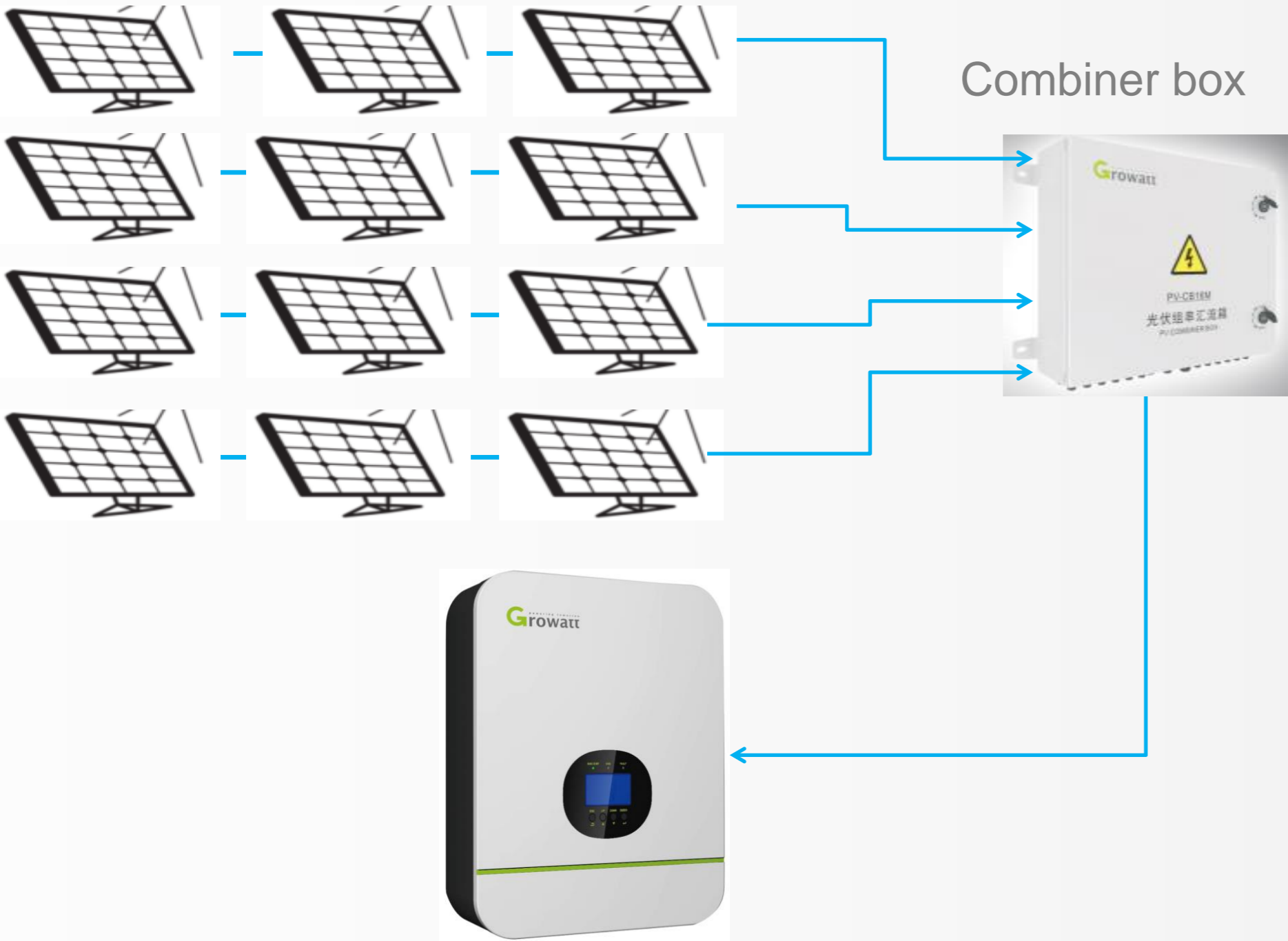
Battery
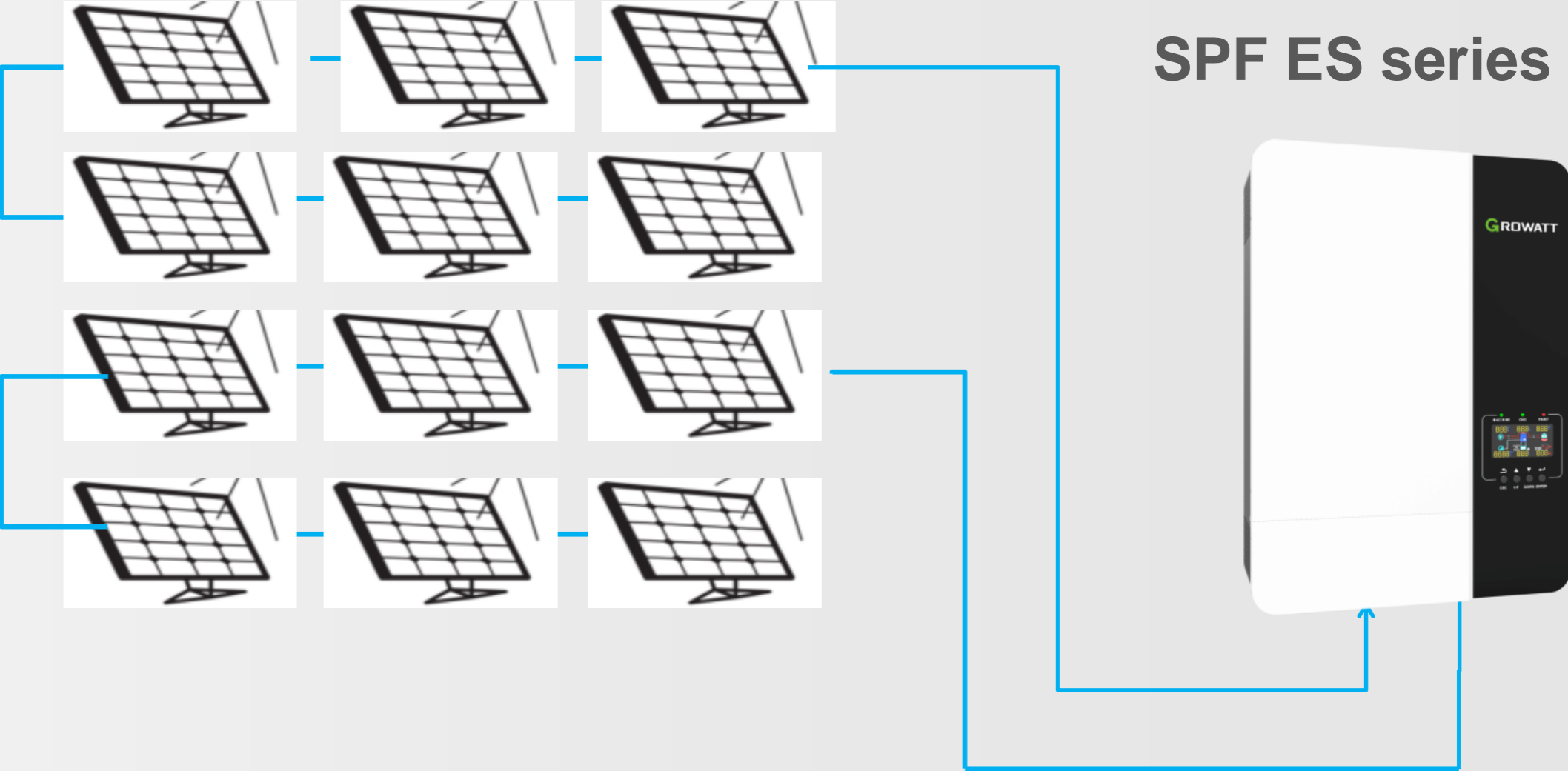
03

Flexible & Scalable

Higher PV Input Range

GROWATT

General inverter application
Max. PV Input is 145VDC

Combiner box

SPF ES series

SPF 2000-5000TL HVM (old version)

ES series inverter PV input range up to **450VDC**, no need additional combiner box, which is convenient for installation and save the wiring cost.

