

How SG6800HV-MV Empowers the Utility-scale Solar Market

Overview

With the solar industry rapidly changing, there come many challenges in the utility-scale solar plants, including the declining PPA, the pressure of investment costs, the more stringent grid demand and land-use application procedure, as well as requirements on easier O&M. These new requirements and standards set a higher threshold for the inverter. The inverter either has a wide range of ride-through capability and special grid support function or the energy storage interface to solve issues like intermittence, randomness of renewable energy.

Optimized to the utility-scale market, Sungrow released its updated turnkey central inverter solution SG6800HV-MV which is flexible to tackle the emerging demands and brings much more benefit for stakeholders of solar plants.

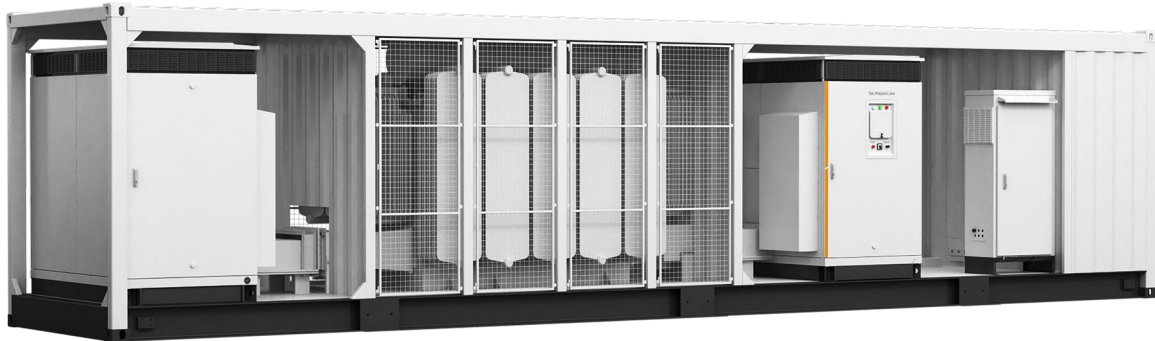


Fig-1: SG6800HV-MV

All-in-one solution, more convenient

The standard 40-ft container integrates two units of SG3400HV-30 outdoor central inverter, 6.8MVA medium-voltage transformer, RMU, auxiliary power and communication parts altogether, which minimizes the land utilization and enables cost savings on the transportation, installation, commissioning and O&M, enabling an optimized LCOE.

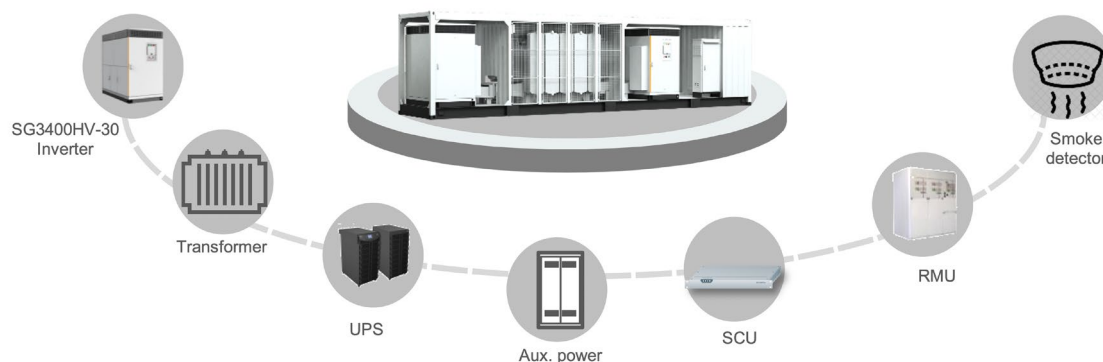


Fig-2: SG6800HV-MV components

The energy density hikes 100% compared with previous big block schema; A 50% footprint reduction since it's highly integrated, optimizing the gap among parts. The 40-ft standard container design can maximize the space utilization of sea transportation, ensuring safety and cost-savings during transportation and loading.

Self-constructed grid function, earlier COD & lower investment

In the early stage of the power plant construction, most of the equipment has no access to power supply and hence, cannot be debugged when there is no electricity on the grid side. At the same time, some debugging tools need a power supply before the high voltage side is electrified. Sungrow inverter SG6800HV-MV has a self-constructed grid function that can construct AC power with a certain frequency and certain voltage by controlling the inverter to work in voltage frequency mode, thereby supplying AC power for debugging of the equipment.

