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**Applying Power line  
communication in C&I projects**



## Background

Power line communication uses power lines as the transmission medium to modulate information data to the appropriate carrier frequency to achieve communication or control between data terminals and supports AC and DC Power line communication. PLC has its superiority in carrying both electrical power and simultaneously achieving data transmission through electrical wires. PLC together with Wi-Fi, Zigbee, Bluetooth, and other 2.4Ghz high-frequency wireless technologies are also referred to as 'last mile' mainstream communication technology for the IOT.

Some large C&I projects require full feed-in to the grid, therefore the use of PLC can reduce the LCOE. Compared to RS485, it can save communication cable costs, as well as operational, maintenance, and system installation expenses. Additionally, it is more convenient and stable compared to independent Wi-Fi or LAN communication methods.

## Avoid connecting loads on the low voltage side when using PLC

There are still some important considerations to be mindful of when using PLC in large-scale C&I scenario. Especially when there are much electrical equipment, the noise from electrical equipment interferes with the control signal. The power line also generates electromagnetic radiance itself, which has an impact on surrounding electrical appliance. The high speed communication cannot be always guaranteed, which is only the maximum speed under ideal conditions. The power line communication also be affected by power cuts, which is unable to solve.

Due to the characteristic of power line communication, the application scenario of power line communication in a PV power plants has limitations that there must be no loads. Therefore, PLC are widely used in utility projects that all generations are sold to the grid to save the cable investment. At the same time, large-scale C&I projects that are fully fed into the grid can also use PLC, but make sure that the low voltage side is not connected to the load.

## GoodWe C&I PLC solution

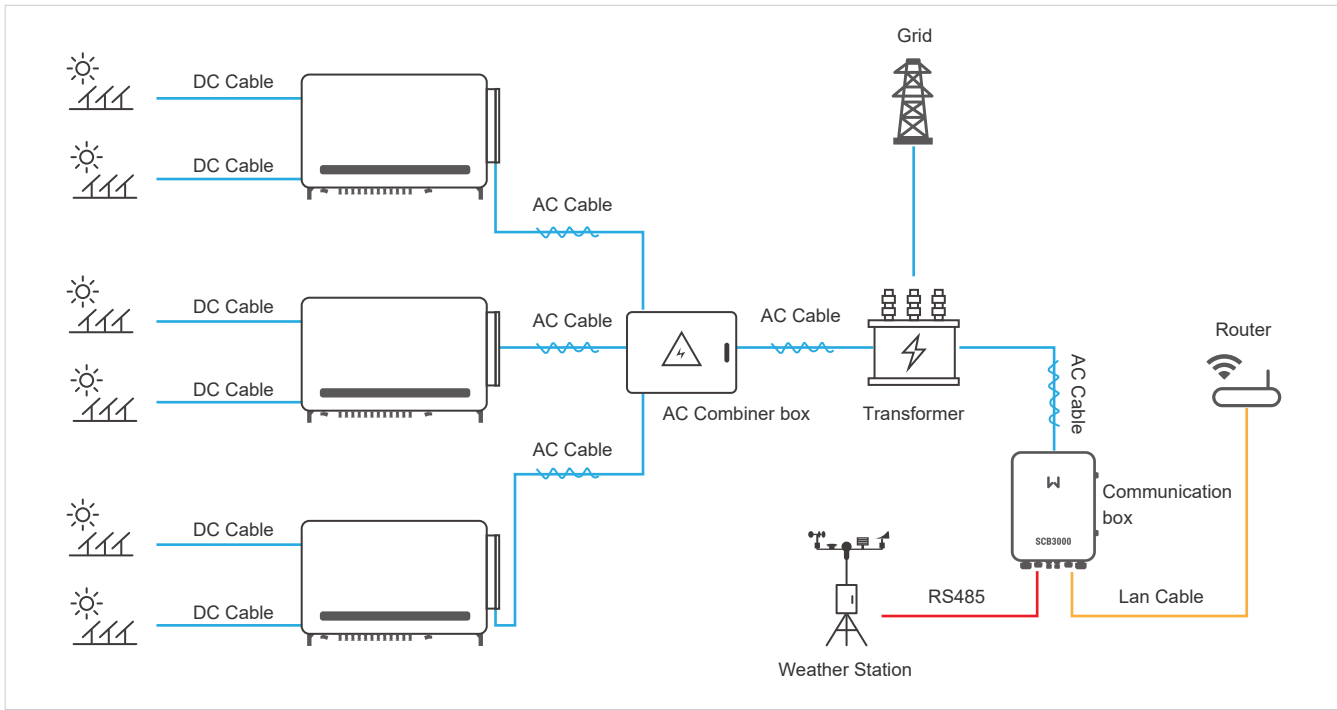


Figure 1 GoodWe C&I PLC solution

As shown in the figure 1, the communication box is the key element in PLC solution. The one in the above diagram is SCB3000, which is designed to be compatible with SMT and HT 250K (1500V) for PLC2.0. Save more DC and AC cables when applied to HT 250K inverters.

The communication rate of PLC can be up to 200Kbps and the communication distance is 1000 meters. One SCB3000 can connect up to 60 units because the SCB3000 has four communication ports in total and the first three are used for inverter connection (20 units max. for each port). However, the actual limit of inverter number needs to be confirmed by GoodWe R&D according to the application scenario. The SCB3000 is key element to connect inverters using PLC and it can also connect inverters to the monitoring platform through IEC104 protocols, which is an international standard widely used in industries such as power and urban rail transit. In addition, SCB300 also offers RS485, LAN, and fiber optic ports to offer flexible access to third party devices for the PV system communication network building.