Parallel Extension

GROWATT

Parallel operation up to 6 units, the maximum system capacity would be 30kW,
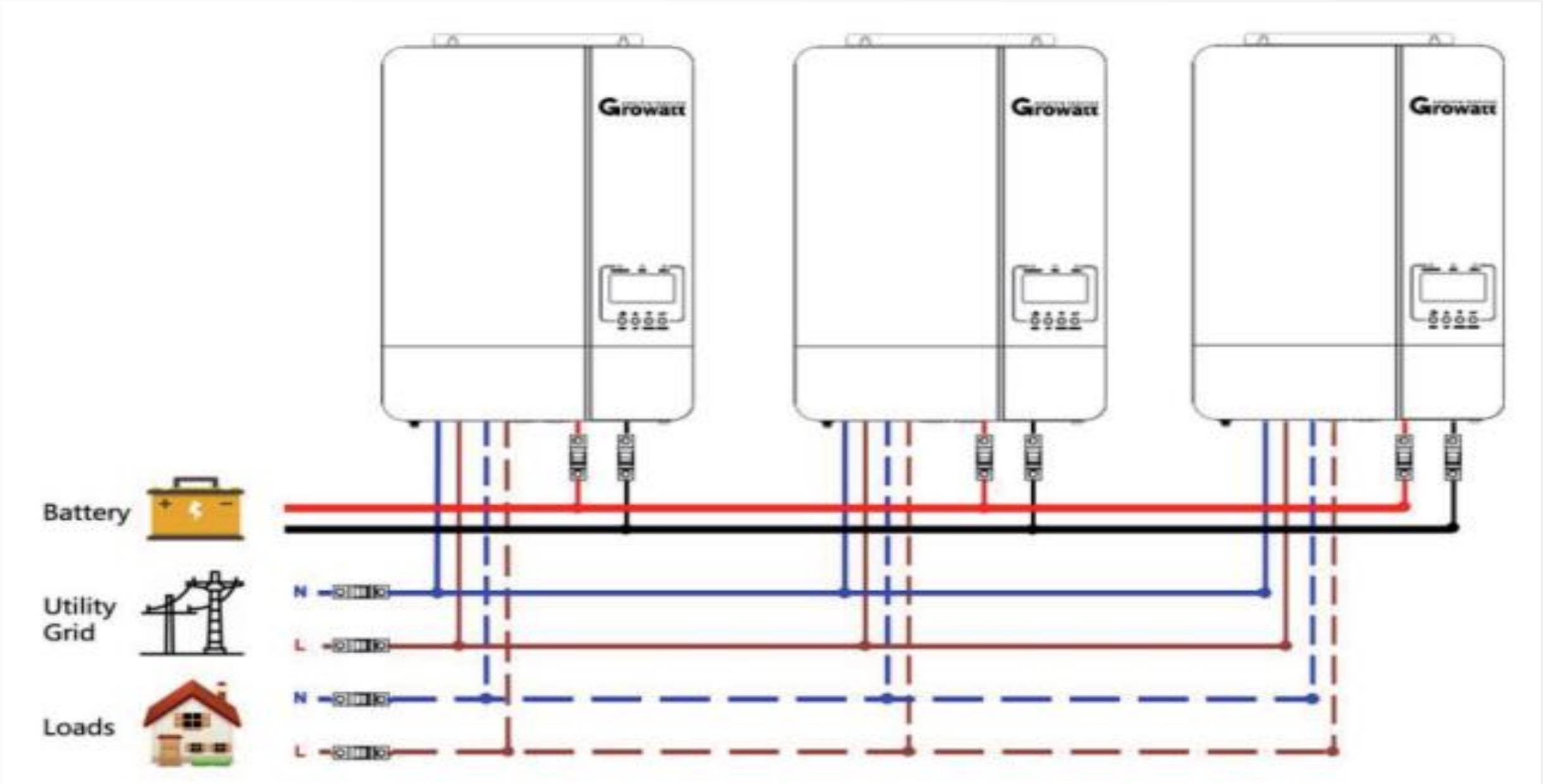also support to configure three-phase system, provide customer enough flexibility.
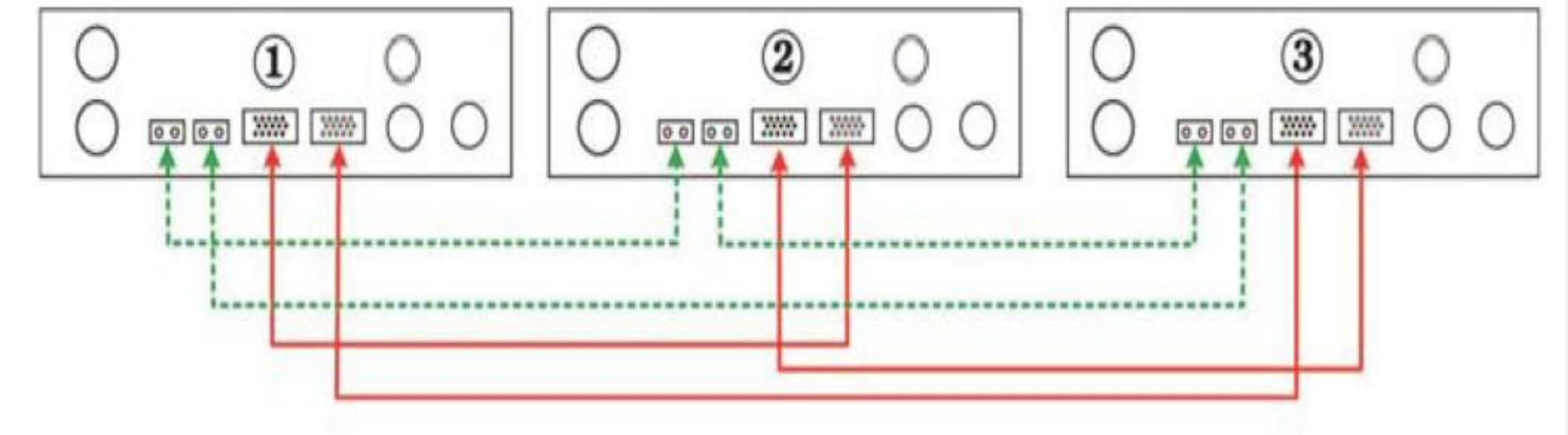
Three-phase system
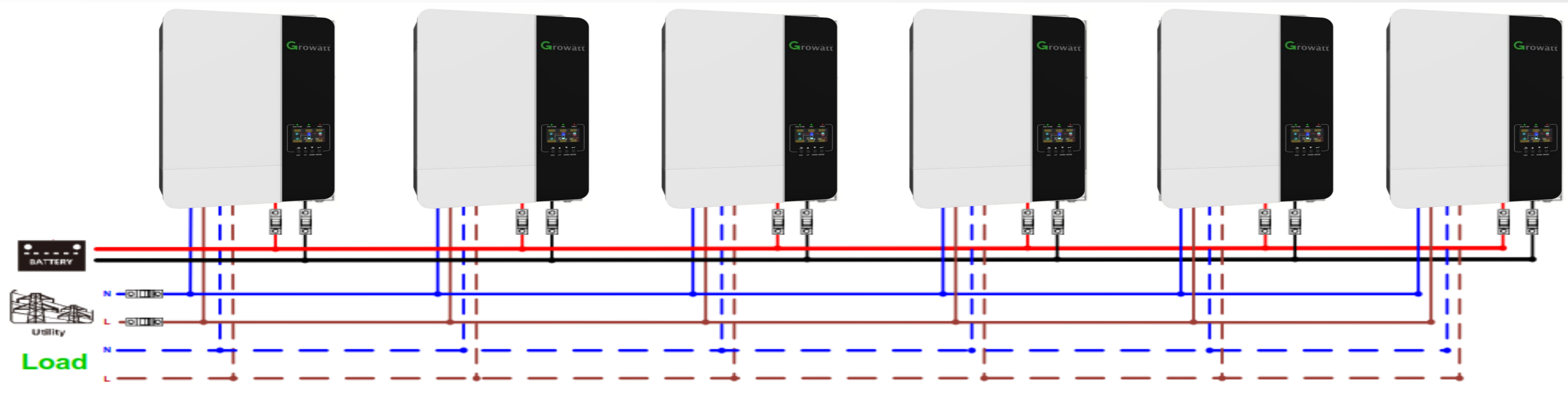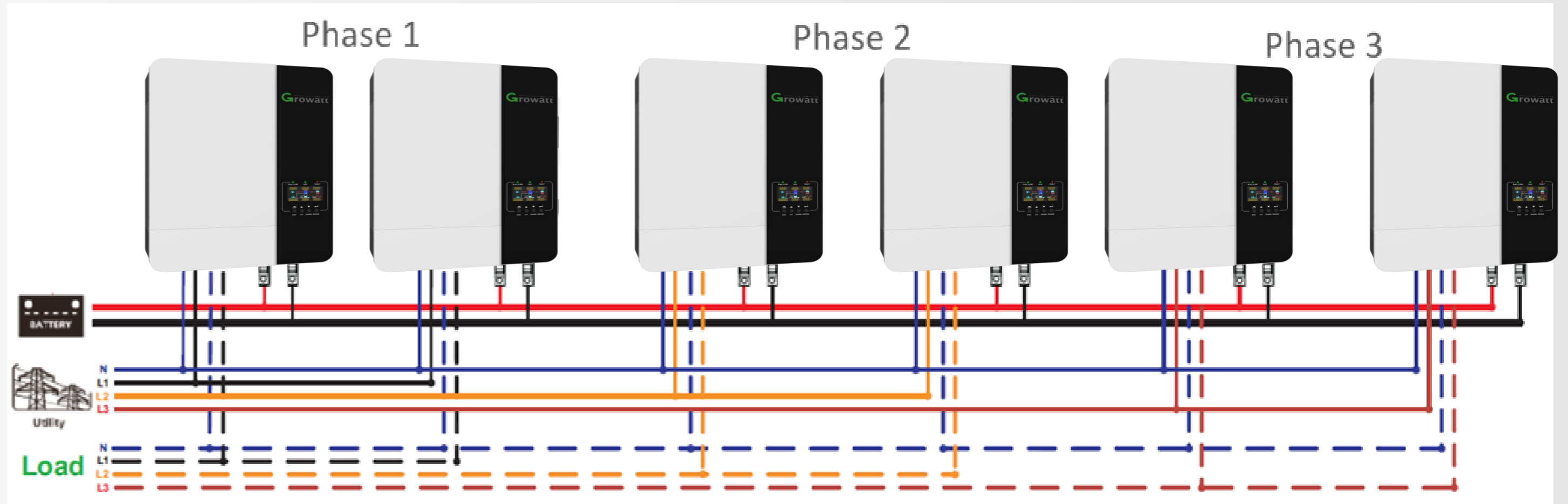
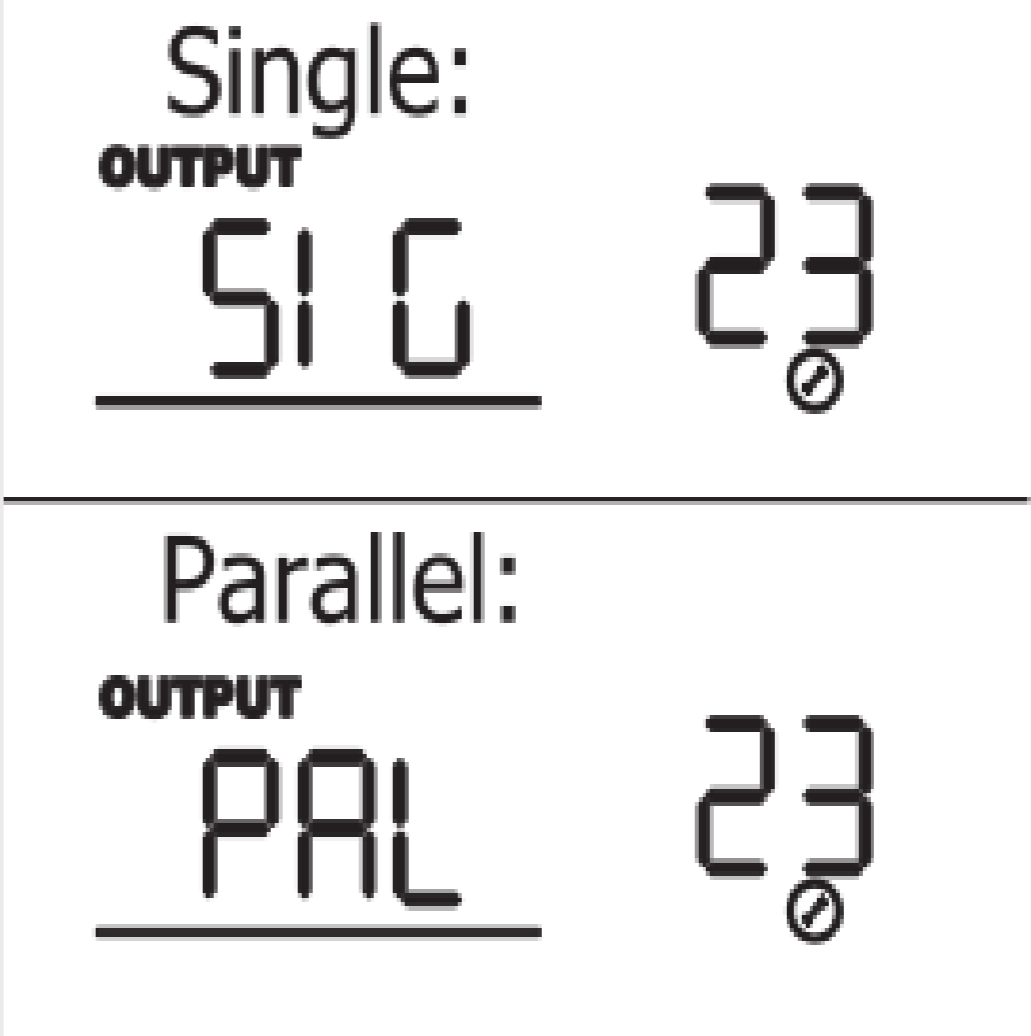**Single-phase system**

Parallel Connection

Single phase parallel:
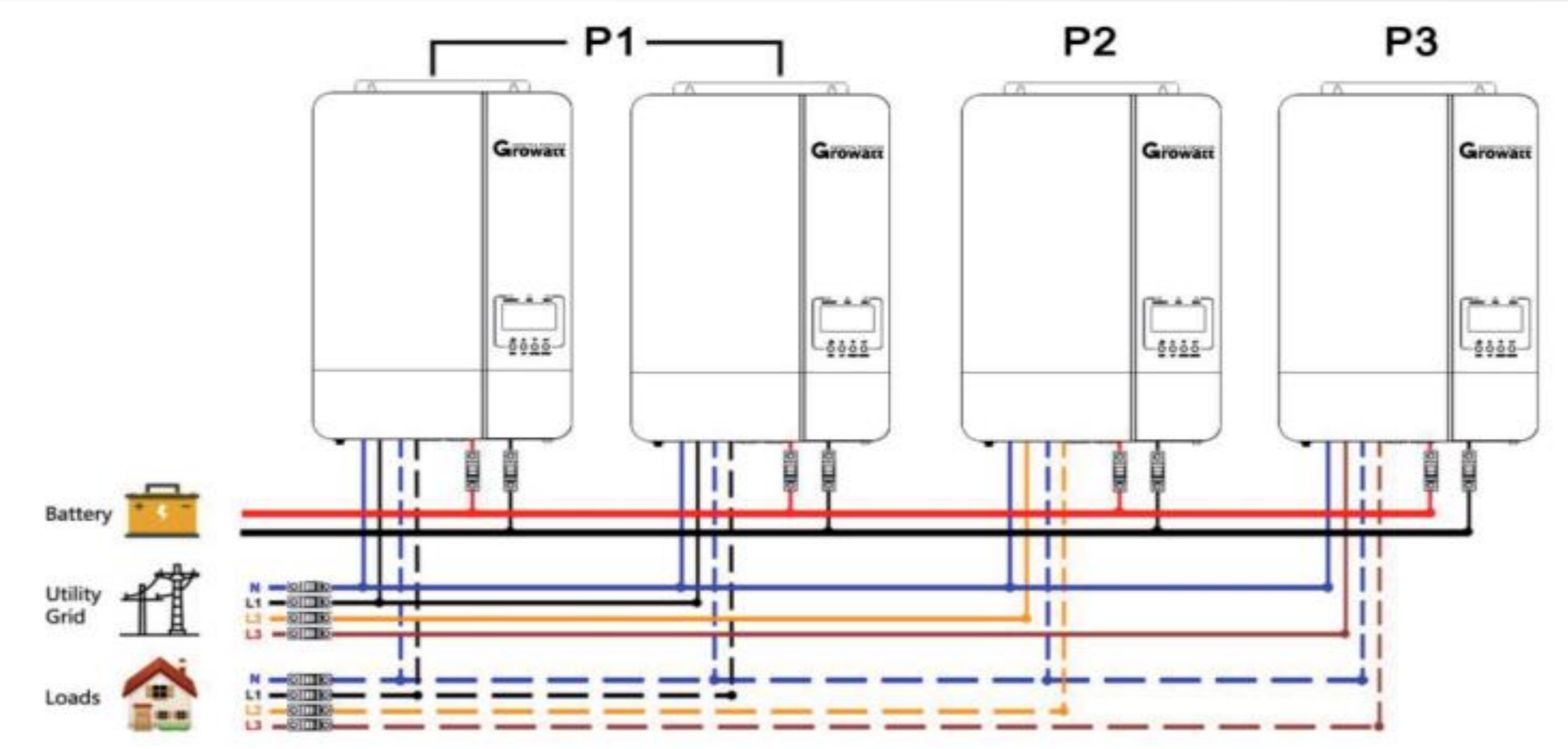

Communication connection:

When the units are used in **parallel with single-phase**, please **select "PAL" in program 23.**

Note: Please connect the current sharing cable for same phase inverters which is like the green color wire and connect parallel communication cable between the each inverters as the red cable .

Parallel Connection

GROWATT

Three phase parallel:

When units are used in **parallel with three-phase**, **please select "3P1" for L1, "3P2" for L2, and "3P3" for L3 in program 23.** All neutral lines must be connected.

Communication connection:

Note: Please connect the current sharing cable for same phase inverters which is like the green color wire and connect parallel communication cable between the each inverters as the red cable .

