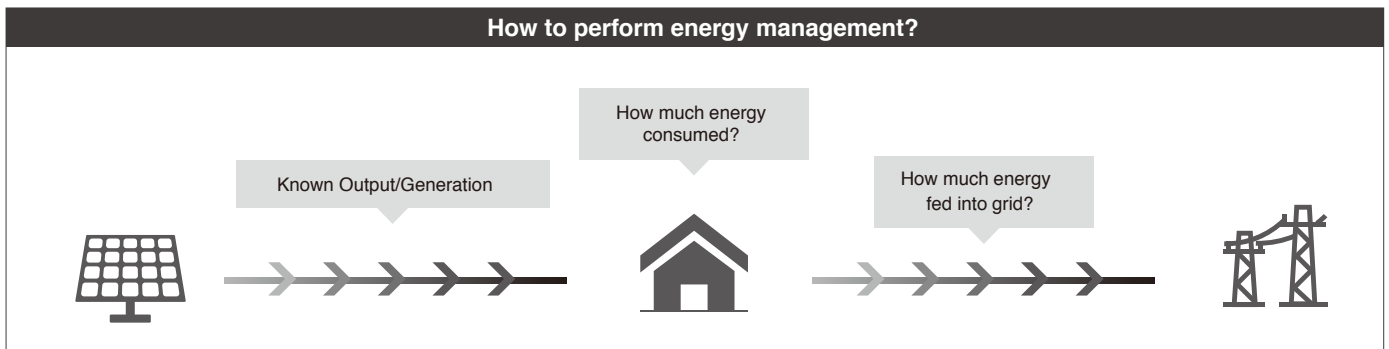


# LOAD MONITORING SOLUTION

VER: 01, UPDATED ON OCTOBER. 23<sup>RD</sup>, 2019

## What Is Load Monitoring?

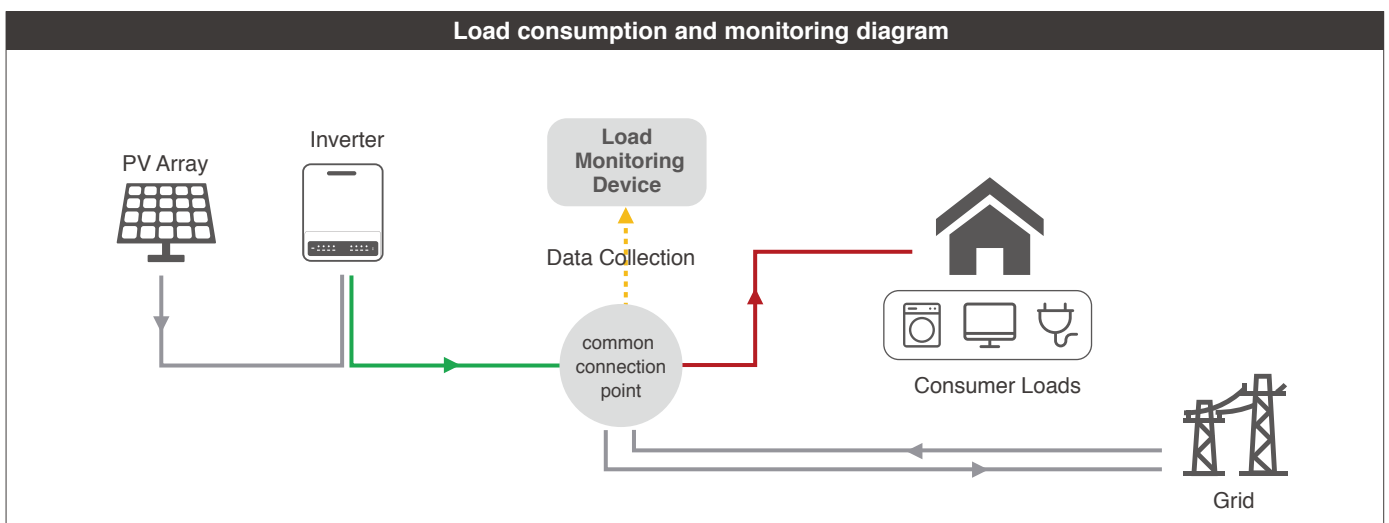
Load monitoring may be performed where facility management is concerned that whether the system has adequate capacity, or where there is need for data to understand consumption pattern, to confirm the accuracy of utility metering, to provide information required to solve operational or performance problems.



