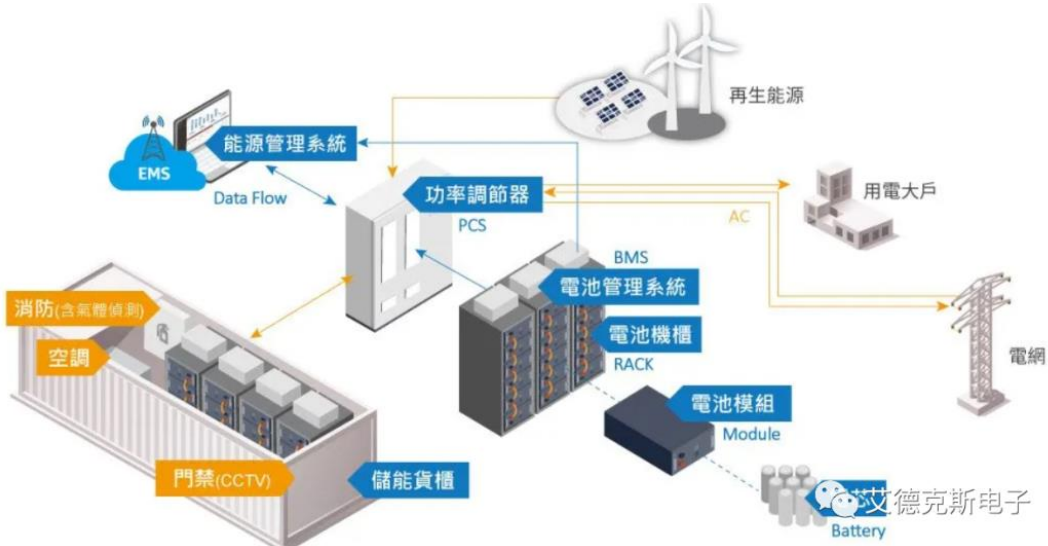




The demand for energy in countries around the world continues to increase, but due to the unstable nature of renewable energy, solar photovoltaics, wind turbines, and energy storage equipment must be widely installed. This has become an emerging high-tech industry and has been listed by the government as one of the six core strategic industries. In November 2022, the world's largest single-phase energy storage power station supplied by BYD Energy Storage was successfully put into commercial operation on the west coast of the United States, which became hot news in the industry. The independent energy storage power station is provided by BYD Energy Storage, a 1500V grid-level energy storage product BYD Cube T28, with an energy storage capacity of nearly 1.7GWh. Large-scale enterprises continue to join the energy storage track, and technology is advancing by leaps and bounds. How to develop energy storage systems to higher voltage levels, larger system scales, and higher safety and stability has become the focus of competition among various companies.



Energy storage system structure

In a micro-grid system composed of multiple energy sources, the energy storage system is an emerging core unit. Renewable energy sources such as photovoltaics and wind power are volatile, and the load is also volatile. Fuel generators can only generate electricity, but cannot absorb it. If there are only photovoltaic, wind and fuel generators in the system, the operation of the system may be unbalanced. When the power of renewable energy is greater than the power of the load, the system may fail, and the energy storage system can absorb electric energy and also generate electric energy. And the reaction speed is fast, and it plays a balance role in the system.

What is bidirectional energy storage converter PCS?

Energy storage converters, also known as bidirectional energy storage inverters PCS (Power Conversion System), are used in AC-coupled energy storage systems such as grid-connected energy storage and micro-grid energy. It is a device to realize two-way conversion of electric energy. It can not only invert the DC power of the storage battery into AC power, and transmit it to the grid or use it for AC loads; it can also rectify the AC power of the grid into DC power to charge the battery.

Energy storage converters mainly have two working modes: grid-connected and off-grid. The grid-connected mode realizes bidirectional energy conversion between the battery pack and the grid. With the characteristics of grid-connected inverters, such as anti-islanding, automatic tracking of grid voltage phase and frequency, low voltage ride-through, etc., according to the requirements of grid dispatching or local control, PCS converts the AC power of the grid into DC

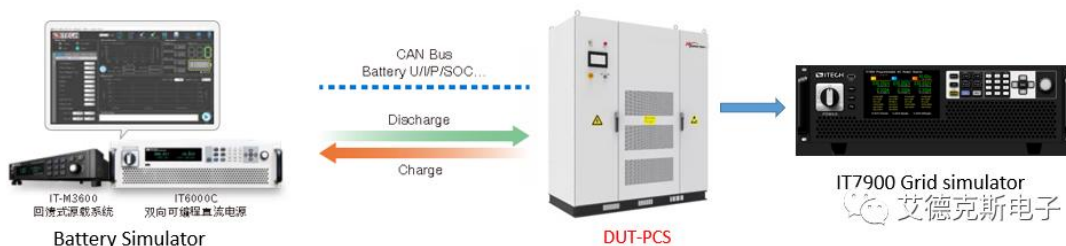
power, charging the battery pack, has the function of battery charge and discharge management; during the peak load period of the grid, it inverts the DC power of the battery pack into AC power and feeds it back to the public grid; when the power quality is not good, it feeds the power grid Or absorb active power, provide reactive power compensation, etc.