Setting Operation
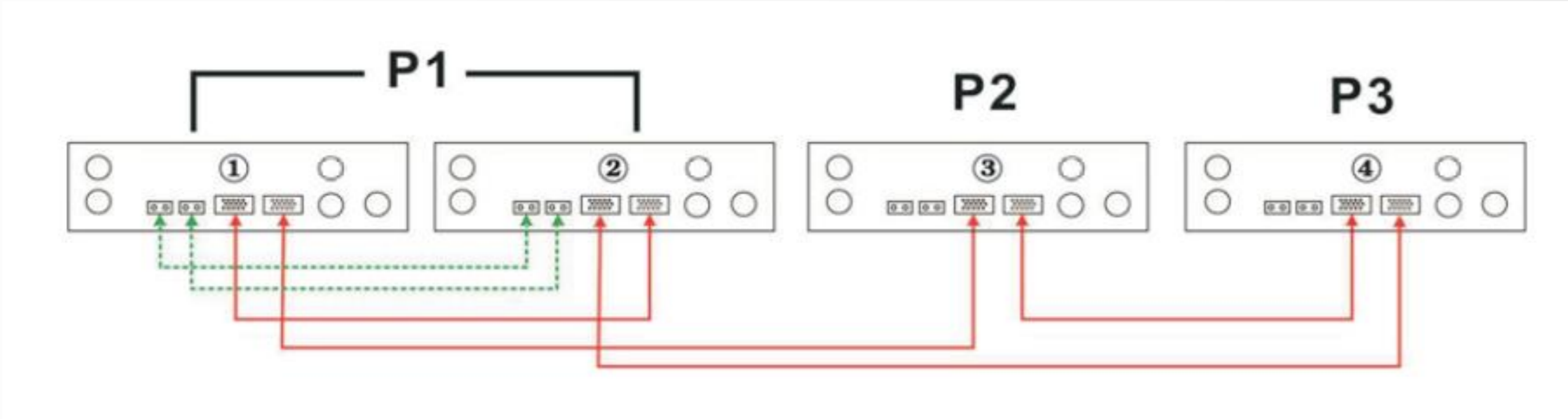
Parallel mode setting step:

Pressing and holding ENTER button for 3 seconds.

Press "UP" or "DOWN" button to select setting programs. Then press "ENTER" button to confirm

Single phase parameter setting

Three phase parameter setting

Work Without Battery

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Shine Server   Cloud Server   Shine Phone

PV Array

Grid

Shine WiFi-F

Battery   Load
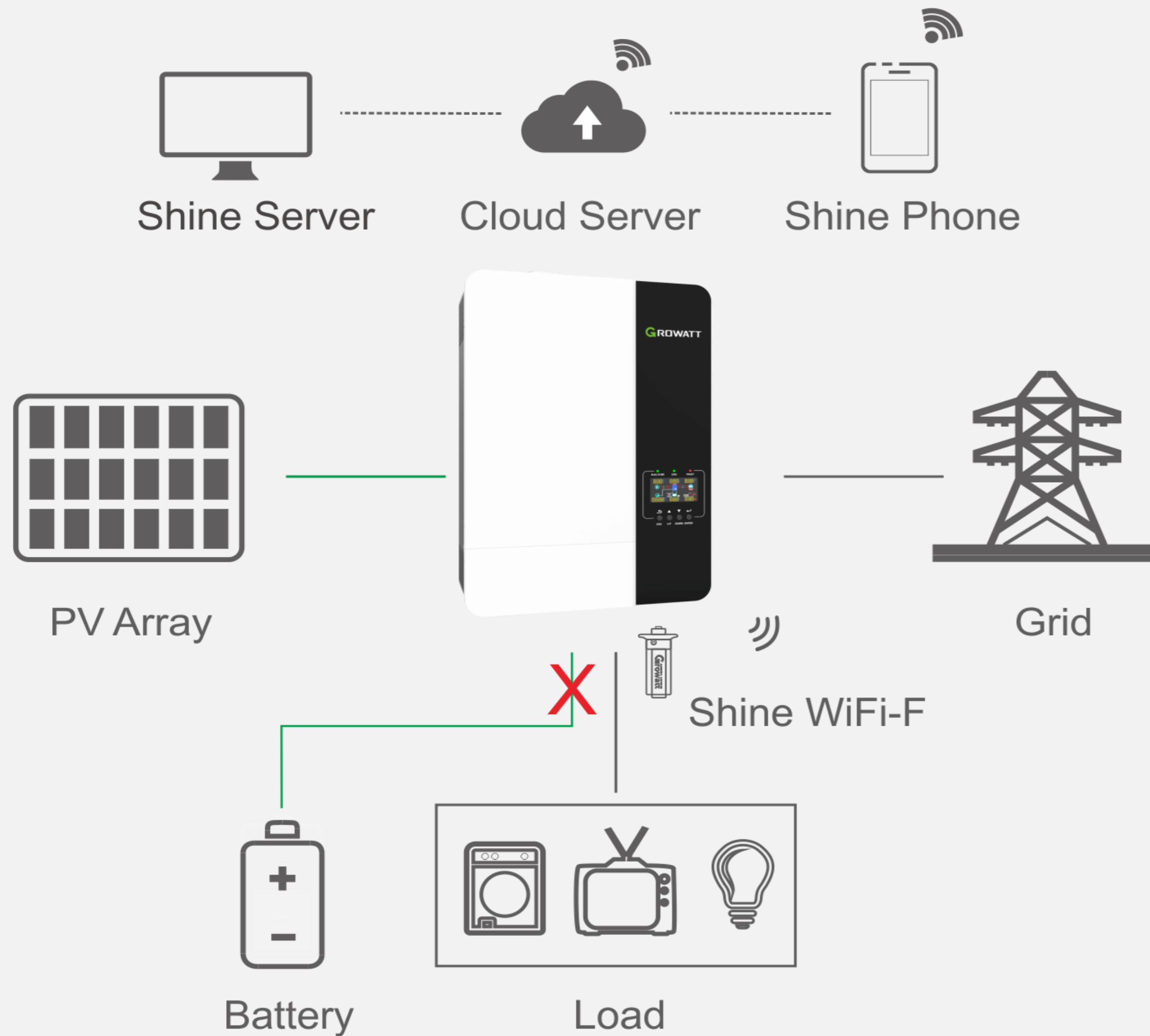
1. Directly connect solar panel , without battery and grid operation mode

2. Directly connect Grid power , without battery and solar operation mode

3. Directly connect solar panel and grid power without battery operation mode

4. Connect battery optional for energy storage and back-up support

CAN/RS485 Communication with Lithium Battery

GROWATT

Inverter built-in BMS port which include RS485 and CAN communication, and then easy to connect to different communication methods of lithium batteries.

CAN

RS485

AXE LV Battery

BMS port (RS485 /CAN)

Other Brand Battery

Setting operation

GROWATT

Battery type setting step:

Pressing and holding ENTER
button for 3 seconds.

1. AGM, Flooded, User-Defined
   battery type can be selected
   (For lead-acid battery)

2. Lithium , User-Defined 2 (lithium
   battery without communication)
   type can be selected
   (For Lithium battery)

Note: for Lithium battery please
select correct communication
protocol base on different brand
battery.

Lithium Battery Communication protocol

Battery		High Frequency Inverter (Off-grid)					
Brand	Model	Protocol type	SPF 5000TL HVM SPF 5000TL HVM-P	SPF 3000TL LVM-48P	SPF 3000TL HVM-48	SPF 5000TL HVM-WPV SPF 5000TL HVM-WPV-P	SPF 3500-5000ES SPF 3000TL LVM-ES
Growatt	ARK 2.5L-A1/ AXE 5.0L-A1	L51	CAN	CAN	CAN	CAN	CAN
PYLON TECH	US2000 / US2000(New version）	L52/L04	CAN/RS485	CAN/RS485	CAN/RS485	CAN/RS485	CAN/RS485
PYLON TECH	US2000 PLUS/ US2000 PLUS(New version）	L52/L04	CAN/RS485	CAN/RS485	CAN/RS485	CAN/RS485	CAN/RS485
Growatt	Hope 4.8L-C1	L51	CAN	CAN	CAN	CAN	CAN
Growatt	Hope 3.3L-C1	L51	CAN	CAN	CAN	CAN	CAN
DYNESS	B4850	L01	RS485	RS485	RS485	RS485	RS485

Battery		Low Frequency Inverter (Off-grid)					
Brand	Model	Protocol type	SPF4-6KT HVM SPF 4000-6000T DVM	SPF8-12KT HVM SPF 8000-12000T DVM	SC 4860-120 SC 4860-120-MPV	SPF 3000T HVM-G2	SPF 6-12KT DVM-MPV
PYLON TECH	US2000 / US2000(New version）	L52/L04	CAN/RS485	*	CAN/RS485	CAN/RS485	*
PYLON TECH	US2000 PLUS/ US2000 PLUS(New version）	L52/L04	CAN/RS485	*	CAN/RS485	CAN/RS485	*
DYNESS	B4850	L01	RS485	RS485	RS485	RS485	RS485
Growatt	Hope 4.8L-C1	L51	CAN	CAN	CAN	CAN	CAN
Growatt	Hope 3.3L-C1	L51	CAN	CAN	CAN	CAN	CAN
Growatt	ARK 2.5L-A1	L51	CAN	CAN	CAN	CAN	CAN

04

Smart & Reliable
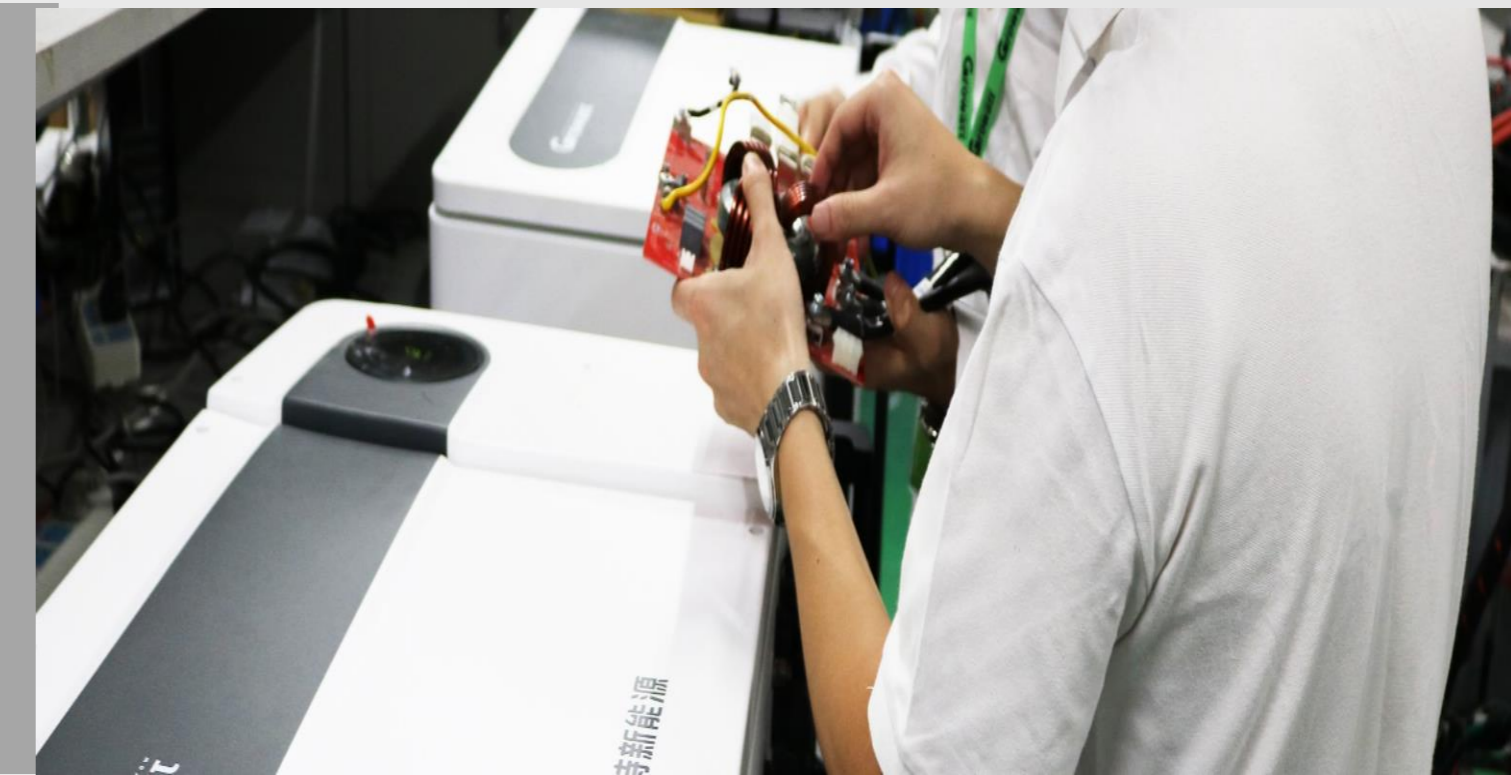
Convenient HMI

Colorful LCD display

ES series

PVkeeper platform
for local configuration or monitoring.

