Inverters as grid managers

The global energy mix is undergoing a massive change, as the world looks to reduce its dependence on limited and pollution-causing fossil fuels. Solar power, clean and abundant, is a central character in this transition, but seamlessly integrating renewable energy into the public distribution grid has its own set of challenges. When optimally incorporated, solar electricity helps ensure a stable power supply while increasing the use of renewable energy.

Unlike conventional power plants, PV systems – even large-scale arrays with capacities of up to 500 MW or more – have customizable control features that allow them to provide grid management. This allows PV systems to stabilize power grids in a manner that would otherwise incur additional costs.

Advanced power electronics and communication components ensure compliance with all PV power plant grid requirements. The ability to reduce the feed-in rate within seconds of a frequency increase and to provide...
reactive power and short-circuit current when an error occurs allows PV power plants to accurately control the amount of power they supply to the grid.

To ensure that solar power generation continues to expand, SMA is actively shaping the discussion on global requirements for power distribution and transmission grids. Inverters that function as grid stability managers help secure the future of the solar industry.

Grid integration features of SMA central inverters

Implement target values, control line voltage, ride-through voltage dips

SMA central inverters offer both an intelligent interface to the power distribution grid and decentralized grid management services. These inverters are able to receive and implement the target values specified by grid operators using all standard data transfer protocols (Modbus, OPC, Ethernet and TCP/IP).

Remote-controlled power reduction

To avoid temporary overloads in the power distribution grid, grid operators prescribe specific active power values that inverters are required to achieve with minimal delay. In conjunction with the SMA Power Reducer Box, these target values are transmitted via a ripple control receiver.

Active power control

If there is a frequency spike in the transmission line, the inverters respond by automatically reducing their active power output according to a characteristic curve. The inverters can therefore play a decisive role in stabilizing power frequency.

Voltage control with reactive power

In order to keep line voltage constant, SMA inverters supply lagging or leading reactive power to the grid. The grid operator specifies whether the reactive power value is fixed or dynamic. The SMA Power Plant Controller is used to analyze and manage the process. The reactive power, or displacement factor, can also be controlled along a characteristic curve in relation to the supplied active power, the line voltage or an absolute value.

Reactive power at night

Providing reactive power at night avoids future costs and offers an additional source of income. Reactive power compensation reduces the load on power grids while ensuring decentralized voltage stability.

Low Voltage Ride-Through

Through dynamic grid support the inverters remain connected to the grid during voltage dips that last no longer than a few seconds and support the grid by feeding in reactive power. They immediately resume normal feed-in operation once the voltage exceeds a defined minimum threshold.
Intelligent management of PV plants promotes the growth of PV power

PV power plants use SMA system technology for optimal grid management

Flexibility and maximum energy production

PV power plants can offer even more

The stability of the transmission system can be maintained and strengthened through the active contributions of SMA inverters, and flexible PV park regulation and power plant configurations with SMA systems technology.

Grid operators across the globe benefit from new technologies such as the ability to supply reactive power both night and day, intelligent and flexible PV plant regulation with the Power Plant Controller, and communication interfaces integrated into the inverter.

SMA inverters are the ideal solution for managing reactive power. The requirements for supplying reactive power to electric utility companies already pose serious challenges. Large-scale PV power plants that offer grid management services and flexible functions for reactive power provision have proven to be the perfect partner in this regard.
Since reactive power cannot be transported over large distances, the fact that it can be supplied in a distributed manner via PV power plants is especially beneficial. PV power plants can provide this form of decentralized power for grid stabilization.

SMA’s PV plant regulation systems, which include the Sunny Central Compact Power (CP) and Sunny Central High Efficiency (HE) series of inverters, are able to handle the most advanced grid management regulations. This ensures the stability of the transmission in the future and guarantees the highest degree of flexibility and stable energy production for investors.

Unlike conventional power plants, large-scale PV systems are already capable of offering grid services. The PV industry continues to plan and research for the future. Existing features of conventional power plants will soon be implemented in large-scale PV plants. This includes the use of storage technologies, which expands the functionality of PV power plants even further.