## GoodWe PLC-Fiber optical ring solution

PLC-Fiber optical ring solution is part of the communication network, which helps to secure data access and ensures data will not be lost. In this solution, several SCB3000s form a ring through optic fibers and one of them is set as the master device with the rest as slave. The master SCB3000 is connected to the local server through LAN or optic fiber. The benefit of the PLC-fiber optic ring solution is to make sure the data transmission is without packet dropouts if any of the communication box has a signal interruption.

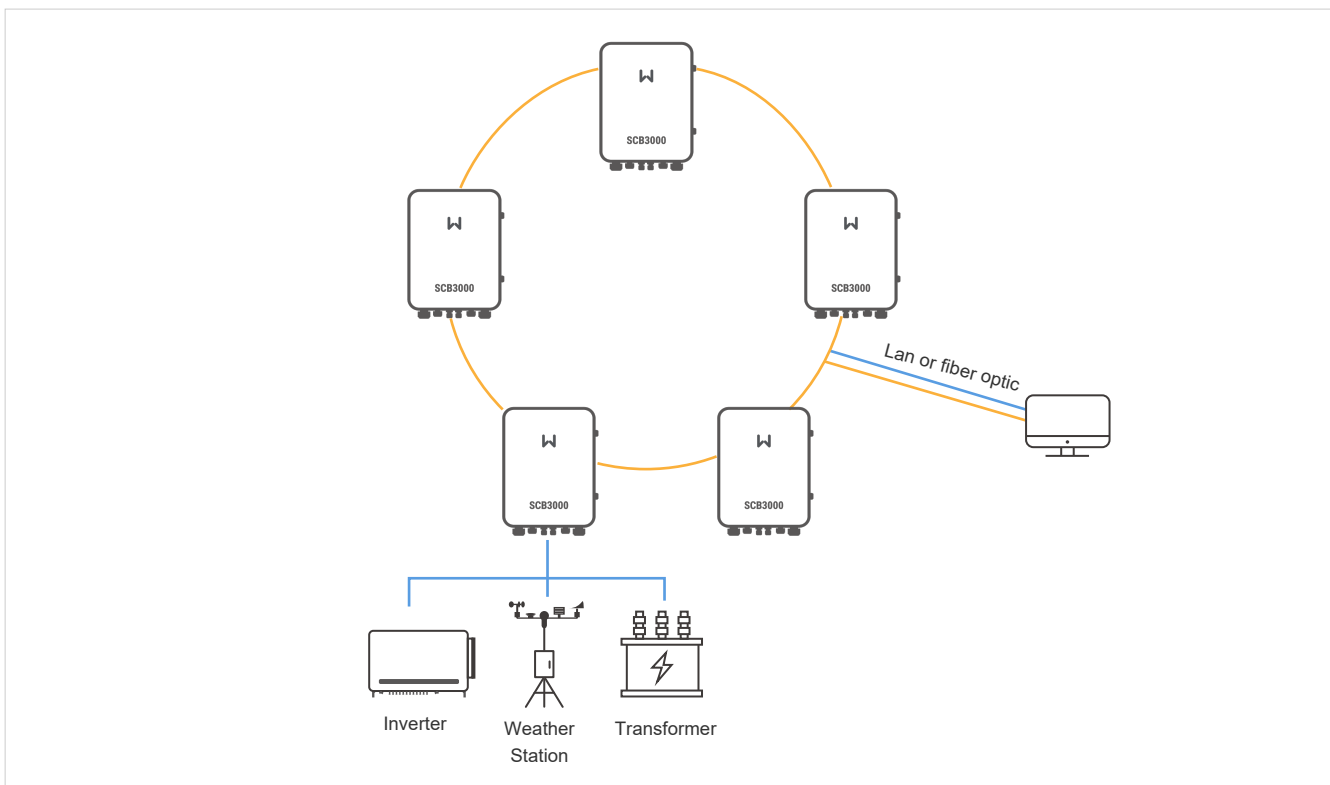


Figure 2 GoodWe PLC-Fiber optical ring solution

Sometimes, PLC-4G LTE solution is also applied to provide a high speed, reliable, smart communication network. This solution can solve the problems like complex deployment of fiber optic rings, difficulty maintenance, slow data transmission and packet dropouts. This solution uses PLC within the subarray and 4G between the subarray and control room.

## GoodWe C&I case of using PLC

GoodWe has a project in Tianjin, China that uses 104 units GW80KHV-MT and seven SCB2000 to realize the PLC on the low voltage side. The SCB2000 is integrated with PLC communication board, Ezlogger Pro, and fiber optic ring switch.



Figure 3 GoodWe SCB2000

The project has seven connection points of MV stations and we configured one SCB2000 for each MV station. The communication boxes are wall-mounted that installed close to the MV station. A 220V power with three-phase power line cables was introduced at the low voltage side. In this project, the SCB2000 communication box uses PLC monitoring to collect inverter data and transmit data to the MV station monitoring and control unit through a LAN cable. In the end, data is transmitted to the main station control layer switch.

## Conclusion

In conclusion, in large C&I projects, the power line communication method with GoodWe smart communication box can provide a complete solution to reduce the LCOE of the C&I PV power plant. Power line communication is a cost-effective communication method in the solar power plant as long as no loads at the low voltage side.

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