Off-grid mode, also known as isolated grid operation, means that the power conversion system (PCS) can be disconnected from the main grid according to actual needs and meet the set requirements, and provide local partial loads with AC that meets the power quality requirements of the grid. electrical energy. The energy storage PCS itself has high voltage and high power. During the test, it is necessary to build a DC terminal for battery simulation and an AC terminal for grid-connected/off-grid simulation to meet the bidirectional operation status of charging and power generation. The structure is complex, the simulation requirements are high, and there are Completed a number of regulatory testing requirements, which put forward extremely high requirements for testing equipment. ITECH provides high-efficiency and high-power-density test solutions for energy storage PCS.

ITECH Case - Energy Storage Converter Design Verification

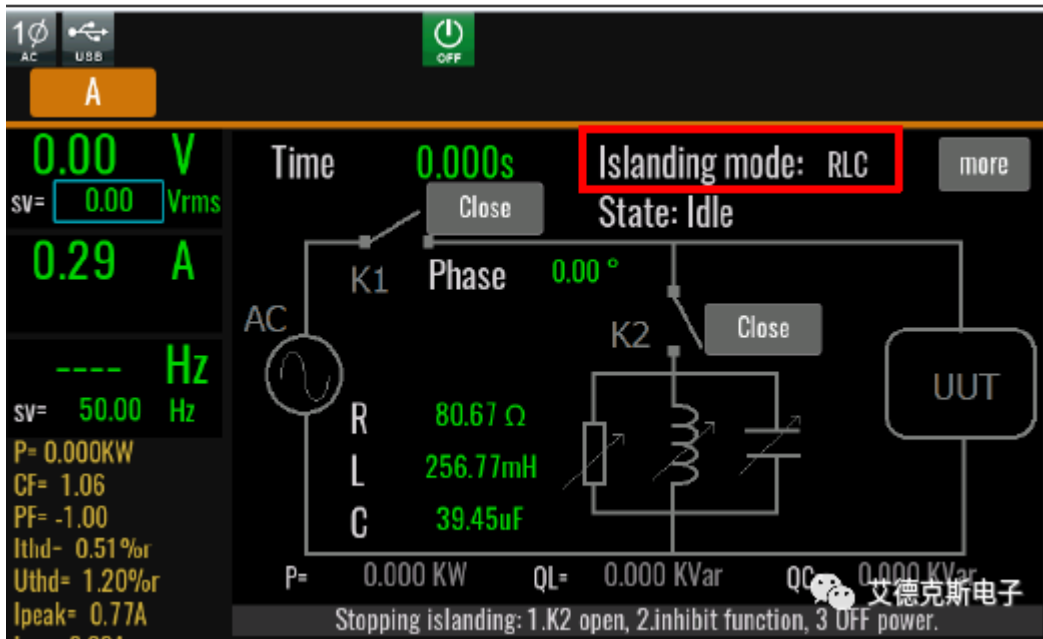
An energy storage manufacturer used IT7900 grid simulator & IT6000C high-power bidirectional DC power supply to verify the islanding switching time test of energy storage converters.

Both IT7900 and IT6000C work in two directions, and can complete continuous charge and discharge tests without changing wiring and control. IT7900 is a four-quadrant AC power supply with a maximum power of 960kVA. It can automatically absorb reverse power while providing grid power, and has a built-in island protection test function. IT6000C can be combined with BSS2000 to form a professional battery simulator, which has 8 commonly used battery models and user-defined model functions. The maximum voltage can reach 2250V, and the maximum power can reach 1.152MW.



ITECH Energy Storage Converter Test Scheme

There are two switching times for energy storage inverters. One is charging and discharging switching. Large-scale energy storage reverse flow should be able to quickly switch operating states. Usually, it is required to be between 90% rated power grid-connected charging state and 90% rated power grid-connected discharging state. , the switching time is not greater than 200ms, and the second is applied to the switching between grid-connected mode and off-grid mode, and the switching time is not greater than 100ms. IT7900P and IT7900 power grid simulators have built-in island protection function, which greatly reduces the workload of island protection test wiring control.



IT7900P/IT7900 island protection function interface

Compared with IT7900 grid simulator, IT7900P high-performance grid simulator has more comprehensive AC load functions: one-key switching of source load status, and supports CC/CP/CR/CS/CC+CR/CE multiple working modes in AC mode. Testers can adjust RLC parameters or configure active power and reactive power parameters to achieve the effect of simulating pure resistive or nonlinear grid loads, and further verify grid-connected DUTs under different equivalent impedances, three-phase load balance and unbalanced states the response to. It is clearer and easier to set the on-grid/off-grid status.

At the same time, IT7900 power grid simulator and IT6000C bidirectional DC power supply are both regenerative products. The feedback efficiency of IT7900 is 88%, and that of IT6000C is 95%. In the high-power test, the electric energy can be fed back to the grid without pollution, which meets the needs of environmental protection and also Save a lot of electricity and cooling costs.

For more information, pls. visit www.itechate.com or send email to info@itechate.com .

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