USB cable

1. Input information (PV voltage, AC voltage, frequency, PV generation, battery voltage, charger current)

2. Output information (voltage, load percentage, frequency, load in VA, load in watt, discharging current)
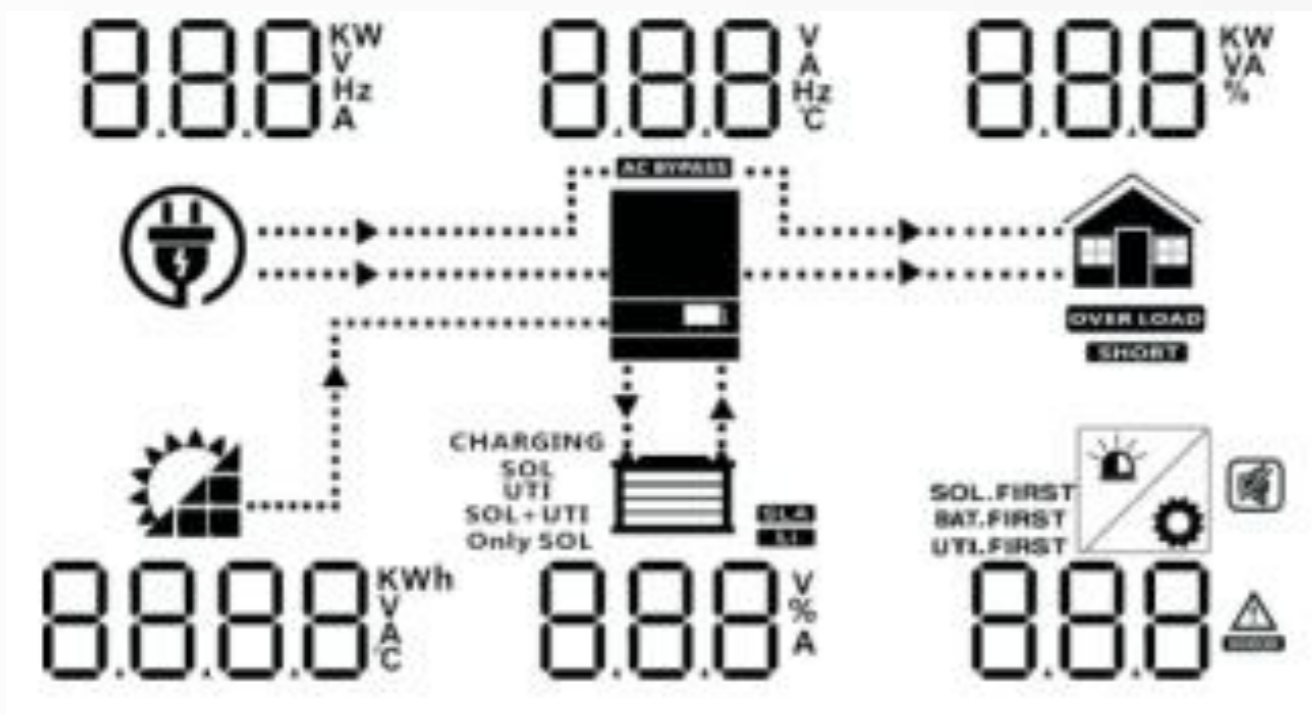
PC install monitoring software

Smart Management

GROWATT

Remote monitoring, Support remote FW upgrade

WIFI, GPRS communication port for remote monitoring
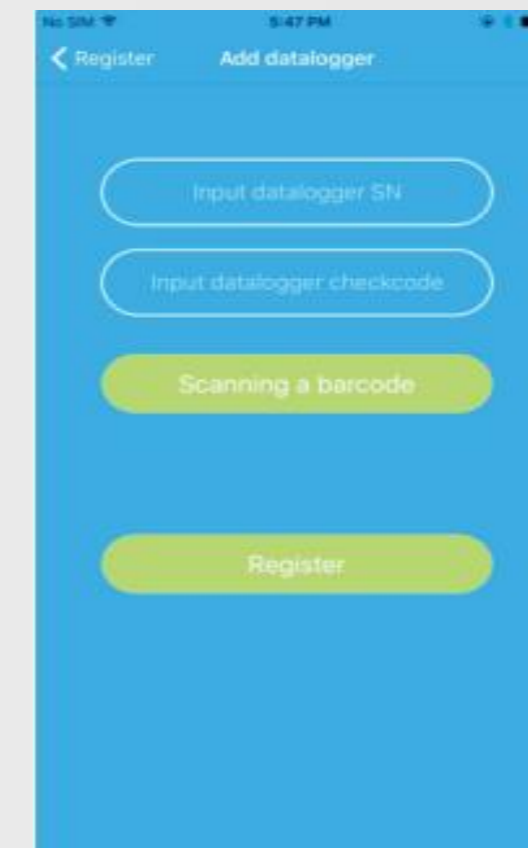
WIFI-F   GPRS-F
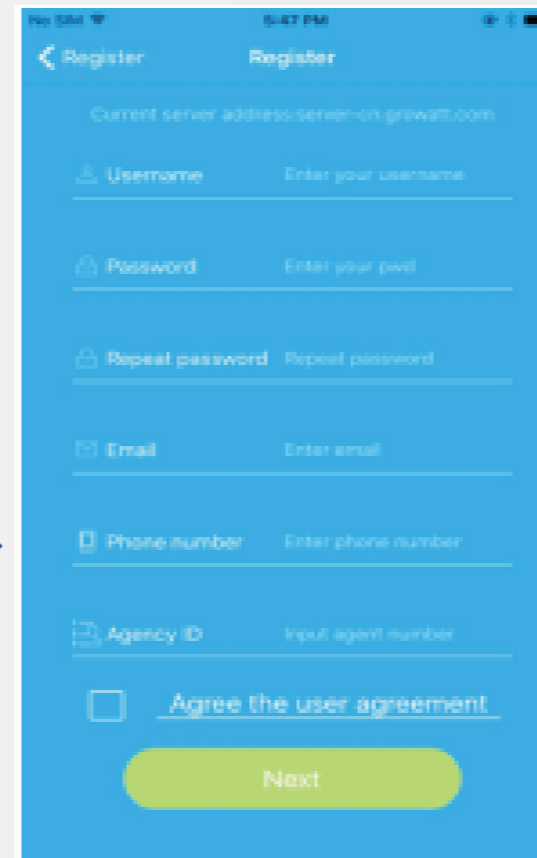
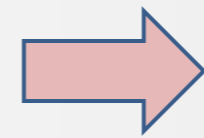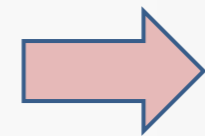ShinePhone APP   ShineServer
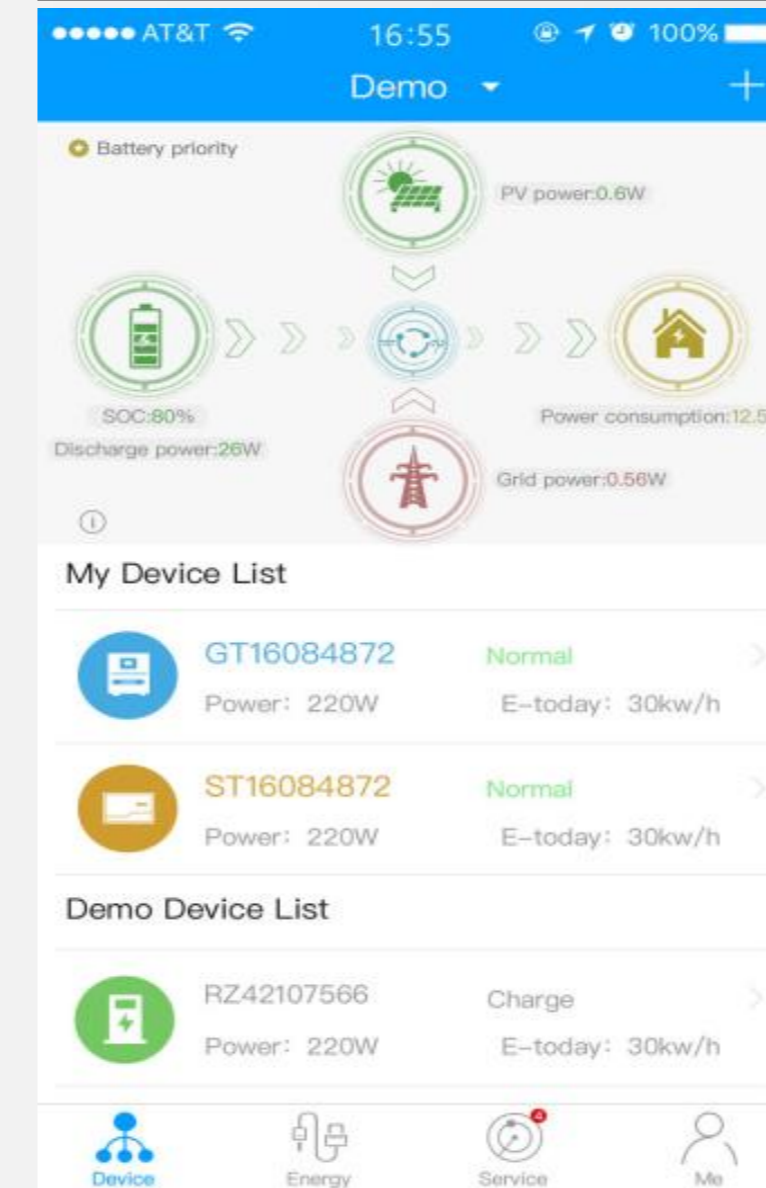
Monitoring Configuration Process

GROWATT

1. Scan the QR code below to download ShinePhone APP, also you can search ShinePhone in IOS or Google Play Store.

2. Open Shine Phone APP, click "Register" on login page.
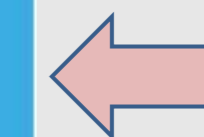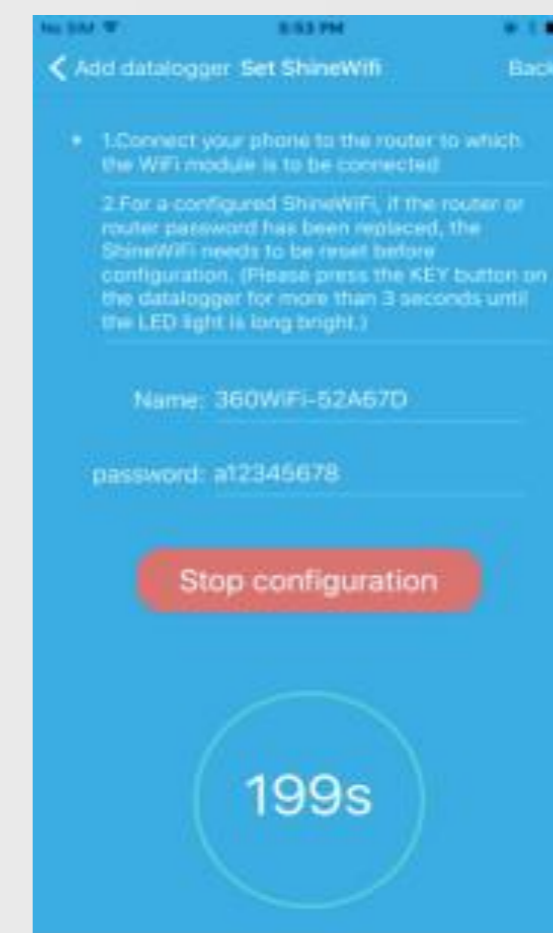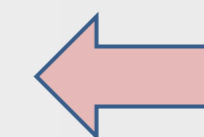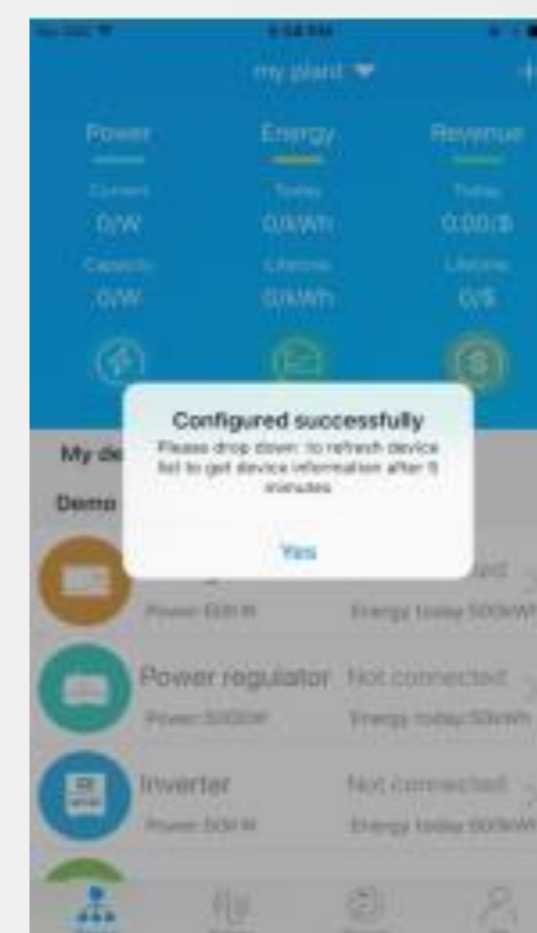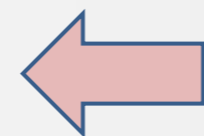
3. Fill out the required information
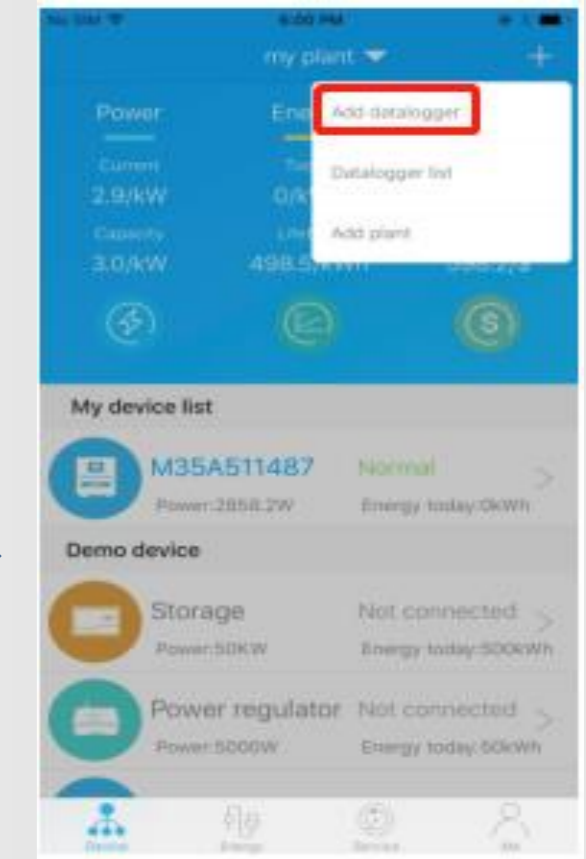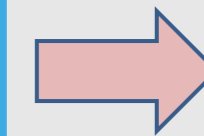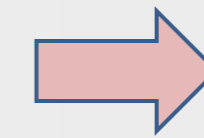
4. Click the "+" sign on the right top side "my plant" page and select "add data logger"
5. Scan or input the Shine WiFi barcode and check code.
6. Fill out the wifi network and password, then click "Configuration"
7. After successful configuration, it will move to the "my plant" page

