



PV system efficiency with battery storage

Differentiating between system and battery efficiency

For homeowners, it is very important to ensure that their PV system with battery storage is working efficiently. The system efficiency of the PV system can be calculated using data from the Sunny Portal.

System efficiency vs. Battery efficiency

To fully determine the efficiency of a PV system with battery storage, it is crucial to differentiate between system efficiency and battery efficiency.

System efficiency refers to the overall efficiency of the PV system, including all components such as inverters, batteries and battery backup units and the associated losses. These include regular losses on conversion from DC to AC within the inverter (and vice versa) as well as losses in the battery, in the battery management system (BMS), from the no-load consumption of power electronics, in the battery backup unit for the battery

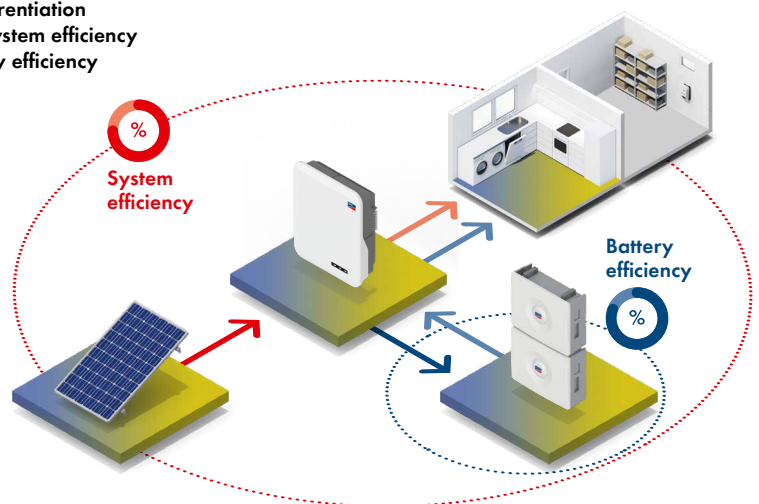
backup supply and also from electrical resistance in the wiring.

By contrast, battery efficiency specifically refers to the efficiency of the battery storage system. It shows how much of the stored energy is actually available once the battery is charged with and then discharged.

In the current market environment, typically only the battery efficiency is shown in the system monitoring. However, this does not include any of the losses that are taken into account when considering system efficiency.

For consumers, **system efficiency** is an important measure of the efficiency of their system, as it reflects the ratio of solar energy generated to solar energy that can be used.

Fig.1: Differentiation between system efficiency and battery efficiency



Display in Sunny Portal

The efficiency of a PV system can be calculated based on the individual generation and consumption figures displayed in the Sunny Portal. The figures referred to as “battery charging” and “battery discharging” reflecting the **system efficiency**. Due to their unclear names, these figures are taken by some users as the basis for calculating battery efficiency. For this reason, we are working to change the names to “system charging” and “system discharging” to avoid this misunderstanding.

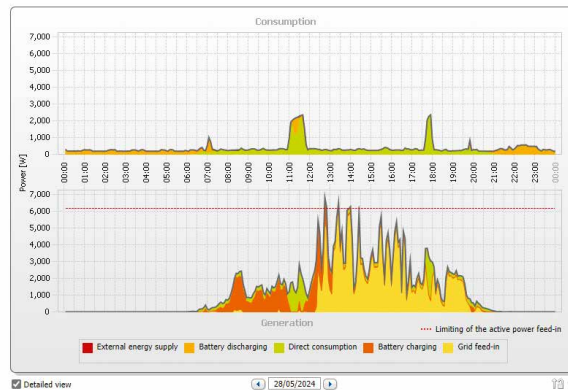


Fig. 2: Sunny Portal’s “battery charging” and “battery discharging” displays reflect the system efficiency.

Which factors influence system efficiency?

In addition to the aforementioned losses in the overall system, the quantity of energy demanded from the battery has a direct impact on the efficiency of any battery-supported PV system. In the case of very low consumption, efficiency is low due to physical factors, whereas higher consumption leads to efficiency that is accordingly high – refer to the chart below.

To protect households from power outages, the Sunny Tripower Smart Energy (STP-SE) hybrid inverter also features an integrated battery backup function. This is available to supply energy to the consuming devices in the home in an emergency. The inverter requires a continuous supply of energy to allow for constant review of grid stability.

Because efficiency is dependent on output power, the STP SE’s self-consumption plays a greater role when the power demanded is very low (e.g., overnight) and is less important when, for example, several different devices are demanding energy during the day.

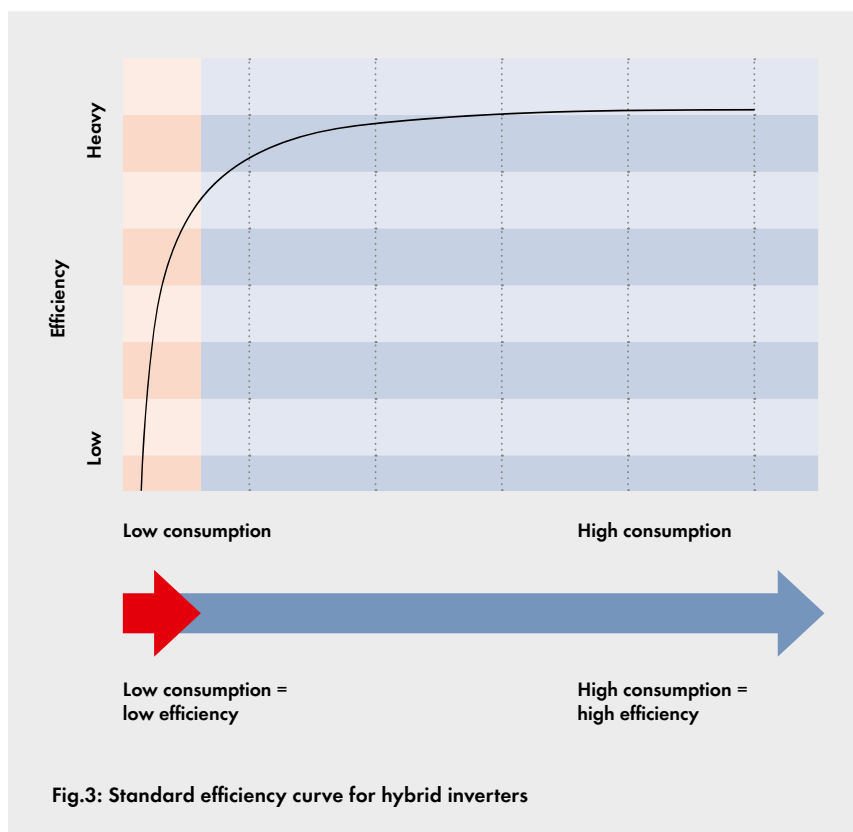


Fig.3: Standard efficiency curve for hybrid inverters

Summary

The Sunny Tripower Smart Energy hybrid inverter paired with home storage systems provides a reliable and efficient system solution for homeowners. Changing the names of the figures shown in the Sunny Portal (to “system charging” and “system discharging” instead of “battery charging” and “battery discharging”) will make them easier to understand.

The array efficiency varies depending on the quantity of power demanded. Generally speaking, when very little power is needed, efficiency is lower. Conversely, efficiency increases very quickly when more power is needed.