In a solar system, customer can adjust his load consumption habits in the facility or improve his system design based on the load monitoring data so that solar energy can satisfy the self-use needs to the most extent.

## How Does Load Consumption Monitoring Work?

Typically, external measurement instrument is connected at one or more points between grid and solar inverter so that load characteristics and energy flows to and from grid can be captured. The data of actual load consumption in the facility and the generation of solar system are processed to support further analysis of energy pattern.



## What Are GoodWe Solutions For Load Monitoring?

For single-phase and three-phase application, GoodWe provides different solutions.

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## Scenario #1 Household Single-phase Application

Generally, there are two different types of solar system commonly seen in households, namely grid-tied system and energy storage system. An exceptional application scenario is that one existing grid-tied system is retrofitted into an energy storage system with retrofit inverter added. Different devices and logics are used to measure load characteristics in different solar systems.

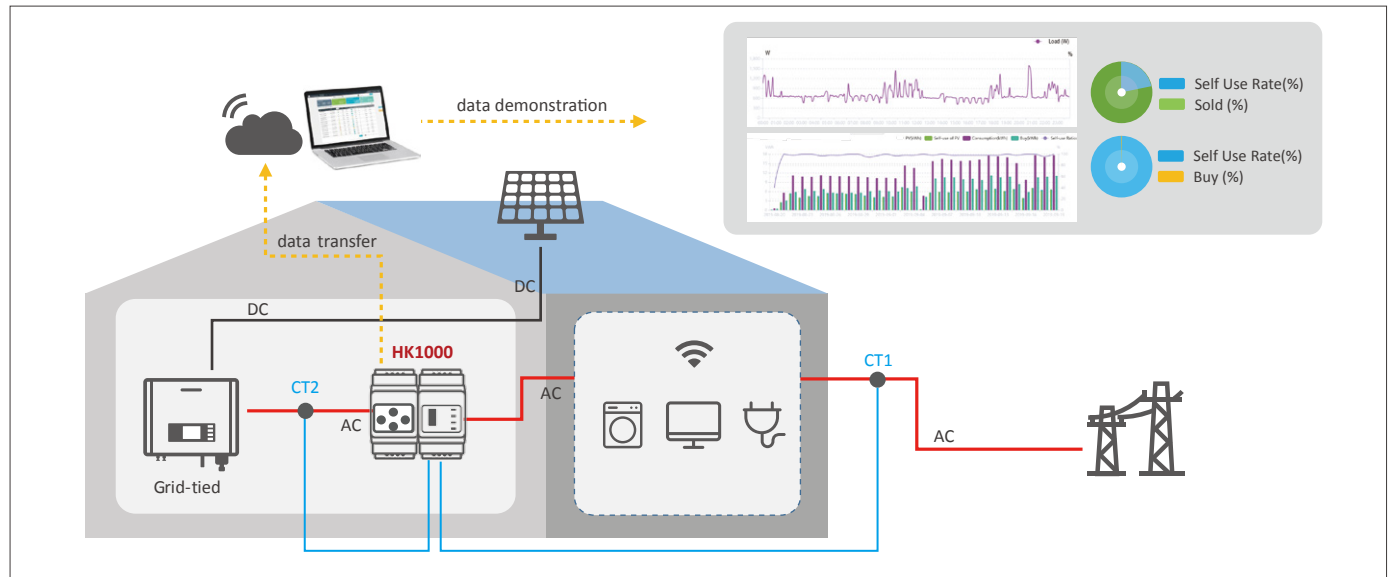
### Solution 1. HomeKit for grid-tied solar system (single-phase)



