Possible ways to energize the cluster

1. Autonomous PV system: a PV system is designed to cover all the consumption of the cluster. Characteristics. • They normally operate at voltages of: 12, 24 and 48 VDC. • Needs 1 or more MPPT controllers (efficiency between 90 and 97%) • They operate at relatively low voltages, therefore they use high current values and have high losses due to cable voltage drop. • It requires cables with a large cross section. • The photovoltaic array must be oversized between 15 and 25% (after covering all losses) • The battery bank must have at least 3 days of autonomy by design, it is the option with the largest battery bank and therefore expensive. • If you want to feed the PCs directly with DC, you have to replace their source with another that accepts 12, 24 or 48 V input and delivers all the voltages the PC needs (+12V, -12V, +5V, - 5V, +3.3V). In addition, it must do it with high efficiency. • In these systems, the batteries are charged and discharged by a significant % every day, they are subjected to stress that will limit their useful life.

2. PV system with hybrid grid connection inverter and backup battery bank: it is the most flexible system in its design, PV can be installed from just to reduce consumption until it is capable of generating all consumption plus implicit losses . The battery bank would cover a certain number of hours for example 8 hours up to 24 hours or more. Characteristics. • The grid connection hybrid inverter with high voltage in battery bank (100 to 400V) has a high efficiency. • It can be designed with a PV power such that in the event of a prolonged blackout the system works as an autonomous one, but in normal conditions the power generated by the PV array that is not consumed within the backup circuit is consumed by the immediately connected loads. outside the backup circuit, taking full advantage of the PV system. • The system can be configured so that the batteries remain fully charged without being in charge and discharge processes, waiting for a power outage from the network. This condition greatly extends the useful life of the battery bank, several years of operation can be achieved with lower cost batteries.

3. PV system with hybrid inverter connected to the grid with battery bank voltage between 300 and 340V and DC supply from the battery bank: the idea with this system is to directly feed the input of the switched sources of the different equipment. Characteristics. • From the point of view of efficiency it is a very efficient option. • It presents the difficulty that although the sources of the equipment from the technical point of view can work being fed in DC at this voltage, the standards for this operation are being developed and therefore it cannot be ensured that it is safe for both the equipment and for the people. In addition, it is possible that the guarantee is lost in case of feeding in this way. • Everything said in the previous case is valid.

Note: when the electrical network is available, the most efficient and economical thing to do is to design a PV system connected to the network and with batteries if you want to ensure its uninterrupted operation in the event of a power failure. Example: for a daily consumption of 20 kWh, a PV power of approximately 5 kWp would be needed, a 25 kWh battery bank, a 5 or 6 kW hybrid inverter.