Battery Equalization

![GROWATT logo]
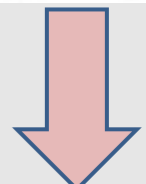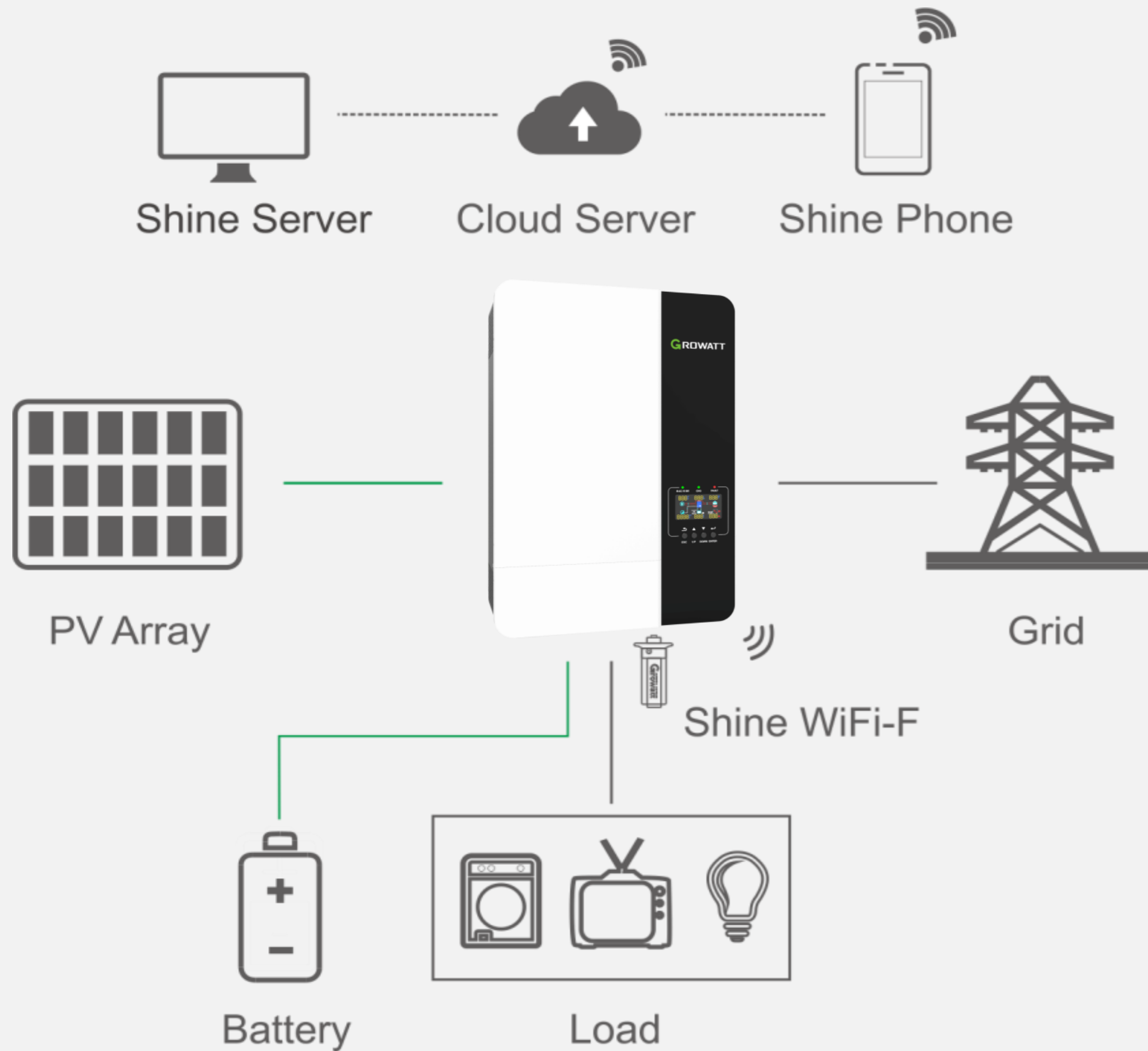
Inverter can setting lead-acid battery equalization charge interval time and charge voltage to active lead-acid battery feature then further can extend lead-acid battery life time.
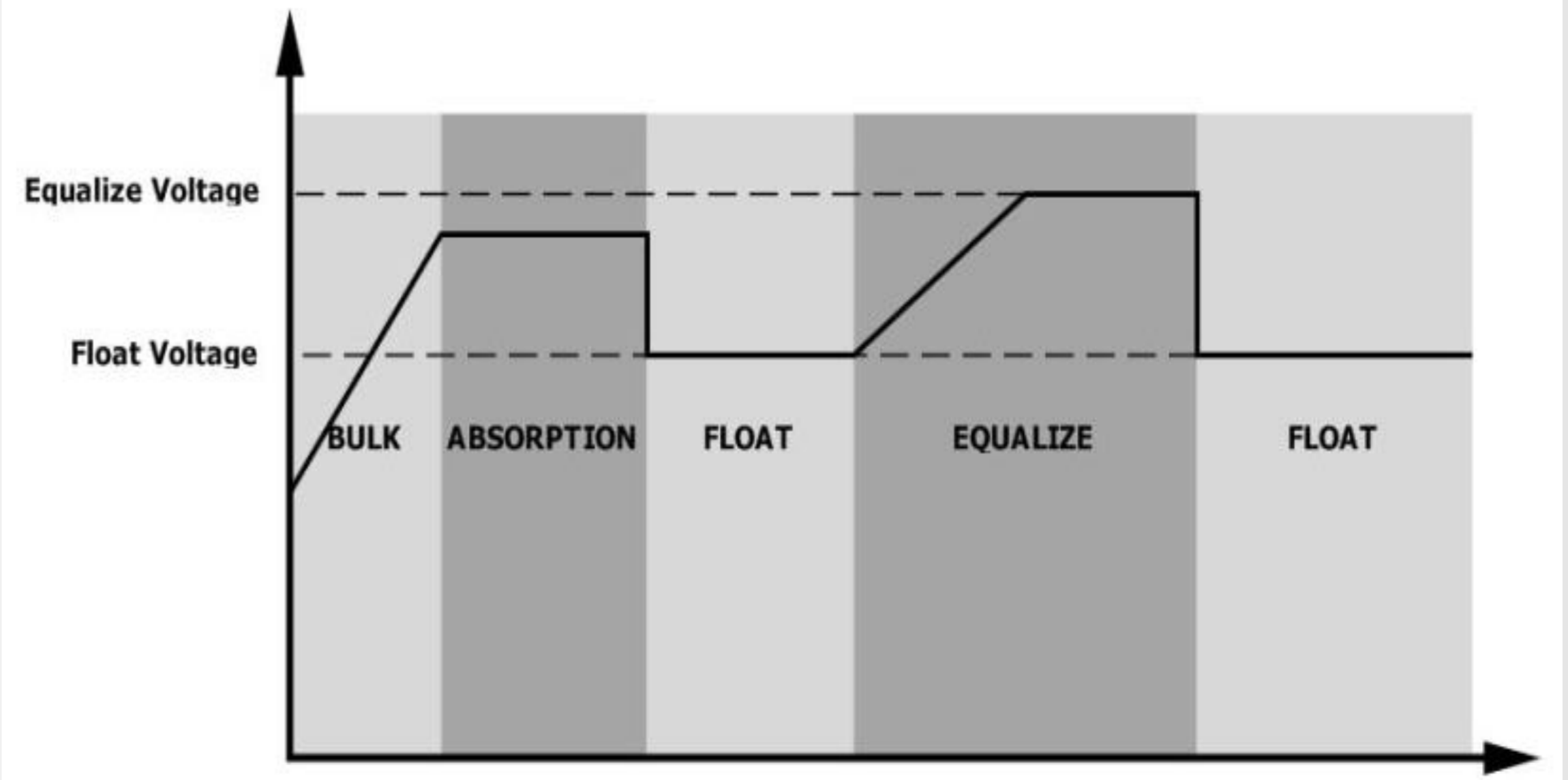
Charging curve

SUB Work Mode

GROWATT

If solar energy is not sufficient to power all connected loads, solar and utility will power loads at the same time

**General 5KVA inverter
(Solar power + battery power)**
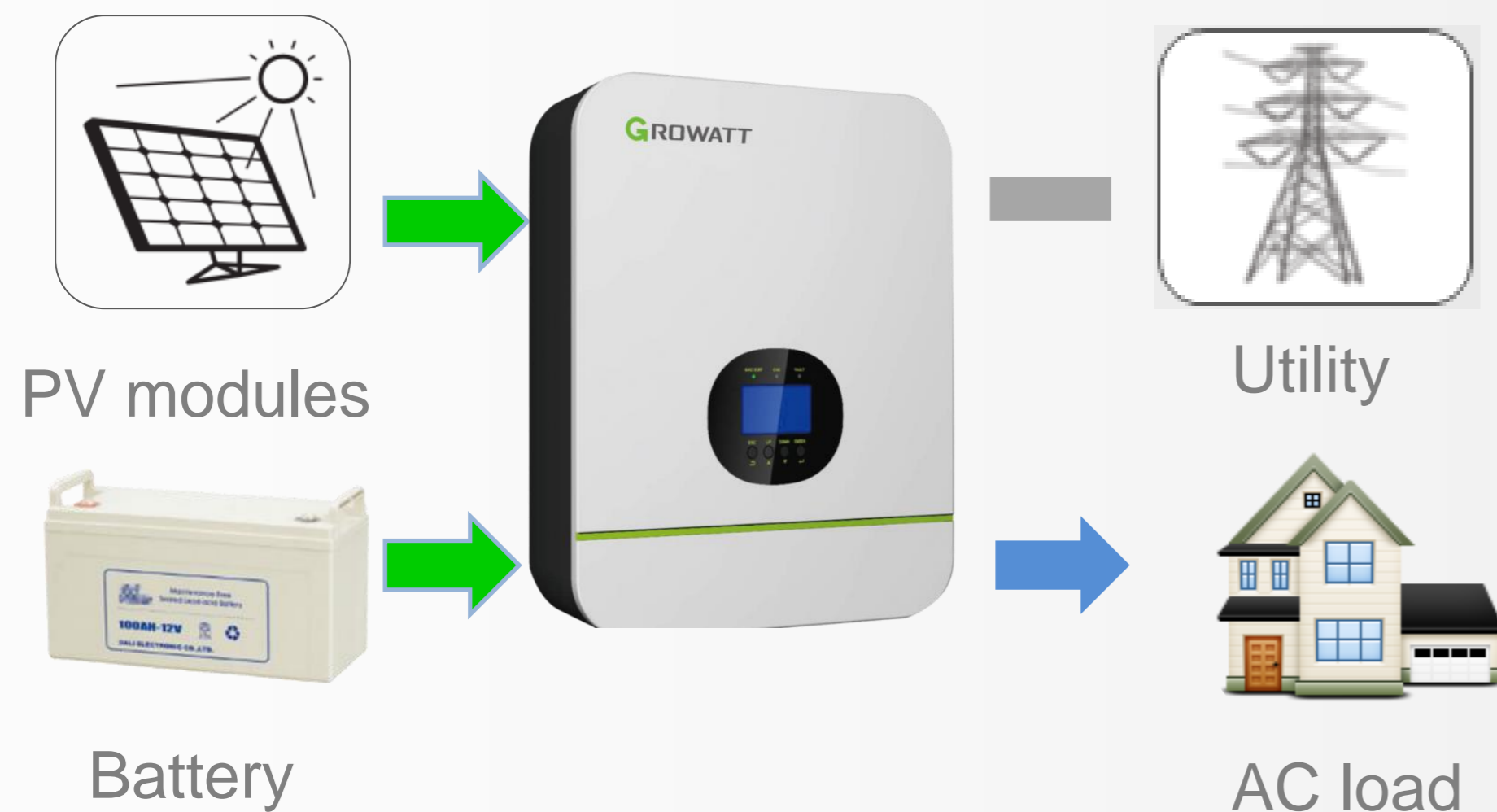
**SPF 5000ES
(Solar power + Utility power)**

