New smart meter solution to improve storage system's PV self-consumption

In practical applications of the integrated solar energy storage system, most power stations will divide the load into critical load and non-critical load, because for users of these power stations, the power consumption requirements of critical loads are higher, such as database stations or special electrical equipment, on the contrary, the electricity demand of non-critical loads is relatively low, Distinctive treatment for critical and non-critical loads can greatly reduce the capital investment of the power station. However, many users hope that the clean energy from the sun can be used for both critical loads and non-critical loads, so that renewable energy be fully utilized, and also the cost of grid electricity can be reduced. In order to fulfill these user demands, ATESS has proposed a solution to add a smart meter to the energy storage system.

CT Smart meter

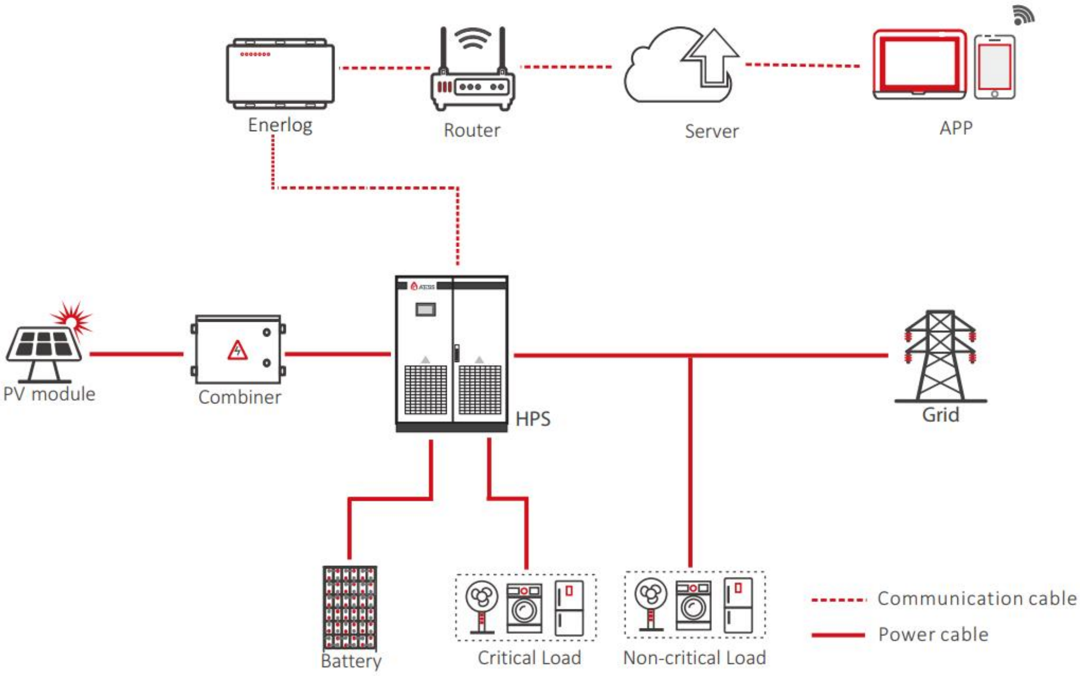

Fig 1

Figure 1 shows a regular solar energy storage system diagram. In this system, the power of the critical load cannot reach the inverter in most case, and when the PV power is greater than the battery charging power plus the power of the critical load, the excess PV energy generated will selectively flow to the AC input terminal of the HPS, but because each power station has restrictions on the power taking and feeding from the grid, so HPS cannot effectively identify the power of non-critical loads on the grid side, resulting in the inability to maximize the use of that part of excess solar energy, and also unable to take advantage of the 150% PV overloading feature of the HPS model.