<b>Model Name</b>		HK1000
<b>Input Voltage</b>	Nominal Voltage	230Vac
	Voltage Range	60V~280V
	Frequency	50Hz/60Hz
<b>Self Consumption</b>		< 5W
<b>Communication</b>	To Inverter	No connection
	To Server	WiFi / LAN

Homekit is an independent device, which does not involve any compatibility issue in term of communication to inverter or load. As an independent unit, it is equipped with both measurement and data transmission functions in itself.

### ● Connection Diagram



### ● Logic

As shown in above diagram, two sets of current transformer (CT ratio: 120A/40mA) are connected at two different locations to measure changes in energy flows to and from grid (by CT1) and energy flow at inverter output point (by CT2). There is no communication between HomeKit and inverter so that the data are uploaded to GoodWe server directly for further analysis.

### NOTE

1. Homekit can work with any brands of inverter in solar system because it does not communicate with other devices.
2. It is not allowed to replace the original CTs that come with HomeKit.

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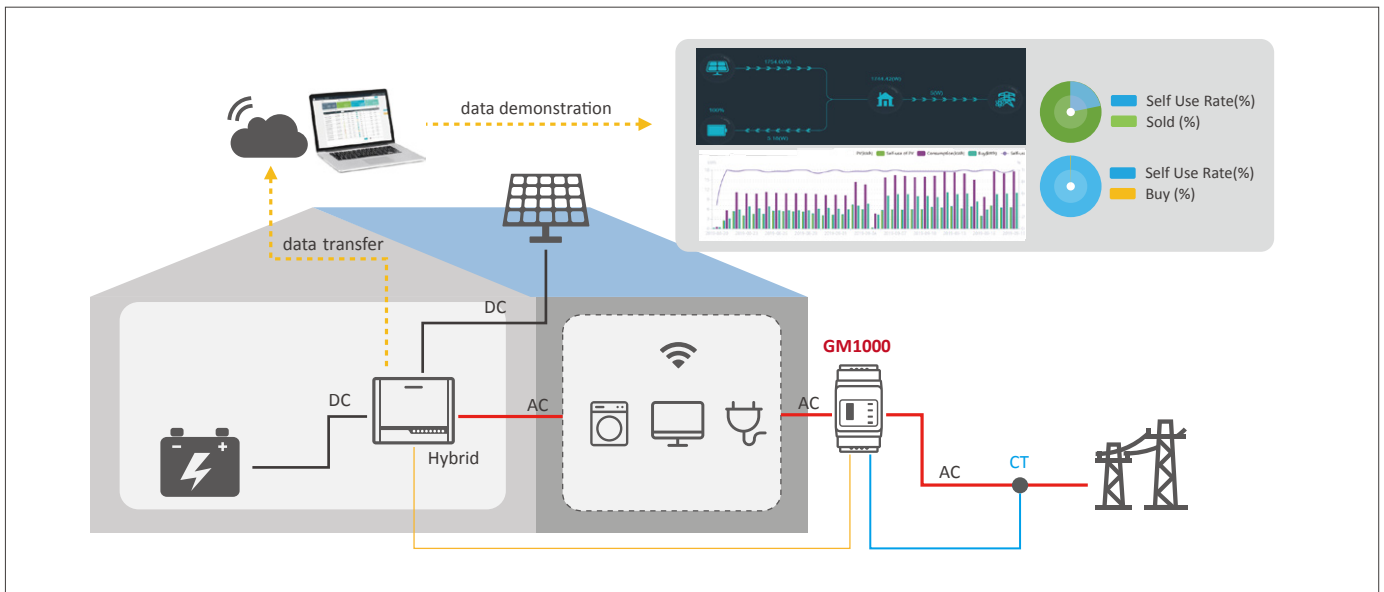
## Solution 2. Smart Meter (GM1000) for single-phase hybrid system



Model Name		GM1000
Input Voltage	Nominal Voltage	230Vac
	Voltage Range	60V~280V
	Frequency	50Hz/60Hz
Self Consumption		< 3W
Communication	To Inverter	RS485
	To Server	No communication

Smart Meter GM1000 is a standard component that comes with GoodWe single-phase hybrid inverter. With its participation, we can realize multiple functions such as export power limit control and load monitoring.