PV modules

Utility

Battery

AC load

PV modules

Utility

Battery

AC load
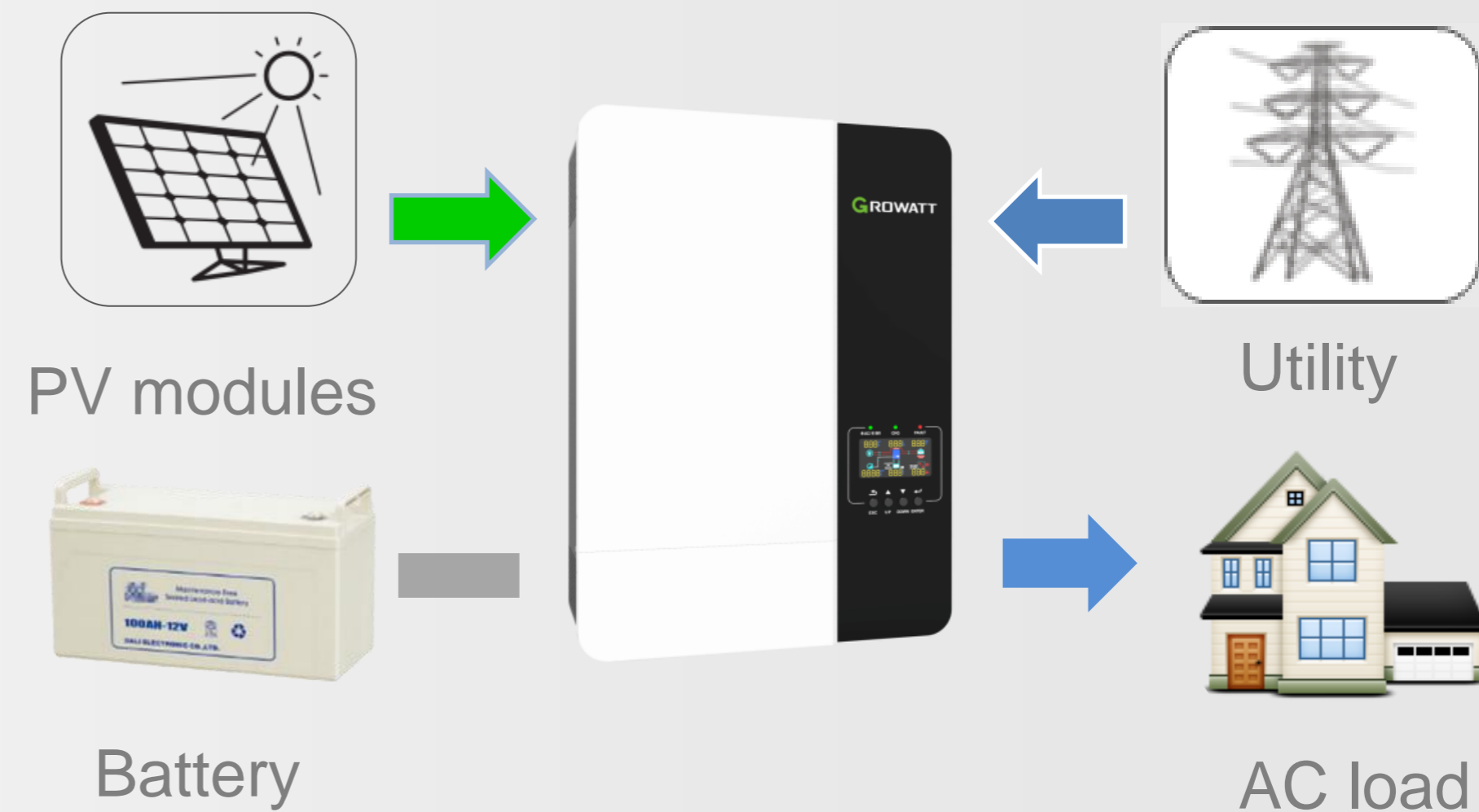
05

AXE Lithium Battery
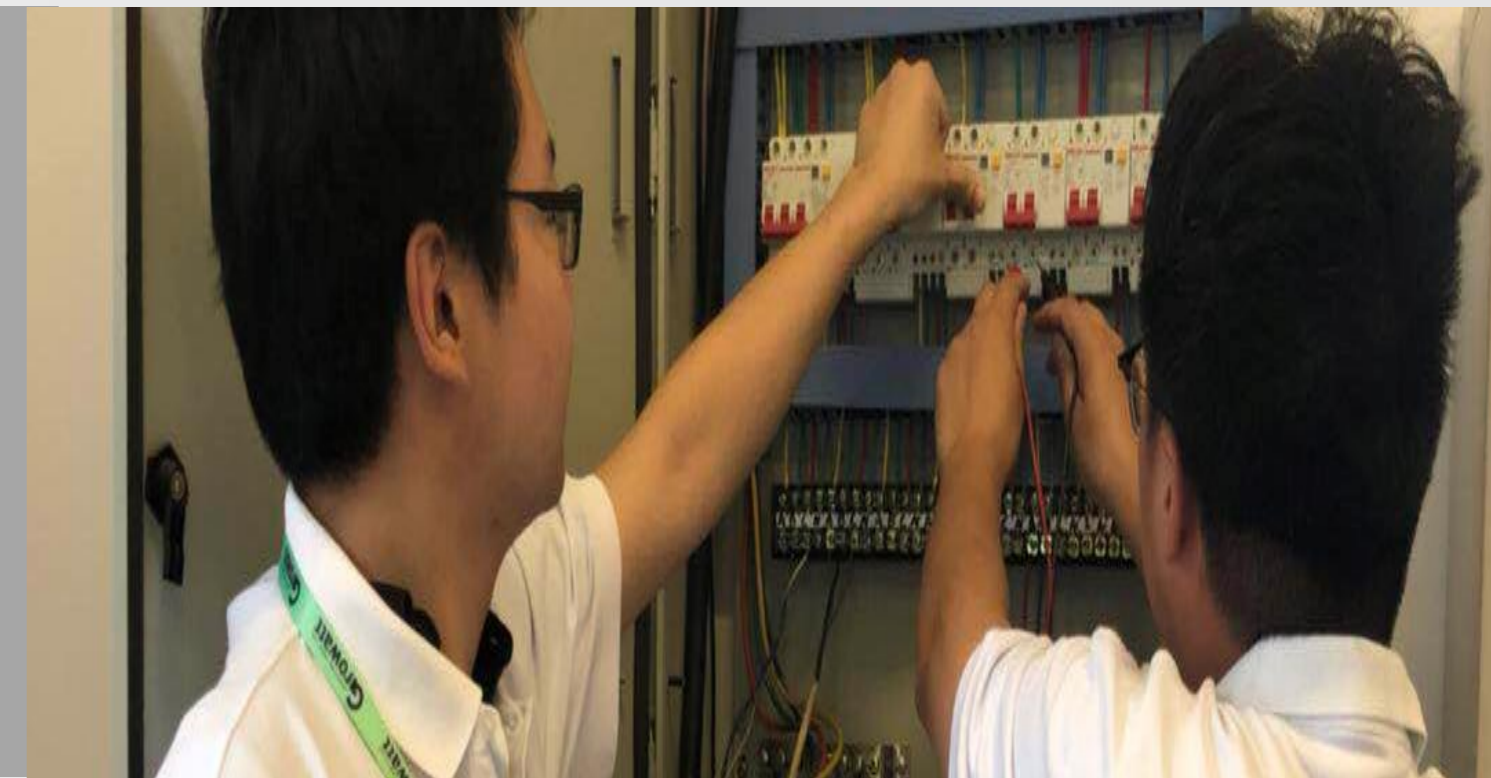
Product Overview

AXE Low Voltage Battery System

5.0kWh / Module

Capacity: 5.0kWh ~ 50kWh

System Flexibility

Easy installation by stacked modular design without any cable connection

Quick connection from battery system to inverter

System Flexibility

GROWATT
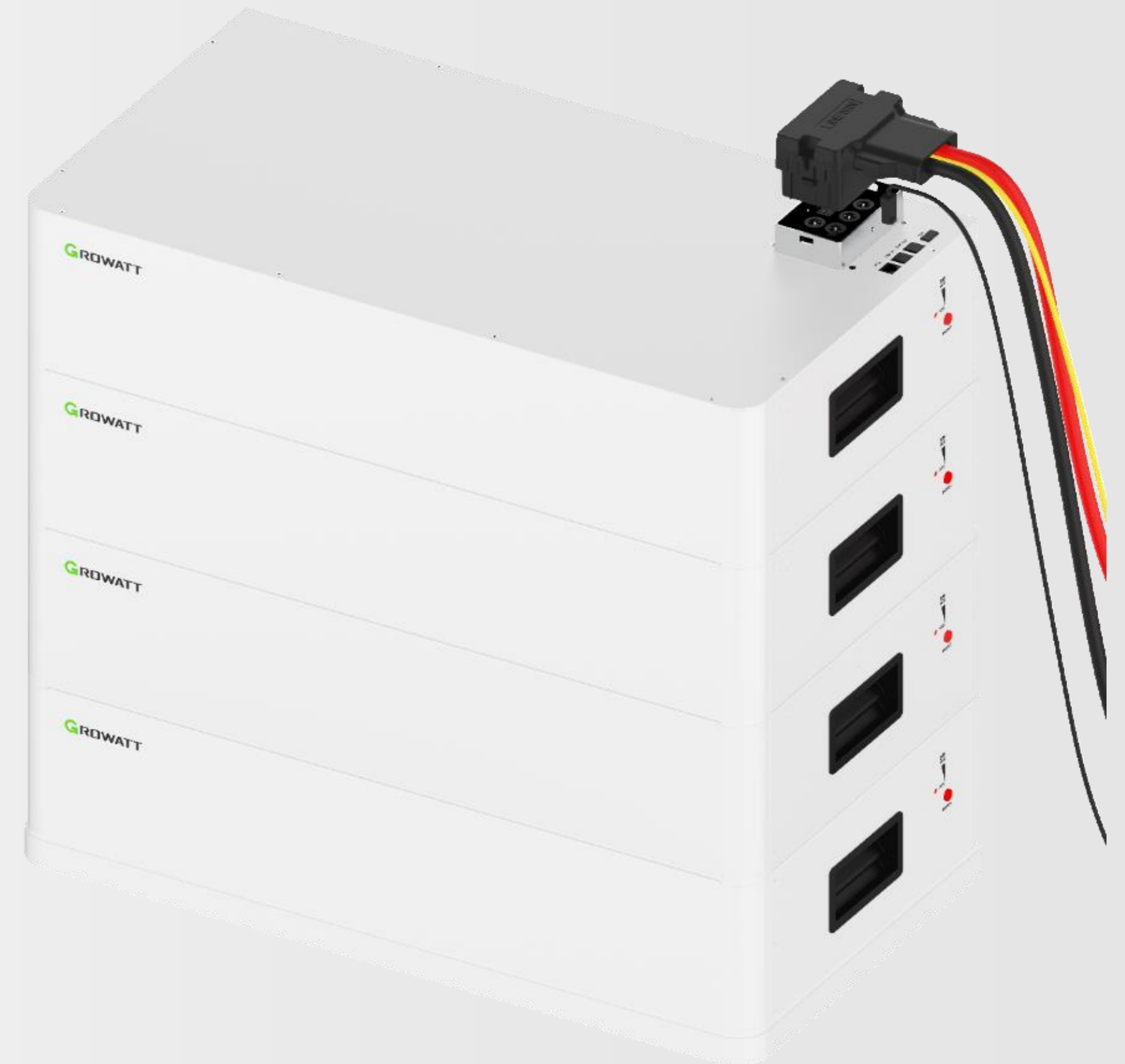
Supporting max. 8 clusters in parallel reaches 400kWh
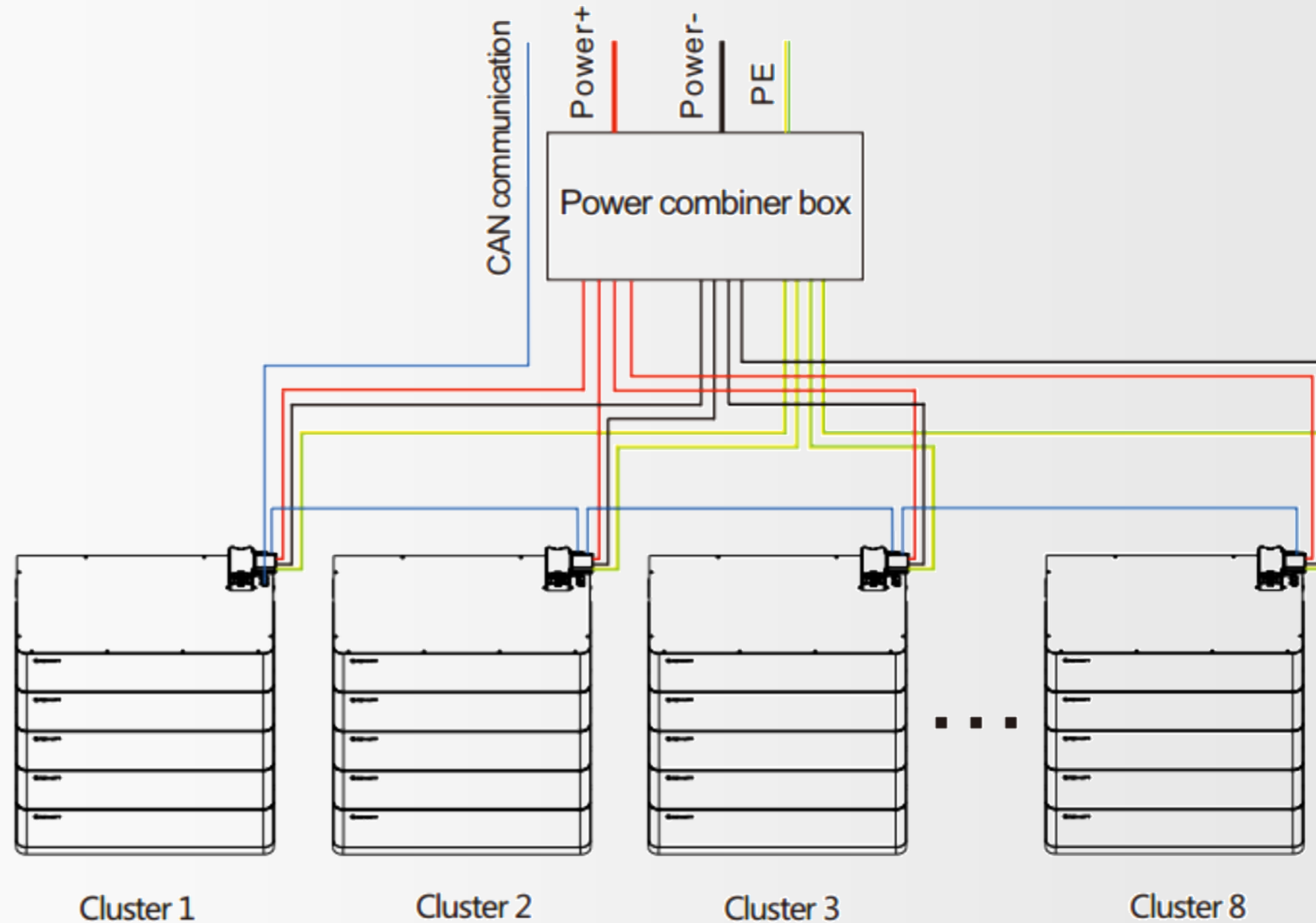
*Power combiner box need to be prepared by installer