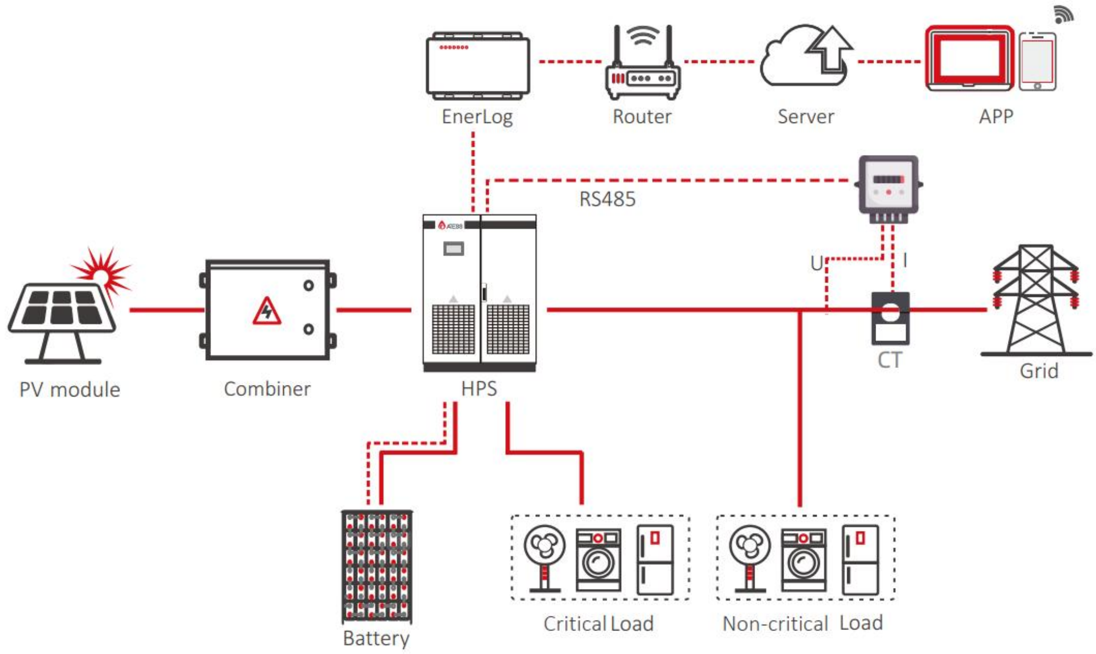

Fig 2

In view of the above situation, ATESS has launched the new smart meter solutions shown in Figure 2. The design ideas are as follows:

A three-phase smart meter is installed between the non-critical load and the grid. The meter and the corresponding CT will detect the power consumption of the grid in real time, and transmit the data to the HPS through 485 communication, and the HPS can calculate the usage of the non-critical load. In this way, HPS can judge and decide how to allocate this part of energy reasonably to the critical loads and grid when excess PV energy is generated, by considering the power consumption of critical loads and non-critical loads, as well as the power consumption requirements of the user on the grid side, so as to make full use of PV energy or reduce the cost of grid electricity.

System advantages:

1. Reduce the overall investment in the power station.

2. Utilize the PV power generation of the system to reduce the power demand of the grid and reduce the cost of grid electricity.

3. The installation position is flexible. There is only one set of 485 communication cables between the meter and the HPS. The length of the communication cable can be up to 1KM.

4. Clear management, you can get the electricity consumption of critical loads and non-critical loads (daily, monthly, cumulative), as well as the electricity consumption distribution of the power grid.

Examples analysis:
If the PV capacity of a user is 40KWp, the selected inverter is HPS30, the capacity of the critical load during the day is 20KW, the non-critical load is 25KW, and the local regulation does not allow solar power to be fed to the utility grid. The comparison of PV self-consumption rate before and after adding the meter is as follows:

	Available PV power (KW)	Inverter output power to critical loads(KW)	Inverter output power to non-critical loads(KW)	Inverter total output power(KW)	PV self-consumption rate = total inverter output power/ available PV power *100%
Before adding meter	30	20	0	20	66.7%
After adding meter	30	20	10	30	100%

Note: The above analysis does not consider the conversion efficiency of the inverter, which is usually above 95%.
It can be seen that after adding smart meters, the self-consumption rate of PV has increased from 66.7% to 100%, which can reduce the amount of electricity obtained from the grid, save electricity costs for users, and make the whole system more economical.

System configuration guide:
The inverters in this solution are currently limited to the HPS30-150 models.
In this solution, depending on the total power of the HPS and the load, CTs with different current ratings should be selected according to the following:

CT model	Rated current	Total power of the load+inverter rated power
CT200	200/1A	＜100KW
CT500	500/1A	⩾100KW