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TREND PAPER FOR INTERSOLAR EUROPE: EASY-TO-USE, FLEXIBLE AND INTERCONNECTED – THE VERSATILTY OF MODERN INVERTERS

Munich/Pforzheim, January 2024 – Exciting developments in the area of inverters: It is becoming increasingly common for inverters to include functions that go far beyond their original task of converting direct current to alternating current. They are increasingly becoming the centerpiece of all-in-one solutions for the efficient management of energy flows. As core of photovoltaic systems, they do much more than convert electricity: They analyze and control solar strings as well as solar batteries, integrating charging stations for electric vehicles, heat pumps, air conditioners, infrared heaters or heating elements. This is why the next generation of inverters should be easy to install, use and maintain, offer flexible options for retrofitting and upgrading, provide open interfaces and feature a modular design. This Intersolar Europe trend paper provides you with an overview of the latest developments.

Devices with integrated emergency and back-up electricity supply are on the rise: While hybrid inverters, which include a battery to store solar power, are now standard, an increasing number of manufacturers is offering devices for power grid failures or grid interruptions. For example, the hybrid inverter (single-phase 3–6 kW, three-phase 6–10 kW) by a renowned European manufacturer features two needs-based variants of emergency power. The basic version can supply devices connected via power sockets with up to 3 kW emergency electricity while the sun is shining. On request, the device can also be equipped to provide a comprehensive emergency power supply for the entire household, including large-scale users such as heat pumps using a connected battery storage system. It is also possible to retrofit the basic version of the inverter. The installer can activate the hybrid function and the full backup emergency power supply with a software update.

Scalability as a selling point

While retrofitting options are important, scalability is also becoming a key factor when choosing the right inverter. The latest generation of a three-phase / hybrid inverter of a renowned German manufacturer, for example, impresses with its scalability. It is available in three power classes S (4 to 7 kW), M (8.5 to 12.5 kW) and L (15 to 20 kW) with an upgrade option by two power levels for each power class. In the power classes S and M, the MPP current (maximum power point current) measures 17 A, in the power class L it even reaches 30 A. This eliminates the need for home users and small businesses to exchange their device or buy a new one when their energy demand grows or they want to upgrade their solar installation. This also applies to large modules of the latest generation. What's more, the compact inverter grows with the requirements – whether it's to charge a connected battery or an electric vehicle or to power a heat pump.

More communication and interconnection

High communication and interconnection capabilities are the hallmarks of the latest generation of inverters. They often feature several digital switching outputs, LAN ports, an integrated WIFI interface, and digital interfaces such as Modbus TCP and SG-ready. This provides many benefits – from easy commissioning and system configuration, connection to a smart meter for measuring and visualizing self-consumption, a quick monitoring data exchange to the integration of additional consumers such as air conditioners, infrared heaters, heat pumps and heating elements.

Simple installation and operation thanks to digital tools and features

Modern inverters are easy to install and start up via the device display or a smartphone app. Digital tools for planning and designing systems and for error diagnostics have become commonplace. This goes hand in hand with the increasingly widespread use of artificial intelligence and cloud-based energy management apps that provide a clear visualization of energy consumption and self-generated energy. A feature that has become quite common in inverters is integrated, self-learning shading management, which helps prevent output drops due to shading of individual panels.

More and more manufacturers are also offering string inverters for commercial PV applications in the output range of between 25 kW and 100 kW with high system voltages, often in combination with matching batteries. This reflects the growing demand for commercial PV with a higher performance and the use of self-generated solar power in the commercial sector. Plant safety is essential and ensured through integrated functions such as arc detection with automatic event messages or type 2 overvoltage protection on the AC and DC sides. Interconnecting multiple devices to create a swarm grid provides flexibility for the expansion of larger PV systems.

Innovative inverters for large-scale PV plants

The development of inverters for large-scale PV plants is also characterized by innovation, with a focus on cost efficiency, flexibility, reliability, safety and grid support. For example, the string inverter of a leading Asian manufacturer in the power class of 350 kW with 12 or 16 MPP trackers allows for a flexible system design of PV modules with high or low output current – whether for elevated systems, tracking systems or floating PV. Communication takes place via power-line communication (PLC), which not only reduces investment costs but also enables quick control. Additional features, such as anti-PID protection of modules, 24-hour real-time AC and DC insulation monitoring, automatic shutdown in the event of a fault, and its design that ensures stable operation despite a weak power grid contribute to this inverter's comprehensive functionality.

Modular design with plug & play

There is an inverter for utility-scale PV systems of the latest generation that is based on modular scalability. It consists of individual components with a minimum capacity of 1.1 MW and can comprise up to eight components for a total capacity of 8.8 MW. Plug & play allows for quick replacement of key components such as capacitors or fans. The result is not only quicker maintenance, but also a reduction in downtime. It also features an additional DC energy storage interface to support future hybrid applications. Grid support functions such as less than 20 milliseconds response time for reactive power regulation, the ability to continuously stabilize the grid without decoupling when voltage sags (LVRT) or overvoltages (HVRT) occur in the extra-high-voltage grid (EHV). As the massive expansion of renewable energy continues, active grid stabilization is the next step. In the future, smart algorithms will enable high-performance inverters to start the power grid themselves (ability to perform black starts). Many inverter manufacturers are currently investing in

expanding their production capacities in Europe while also improving their supply chains to keep up with the ever-increasing demand and to stay efficient and reliable.

Intersolar Europe 2024: Experience innovation up close

From June 19–21, 2024, Intersolar Europe will present the latest products, technologies and trends in the area of modern inverters in Munich. Visitors will have the opportunity to learn more about the latest developments and innovations of inverters and all the different types of applications across ten exhibition halls – particularly halls B3, B4 and C1. A diverse presentation program at the Intersolar Forum (hall A3, booth A3.150) and at the Intersolar Europe Conference on the day before the exhibition kicks off will round off the exhibition program.

For more information, please visit:

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