Parameter

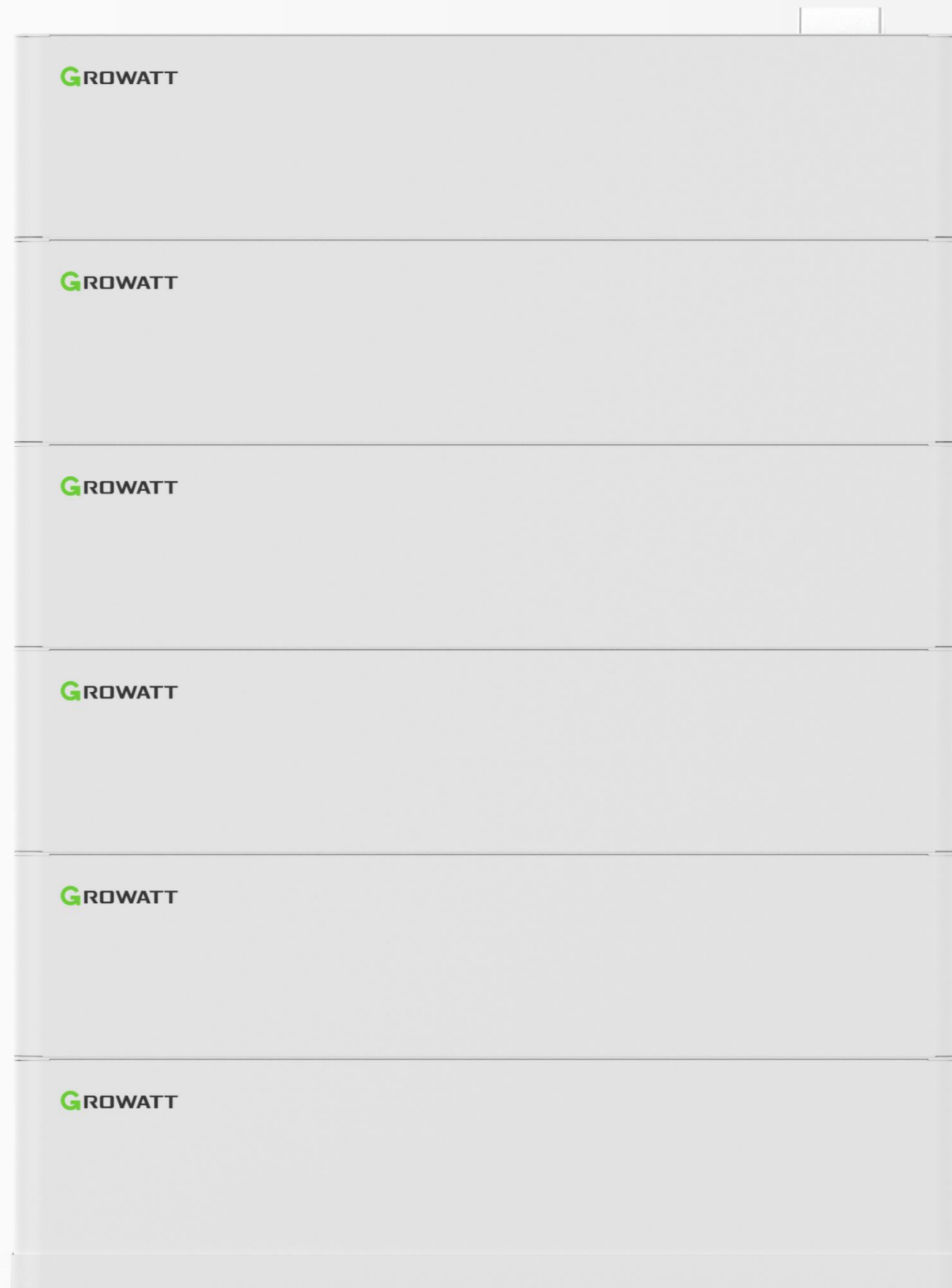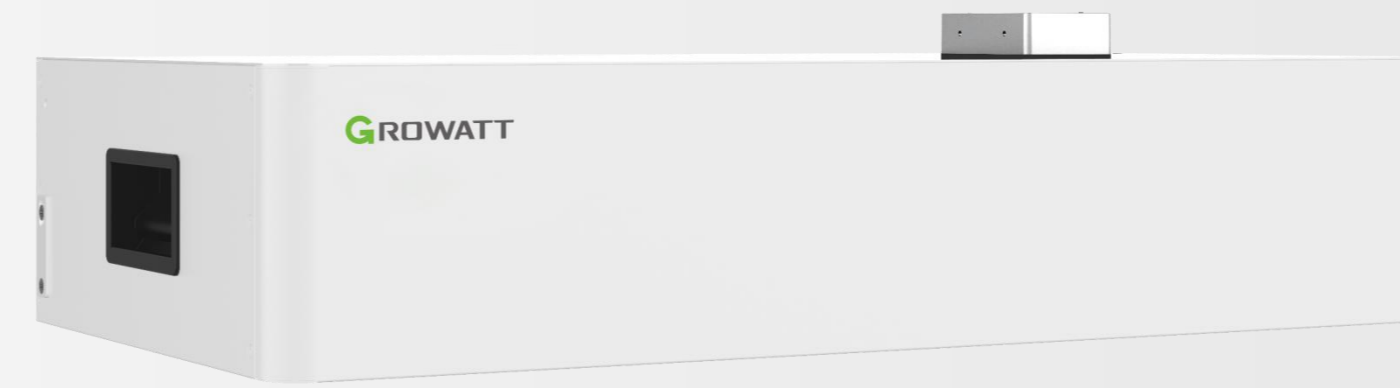| Battery System	AXE 5.0L
Total energy	5.0kWh
Battery pack connection	1 ~ 10 packs in parallel
Battery cluster connection	1 ~ 8 clusters in parallel
Nominal voltage Range	51.2V (48-57.6V)
Charging/discharging current	60A
IP degree	IP 20
Operation temperature	0 ~ 50° C
Dimension(W*D*H mm)	650*350*165
Weight	45kg
Communication	CAN/RS485
Warranty (5 Years/10 Years)	Yes/Opt

06

Application Scenarios
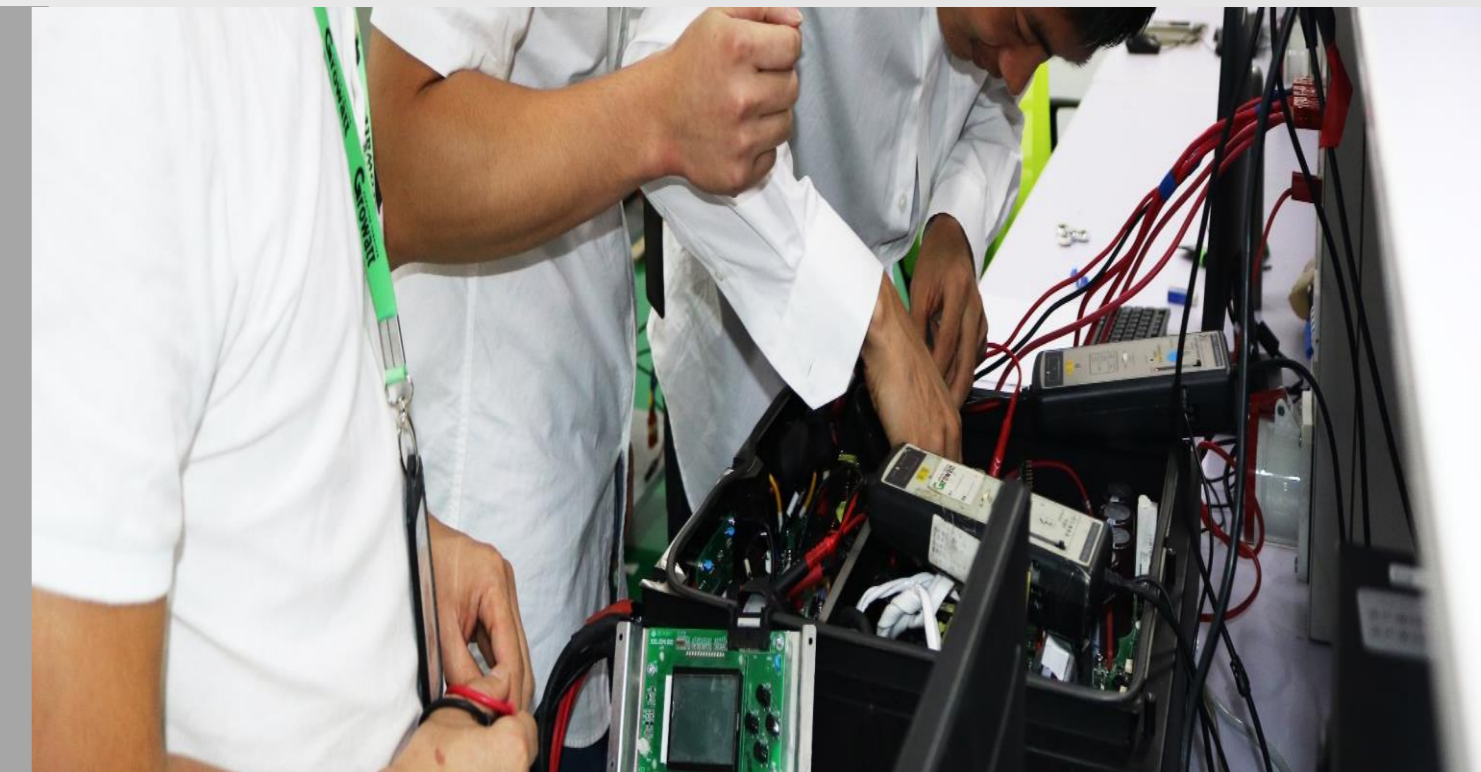
Multiple Work Modes

GROWATT

1. Solar power is sufficient

PV modules

Utility

Battery

AC load

2. Solar power is not sufficient

PV modules

Utility

Battery

AC load

3. Battery discharge low voltage back to utility mode (44-51.2 Vdc can set **)**

PV modules

Utility

Battery

AC load

4. Utility charging voltage back to battery mode (48-58 Vdc can set **)**

PV modules

Utility

Battery

AC load

Multiple Work Modes

![GROWATT]

Working mode: (output UTI: utility first ; charging SOC : solar first)

1. Solar power is sufficient

PV modules

Battery

Utility

AC load

2. Solar power is not sufficient

PV modules

Battery

Utility

AC load

3. Solar power is not available

PV modules

Battery

Utility

AC load

4. Utility power is not available

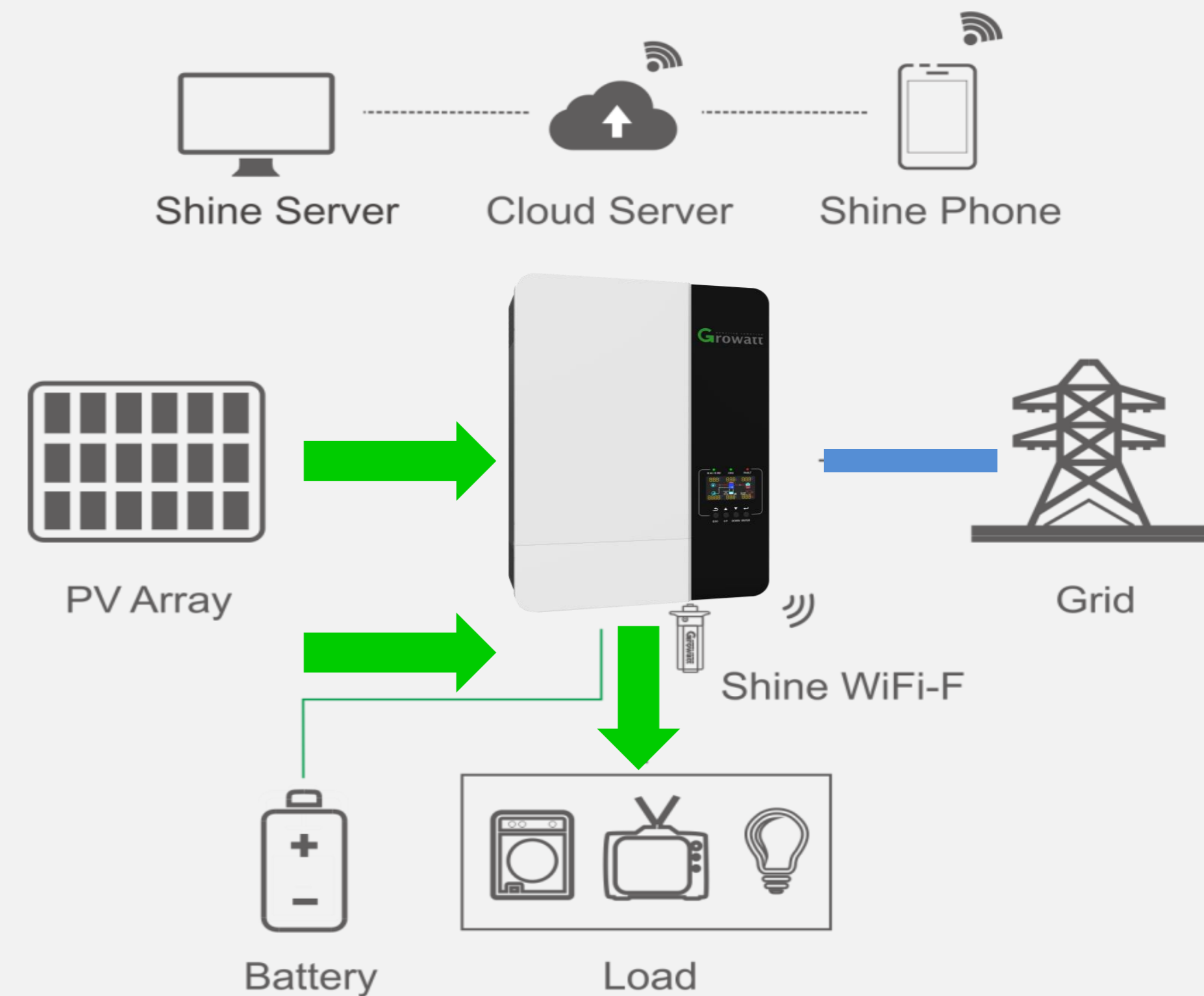PV modules

Battery

Utility

AC load

Scenario 1: Save Electricity Cost

GROWATT

When Solar power is sufficient (supply power to load and charge the battery). For cost-effective support, Utility feeds power only if the battery feeding is under low-level warning value.

