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Background Articles and Features

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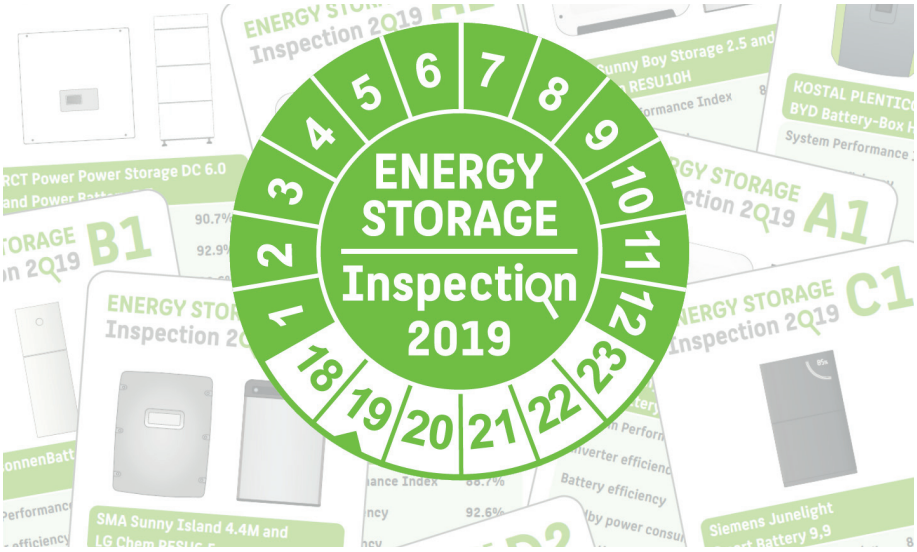
High Performers in the Residential Storage Market



The ENERGY STORAGE Inspection 2019 reveals the currently most efficient battery storage systems available on the market. The ranking is based on laboratory measurements of 16 storage devices from renowned companies like BYD, LG Chem, Siemens, SMA and sonnen.

When customers selecting a home battery system, the focus often lies on finding an appropriate battery capacity. System characteristics like the conversion efficiency or the standby power consumption of the power electronics yet played a minor role in the selection process. However, the results of the ENERGY STORAGE Inspection 2019 show impressively that high storage losses can reduce the financial benefit of a PV storage system by half. The results emphasize the importance of a high system efficiency. It is therefore only a question of time until the demand for storage devices with low conversion and standby losses will increase.

Efficiency Guideline for better comparability

In order to be able to compare different products, standardized test conditions as well as reliable data sheet specifications are needed. With the "Efficiency Guideline for PV Storage Systems" standardized test procedures have been published by the German Energy Storage Association (BVES) and the German Solar Association (BSW). Numerous research institutes and testing institutes such as the Austrian Institute of Technology (AIT), Karlsruhe Institute of Technology (KIT) and TÜV Rheinland have developed the test conditions which allow the determination of the most important efficiency parameters. To meet the international demand for standardized test procedures, an English Version of the Efficiency Guideline have been published.

System evaluation with the System Performance Index (SPI)

Nevertheless, there are various loss mechanisms which effect the overall efficiency of the PV battery systems. For a better comparability, the System Performance Index (SPI) has been introduced to summarise these system characteristics in one number (see figure 1). The test results according to the Efficiency Guideline are used to perform a standardized simulation test, which has been developed by the Berlin University of Applied Sciences (HTW Berlin). The SPI approach is based on simulating the system behaviour with and without the efficiency losses over a period of one year with a temporal resolution of one second. In contrast to other efficiency indicators, the SPI allows to compare the efficiency of PV-battery systems of different storage sizes and system topologies.

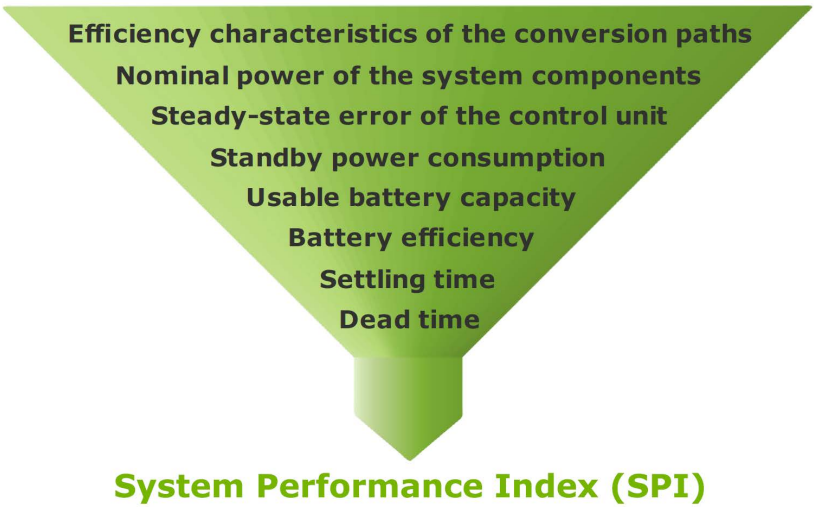


Figure 1: The SPI summarises the system characteristics of PV-battery systems in one number.