There are two working modes of Sungrow central inverter self-constructed grid function, the low-voltage mode and high-voltage mode. The low-voltage mode is applied to supply power for construction tools onsite and the maximum ability is 40kVA, shown as Fig-3.

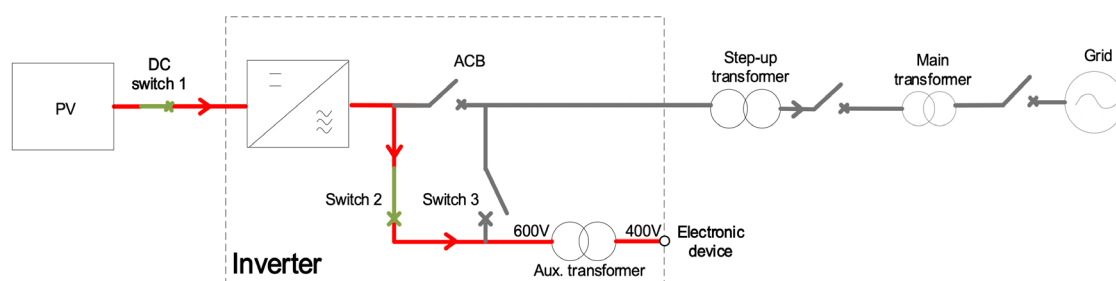


Fig-3: Low-voltage mode

For the high-voltage mode, one inverter sets up a temporary regional grid, another inverter can be debugged in one power line. The rest inverters in the same power line must be disconnected from the regional grid. The inverter to be debugged (#2 inverter) can output reactive power for debugging, with the maximum capacity of 50% Q_n (reactive power per inverter), shown as Fig-4.

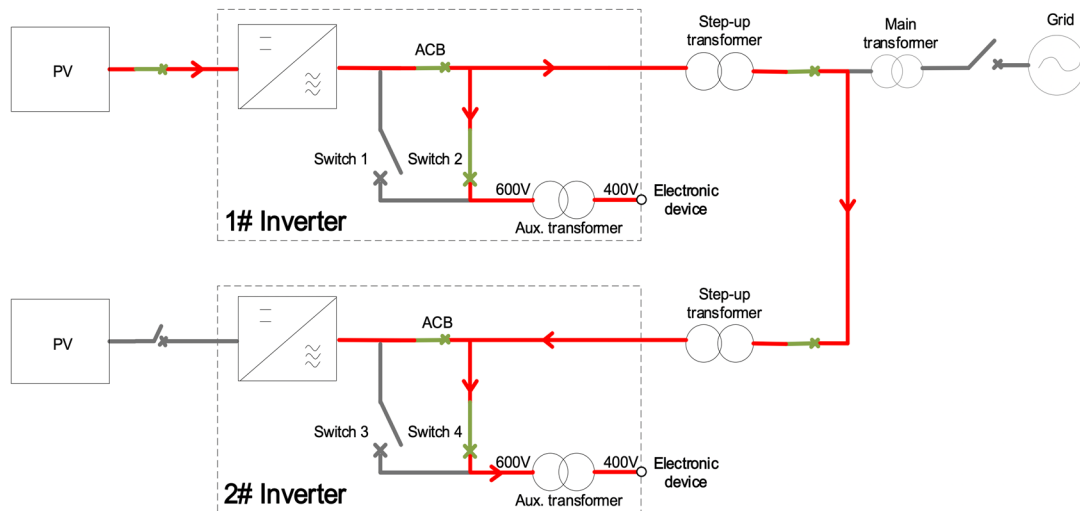


Fig-4: High-voltage mode

Sungrow central inverter self-constructed grid function can have major advantages as below:

- Advanced pre-commissioning prior to grid availability and high pass rate when hot commissioning.
- Convenient for cold commissioning without frequent utilization of generators.
- Safer design and easier setting for function activations.
- Stable output as voltage and frequency source to ensure device safety.
- One block starts self-constructed grid, and all blocks can be powered in the same ring.

Compatible with 500Wp+ PV panel and tracking system, higher yield

A lower LCOE is a major concern as always. Project stakeholders tend to adopt advanced technologies, like the bifacial panel, the large panel of 500Wp+ and tracker system to maximize solar yield. Currently, the power capacity of the panel can exceed 500Wp. There are two different technical roads in large PV panel in terms of the short circuit current, one is below 15A and the other is around 18.5A. Sungrow SG6800HV-MV solution can be compatible with both types due to the reasonable selection of DC fuse. The current of DC fuse in DC combiner box is up to 30A and DC fuse in the inverter is up to 500A.