.

Solar power is sufficient

Shine Server — Cloud Server — Shine Phone

PV Array

Grid

Shine WiFi-F

Battery

Load

Solar power is not sufficient

Shine Server — Cloud Server — Shine Phone

PV Array

Grid

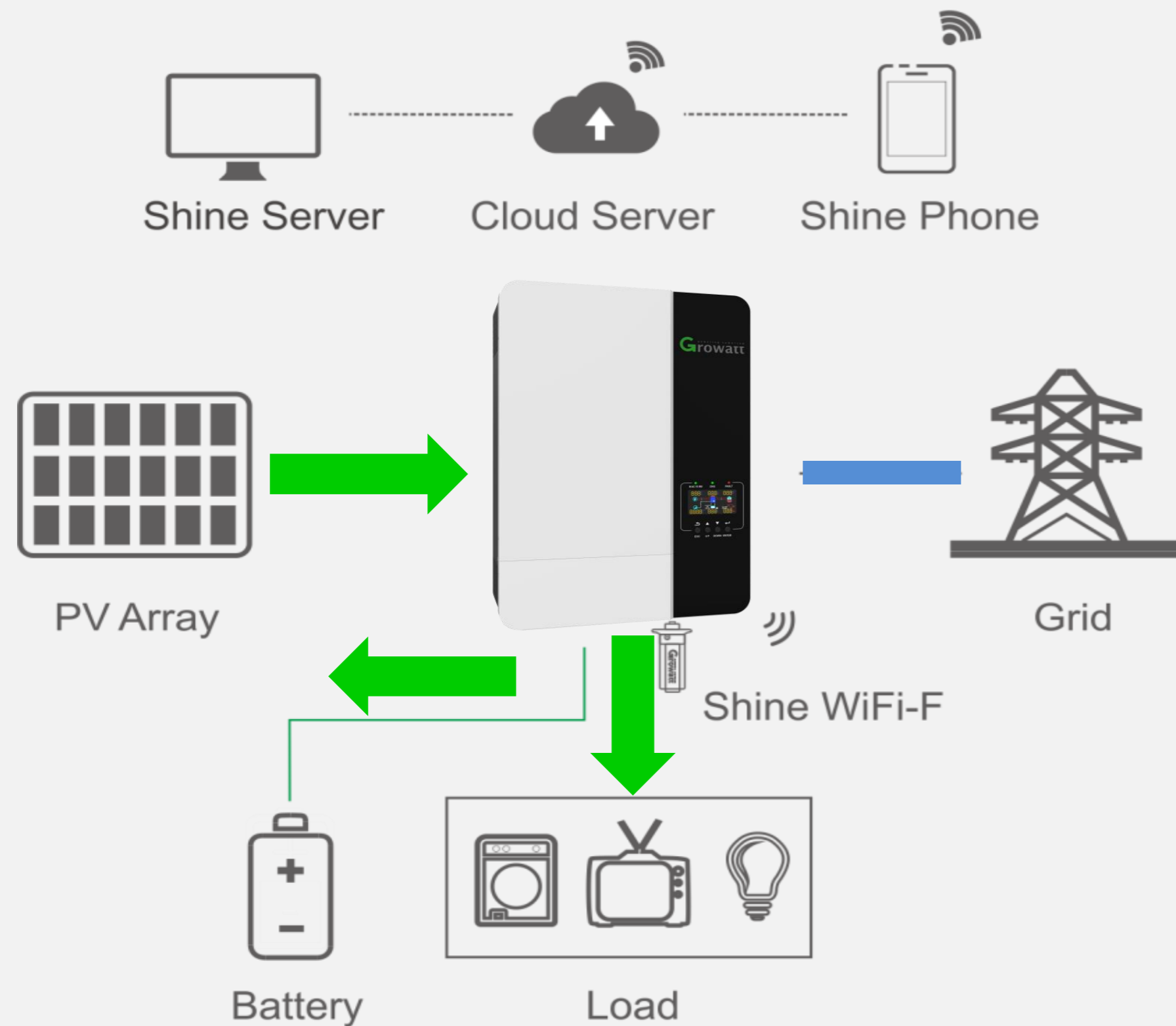Shine WiFi-F

Battery

Load

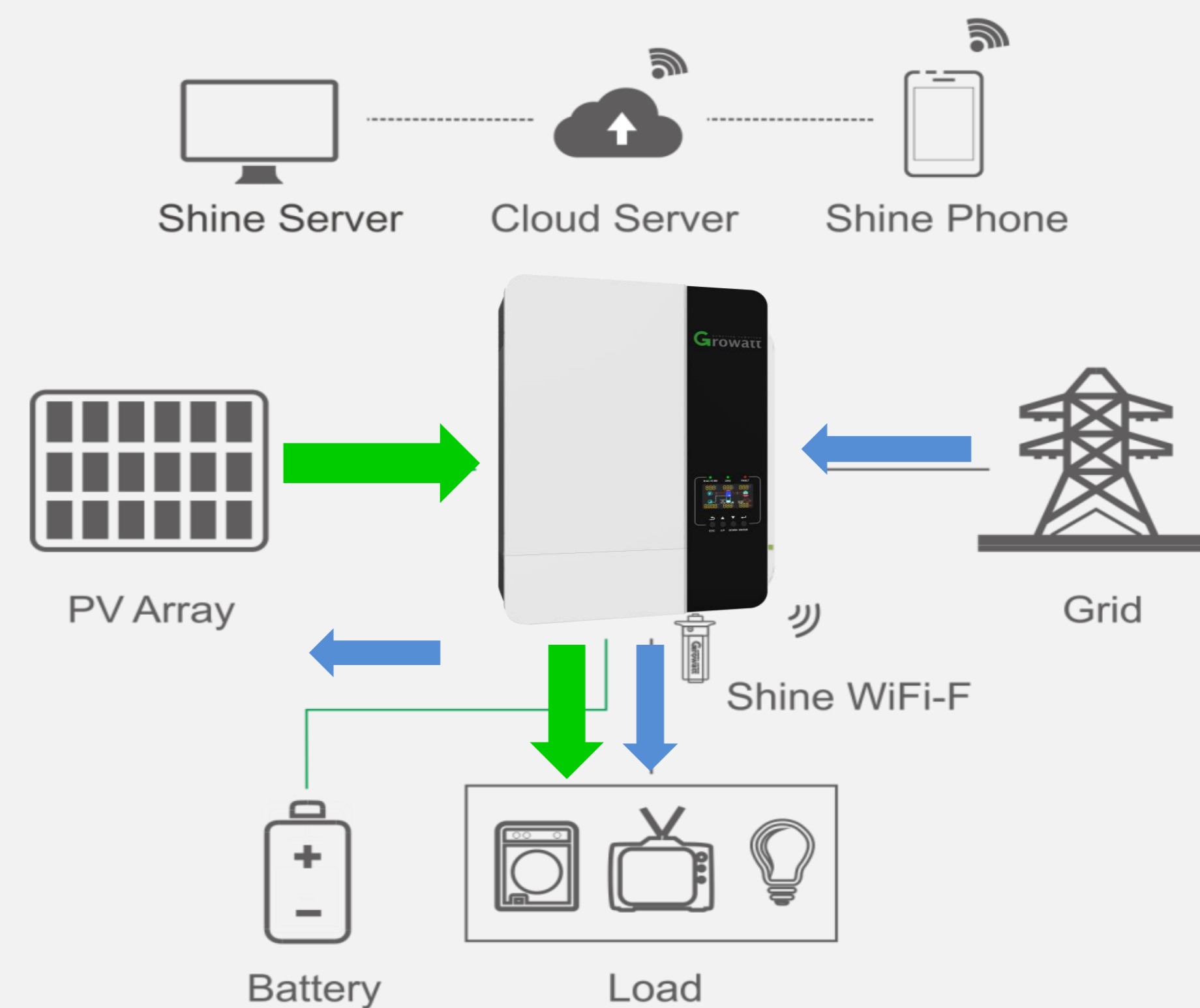**Priority mode : SBU first (other parameters use default setting)**

Scenario 2: Power Backup

GROWATT

Solar power is sufficient (supply power to load and also charge the battery). When solar power is not sufficient, utility supply power to the load and charge the battery

Solar power is sufficient

Shine Server — Cloud Server — Shine Phone

PV Array

Grid

Shine WiFi-F

Battery

Load

Solar power is not sufficient

Shine Server — Cloud Server — Shine Phone
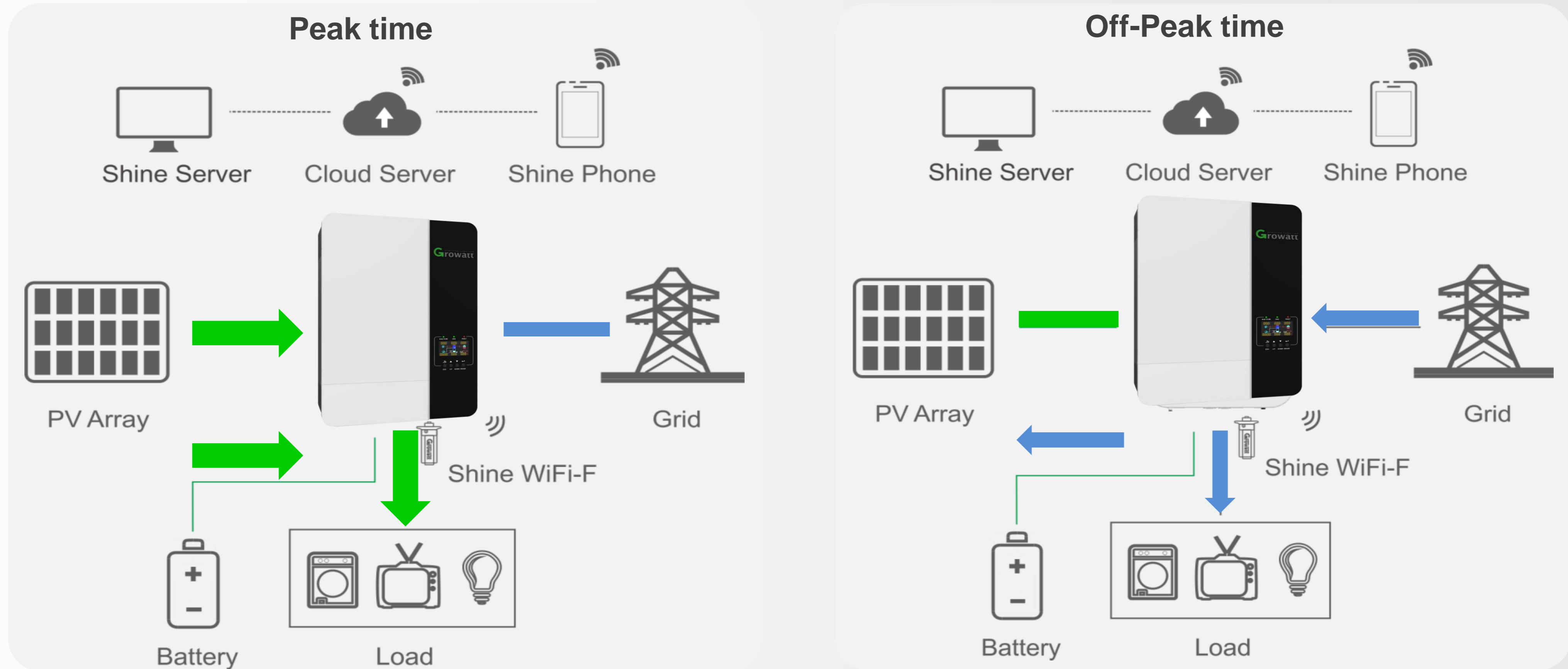
PV Array

Grid

Shine WiFi-F

Battery

Load

Priority mode : SUB first or SOL first
(should set battery discharge voltage higher from program 12 by LCD screen button or shine Phone APP)

Scenario 3: Off-Peak Charging

The time of grid power support and battery charging/discharging can be set during off-peak or peak time

Peak time

Shine Server — Cloud Server — Shine Phone

PV Array

Grid

Shine WiFi-F

Battery

Load

Off-Peak time

Shine Server — Cloud Server — Shine Phone

PV Array

Grid

Shine WiFi-F

Battery

Load

Charging time setting (suitable for all work modes)

Reference

South Africa 10kW system

Turkey 10kW system

Brazil 5kW system

Reference

South Africa 10kW system

South Africa 15kW system

South Africa 5kW system

Thanks!

Growatt New Energy