### ● Connection Diagram



### ● Logic

GM1000 is equipped with just one CT, which is connected at a point between load and grid (as shown in above diagram) so that energy changes from or to grid are measured. As GM1000 communicates to inverter, the data are transmitted to inverter first and then to server along with PV generation data.

#### NOTE

For energy storage system with three-phase hybrid inverter, the standard component GM3000 is used for load monitoring.

# LOAD MONITORING SOLUTION

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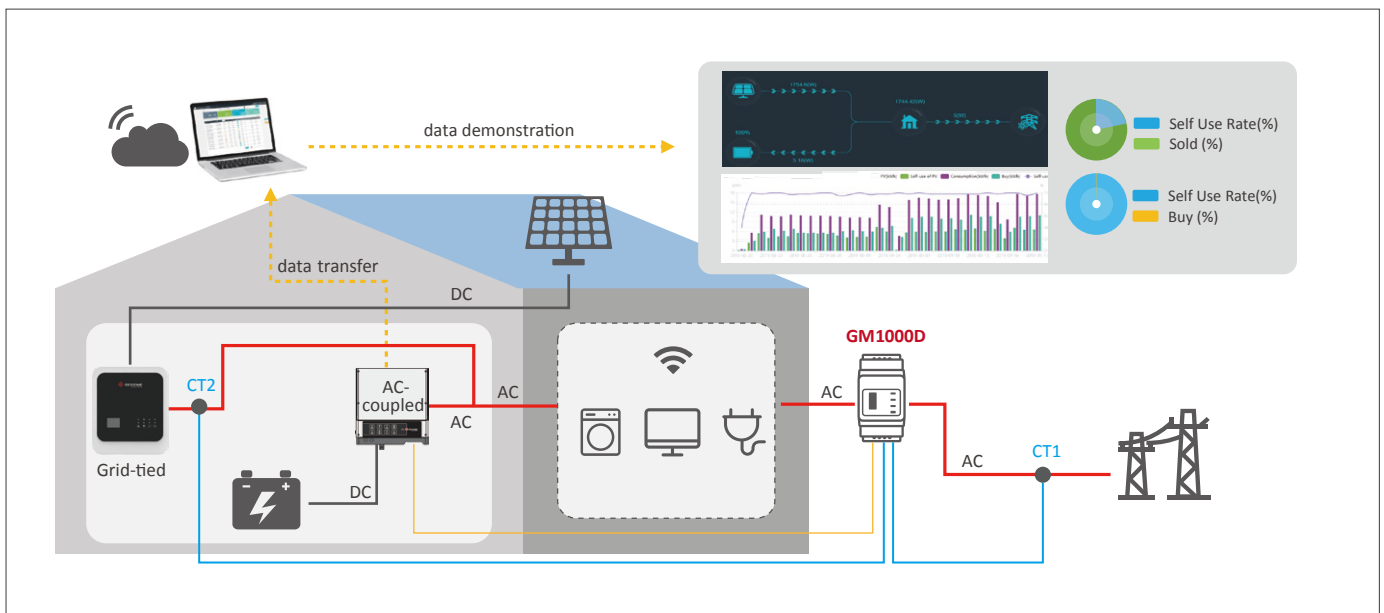
### Solution 3. Smart Meter (GM1000D) for single-phase retrofit storage system



Model Name		GM1000D
Input Voltage	Nominal Voltage	230Vac
	Voltage Range	60V~280V
	Frequency	50Hz/60Hz
Self Consumption		< 3W
Communication	To Inverter	RS485
	To Server	No communication

Smart Meter GM1000D is also a standard component that comes with GoodWe single-phase AC-coupled retrofit inverter, with which an existing grid-tied solar system can be reformed as an energy storage system.