Most of the solar installations in the US market are equipped with tracker systems and bifacial modules. Sungrow, as one of the leading industry players in the US, can not only comply with the system requirement, but also have deep and frequent exchanges and cooperation with local players in a bid to make the project more profitable.



Fig-5: 200MW plant using central inverter + bifacial modules + tracker in California, USA

DC ESS interface and PCS mode, grid support

Renewable energy is expected to account for over 20%-40% in the energy mix globally. However, renewable energy such as solar, wind energy feature randomness, intermittence and volatility, which will reinforce grid instability and lower short circuit ratio (SCR). As we know, the lower the SCR, the weaker the grid will be. Weak systems become more troublesome when renewable sources with fast controllers connect to them. Sungrow central inverter SG6800HV-MV can operate stably with $SCR \geq 1.2$ and support fast active and reactive power control. The Q (reactive power) response time is less than 30ms and the P (active power) response time is less than 140ms to help the grid stabilize as well.

Considering that the energy storage solution can meet the requirements, such as peak shaving, power smoothening, renewable energy curtailment, frequency regulation and voltage regulation, SG6800HV-MV is reserved with a DC ESS (energy storage system) interface for future consideration, enabling no further modifications of system design.

The DC-coupling energy storage system can be more economical with the DC/DC converter and the battery connected to the reserved ESS interface, without any redundant equipment. In addition, SG6800HV-MV supports PCS mode so that the battery can be charged by grid and regulation will be more flexible, shown as Fig-6.



Fig-6: DC ESS interface and PCS mode of SG6800HV-MV

Sungrow is among a few of suppliers having expertise in both PV and energy storage and can offer a comprehensive product portfolio as well as industry-leading 24/7 global services for the solar-plus-storage solutions.

IP65 protection, more reliable

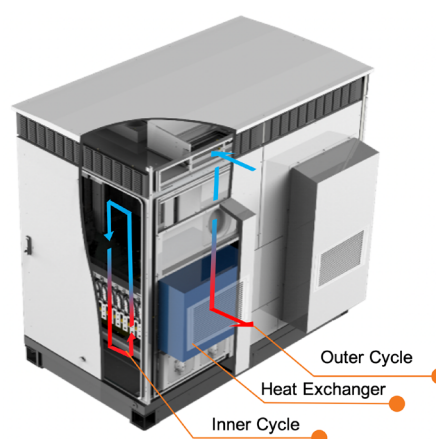
Featuring a maximum inverter efficiency of 99% given the advanced three-level topology design, the SG3400HV-30 outdoor central inverter also characterizes a high ingress protection level of IP65. The whole cabinet of SG3400HV-30 is made up of two compartmental cavities, a heat dissipation cavity and an electronic cavity.

The heat dissipation cavity of the power module and reactor is cooled by the inbuilt smart forced air cooling system. The cool air comes inside from the top of the cabinet and hot air gets outside from the bottom of the cabinet. The components ingress protection in a heat dissipation cavity is IP65.

The electronic cavity transfers internal heat to the outside through a heat exchanger to isolate the electronic cavity from the outside. The schematic diagram of the heat exchanger is shown below.



Heat dissipation cavity: Speed controlled fans for cooling



Electronic cavity: Heat exchanger for cooling

Fig-7: Independent cabinet design for heat dissipation

Sungrow central inverter solutions deployed across the globe

Upgraded from the flagship 3.125MW central inverter, SG6800HV-MV garners considerable global attention given the competitive features. With a profound track record, Sungrow has 10GW of its 3.125MW central inverter solutions installed globally.

In particular, the solution is an ideal match for projects in harsh conditions, like scorching heat and corrosive coastal areas. Considering a landmark 250MW PV project in Vietnam for instance: the solar farm is located in Ninh Thuan Province in Southeast Vietnam characterizing tropical climate. Partnered with Bouygues, Sungrow's 3.125MW medium-voltage turnkey solution has been operating for nearly two years, powering the local facilities and communities at large.



Fig-8: The utility-scale PV plant in Vietnam using Sungrow central inverter solution

Summary

Backed by Sungrow's advanced R&D platform, the SG6800HV-MV housed in a 40-ft container features high efficiency and excellent reliability. The inverter is designed for easy skid integration, convenient for transportation and installation, significantly reducing system cost. With the application of SG6800HV-MV, the solar plant construction will be faster and it will finally bring customers a higher ROI.