Results of the ENERGY STORAGE Inspection 2019

Within the ENERGY STORAGE Inspection 2019 the simulation test was performed for 12 PV-battery systems available on the market. The research study has been supported by manufacturers like BYD, KOSTAL, LG Chem, RCT Power, Siemens, SMA and sonnen with measurement data from independent testing institutes.

Figure 2 shows the SPI ranking of the systems under study. Seven of the eight manufacturers decided to be mentioned by name. Three highly efficient systems were able to achieve an outstanding SPI above 90%. This means that the individual cost saving potential of the PV-battery systems is reduced by less than 10 percentage points. The majority of the analysed systems achieve a very good SPI above 88%. The difference in the SPI between the most efficient and the less efficient system is roughly 7 percentage points. The participating manufacturers also got a detailed loss analysis for their systems under study which allows them to adjust the key parameters for an optimal system performance.

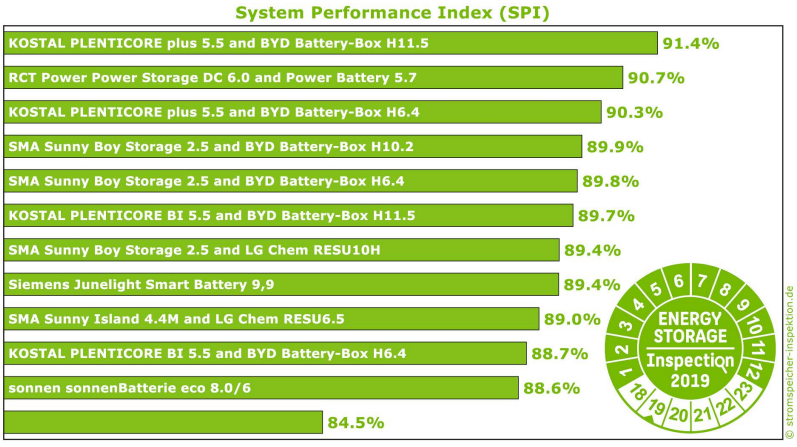


Figure 2: The results of the ENERGY STORAGE Inspection 2019. The majority of systems achieved a very good SPI above 88%.

Besides the SPI assessment, the comparison of the system properties was a key focus in the study (see figure 3). Many of the systems under study can score with an average inverter efficiency in the discharge mode of more than 94%. The standby power consumption is often in the range of 5 to 40 W. It has been shown that the conversion and standby losses of the power electronics dominate the overall system losses. That is why a high battery efficiency does not necessarily lead to a high system efficiency.

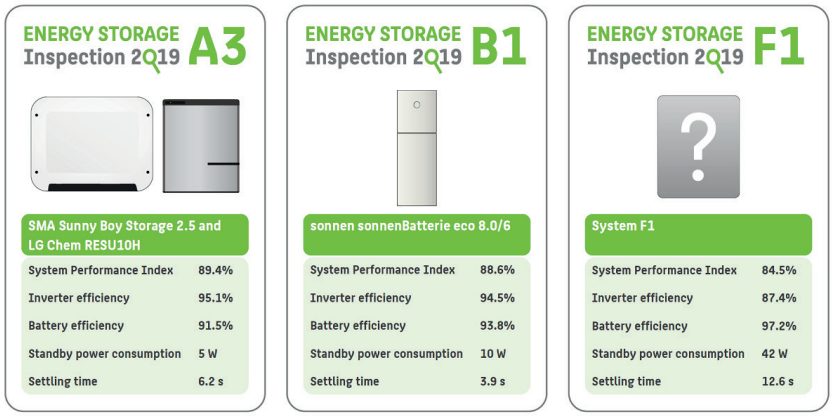


Figure 3: Comparison of the system properties of three evaluated storage systems.

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In summary, it can be said that the majority of the analysed systems can score with a very high efficiency. However, how other systems available on the market would perform remains open. To bring more light into the darkness, the next edition of the ENERGY STORAGE Inspection will be published in spring 2020 and is open for all market participants. Manufacturers and suppliers of home storage systems can take part in the next edition free of charge by providing measurements from independent test institutes according to the Efficiency Guideline until the end of 2019.

Acknowledgment

The "Energy Storage Inspection" is part of the project "EffiBat", which is funded by the German Federal Environmental Foundation (DBU). For more information and free download of the research study please visit the websites:

ENERGY STORAGE Inspection 2019 (English summary available free of charge)
Efficiency Guideline for PV Storage Systems (English version)

Authors:

Nico Böhme, Johannes Weniger, Nico Orth, Volker Quaschning
Solar Storage Systems Research Group
HTW Berlin - University of Applied Sciences
https://pvspeicher.htw-berlin.de