#### ● Connection Diagram



**NOTE**

ARM version of GoodWe retrofit inverter should be V10 or newer.

#### ● Logic

GM1000D is equipped with two sets of CT, where CT1 is connected at a point between load and grid to measure energy changes to and from grid, and CT2 at grid-tied inverter output point to measure generation of grid-tied inverter (as shown in above diagram). Since it communicates to retrofit inverter, data collected by GM1000D are transmitted to retrofit inverter first and then uploaded to server together for further analysis is available for load monitoring.

### Scenario #2 Multiple Three-phase Application In C&I Scenario

When more than one unit of three-phase inverter are installed in a solar system, it is available to perform load monitoring through SEC1000.

# LOAD MONITORING SOLUTION

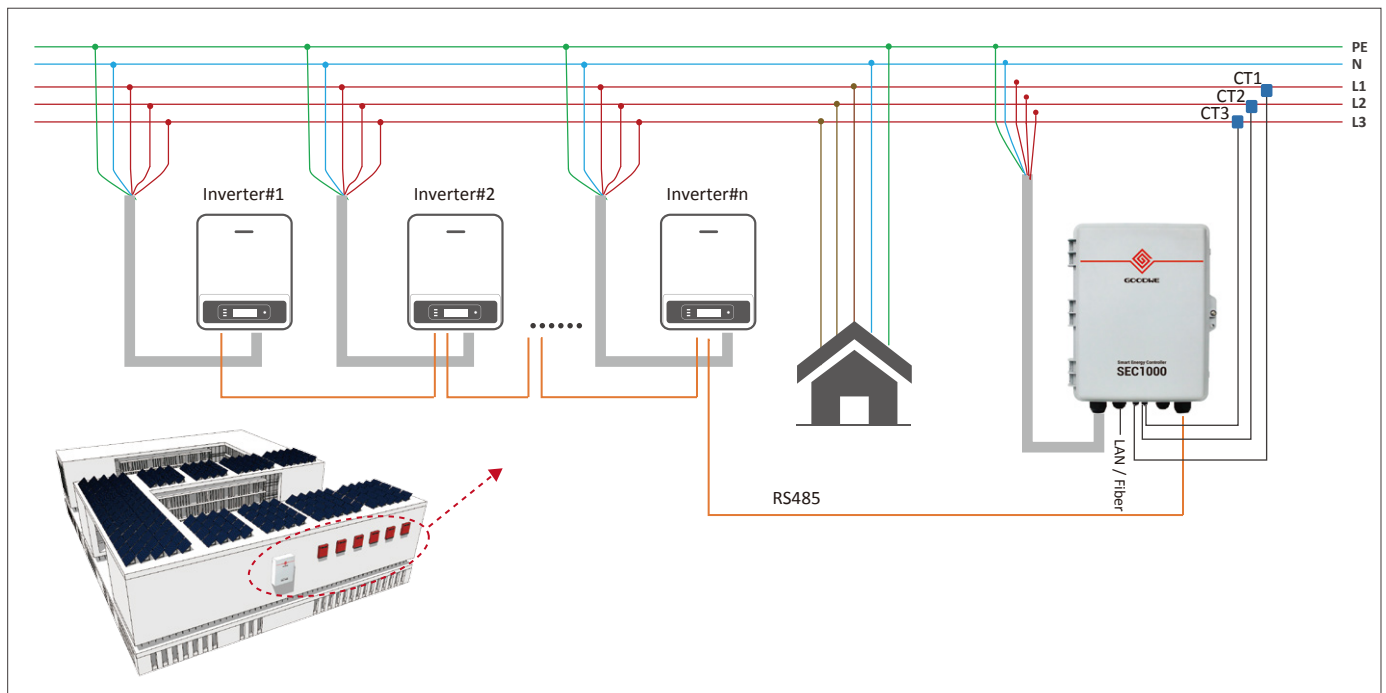
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**Solution: SEC1000 for multiple three-phase system**

<b>Model Name</b>		SEC1000
<b>Input Voltage</b>	Nominal Voltage	230Vac
	Voltage Range	60V~280V
	Frequency	50Hz/60Hz
<b>Self Consumption</b>		< 10W
<b>Max. Number of Inverter Connected</b>		60
<b>Max. Distance to inverter</b>		1000m
<b>Communication</b>	To Inverter	RS485
	To Server	LAN /Fiber Optical



● **Connection Diagram**



● **Logic**

SEC1000 is a smart energy controller box, integrated with multiple functions such as of meter and data logger. In a solar system composed of multiple three-phase grid-tied inverters, load monitoring function is available with the participation of SEC1000.

**NOTE**

*The firmware version of SEC1000 for load monitoring application should V9 or newer.*

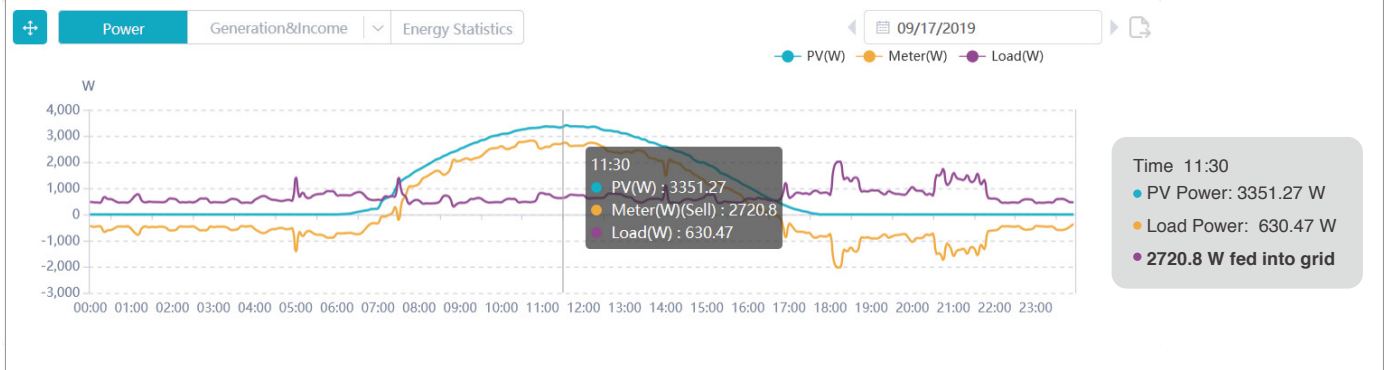
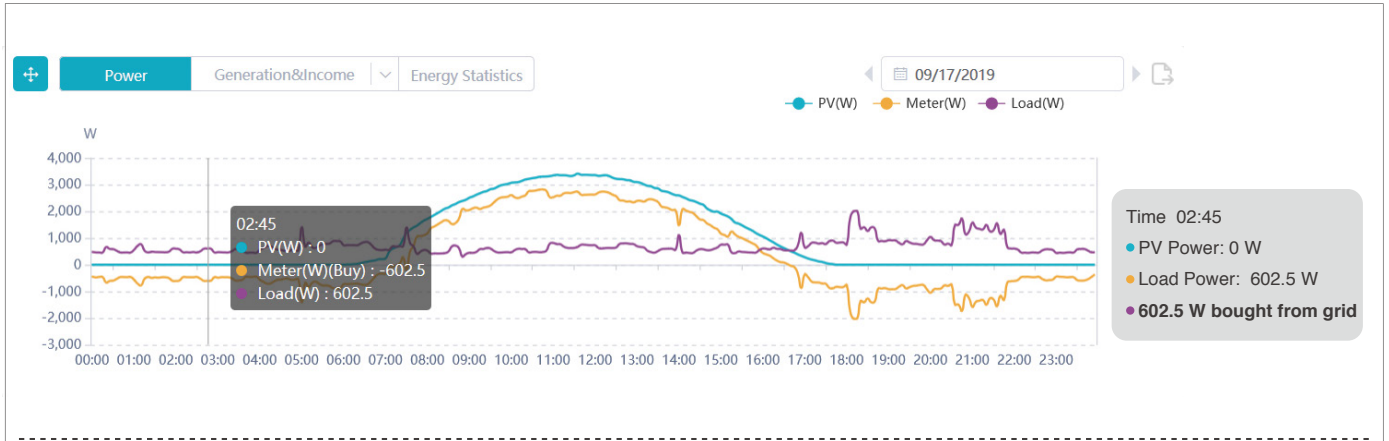
## How to Monitor Load Consumption On SEMS Portal?

GoodWe SEMS Portal is a professional platform designed for solar power plant. On load monitoring page, curve of real-time load consumption power, histogram of comparison between load consumption and solar production and self-use pattern are available as long as load monitoring solution is applied properly.

# LOAD MONITORING SOLUTION

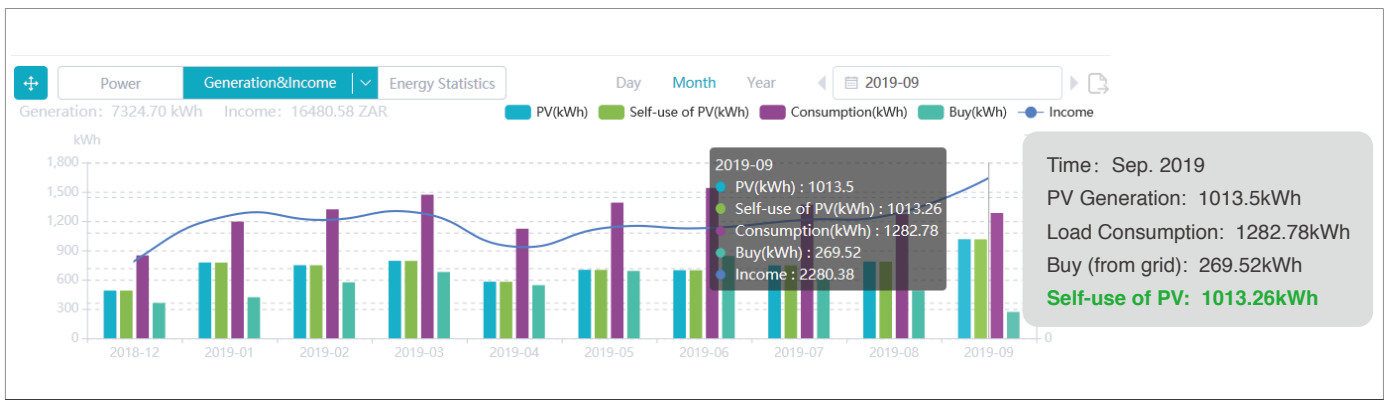
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● Real-time power consumption of load



Example: Real-time power consumption of load on Sep. 17th, 2019

● Comparative analysis of system production and load consumption

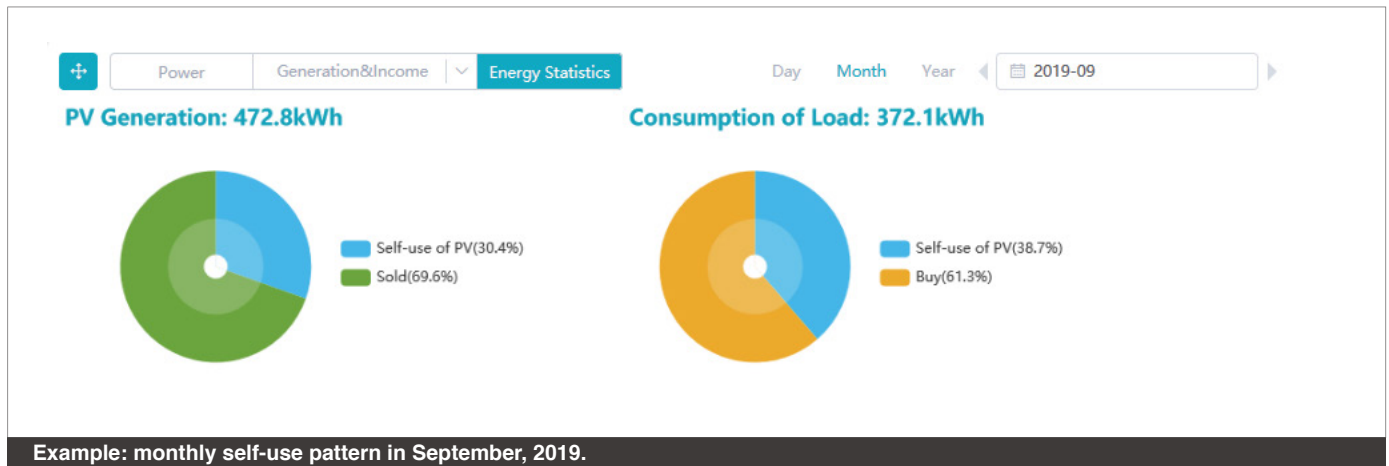
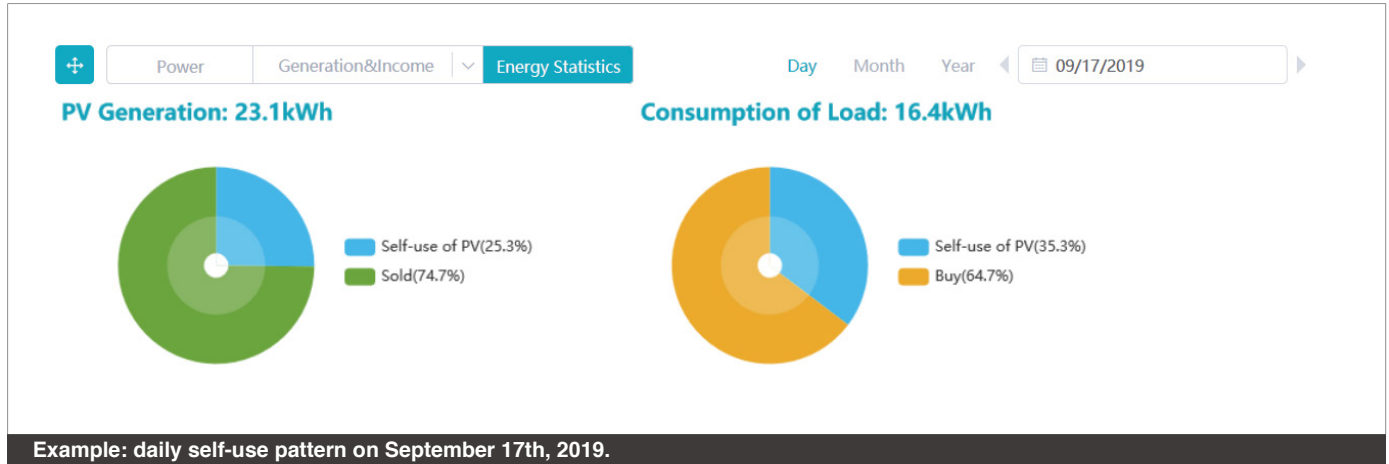


Example: monthly statistics of load consumption in September, 2019.

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• Self-use pattern of solar energy



Load monitoring has become more popular than ever as people are eager to understand their own habit of energy consumption and more concerned about energy conservation and green energy consumption. On this account, GoodWe presents multiple options and solutions to assist most people to perform load monitoring based on single-phase grid-tied system, hybrid system and multiple three-phase system.

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