TWAICE

Verbund

How VERBUND used TWAICE to de-risk deployment & scaling of energy storage systems

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Introduction

VERBUND is Austria's leading electricity company and one of the largest producers of electricity from hydropower in Europe. Close to 100% of our electricity generation comes from climate friendly, renewable hydropower. VERBUND is active at all stages of value creation: from electricity generation and the transportation of electricity to trading and sales.

Especially in commercialization, all stakeholders can benefit from VERBUND's know-how in the energy sector. For example, flexibility marketing is handled fully automated via VERBUND's virtual energy system. VOLERY, VERBUND's digital optimization platform, enables combined marketing via the spot, intraday and control reserve markets, thus always ensuring the most attractive added value for consumption and generation flexibilities as well as energy storage facilities. Intelligent autotrading algorithms are used, which take into account individual constraints of the plant operation, such as heat supply obligations, storage limits and efficiencies.

In the first quarter of 2023, VERBUND added 42 MW to its battery storage sites. Plans are to install a total of 1 GW of battery storage capacity by the end of 2030.

Before energy storage systems can be fully operated, they must be successfully commissioned to ensure that VERBUND's requirements for commercial operation have been met (such as capacity). However, commissioning is a complex process that comes with many challenges. This case study describes how VERBUND used TWAICE's easy scalable Digital Commissioning to get an overview of the performance of their new energy storage systems being added to their assets.

The Challenge

VERBUND uses a measurement service provider to assist with the commissioning of their energy storage systems. The provider comes on site and helps evaluate the BESS's performance via additional measurement equipment. Besides the significant costs for the measuring equipment, it takes an entire working day to install the equipment, as well as additional time to evaluate the measurements.

VERBUND is planning to scale up its ownership of energy storage systems in the coming years. This will add complexity and increase costs during the commissioning process, as more, larger systems need to be commissioned (more time and measurement equipment needed), increasing the risk to fail on deadlines for the deployment of future projects.

An additional challenge VERBUND faces is the cooperation with different manufacturers for their energy storage systems. Every BESS therefore has a different user interface, and, more significantly, different integrators have different ways of calculating metrics such as State of Health. It is therefore incredibly challenging for VERBUND to get standardized, comparable information about the different systems at the beginning of life. This will become increasingly problematic when scaling up the capacity and number of energy storage systems.

How TWAICE responded

TWAICE was able to assist VERBUND with these challenges with the Digital Commissioning report, which requires only an online connection, and no additional measurement equipment. TWAICE's Digital Commissioning determined the performance of VERBUND's energy storage systems, providing several battery relevant key performance indicators, including SoH, DCR, RTE, capacity and various spreads, helping to identify anomalies.

The report provided VERBUND with an audit of the new battery energy storage systems at the beginning of life (BoL), which has many benefits. Metrics provided at BoL set the baseline for future asset management, with reports and measurements always being compared to the BoL metrics. Additionally, getting this information directly at the beginning of life facilitates making warranty or deficiency claims right at the beginning.

Furthermore, these metrics enabled VERBUND to independently verify the information provided by the manufacturer and made it possible to compare the metrics of the energy storage systems more easily. TWAICE

now provides reports for all large storage systems that VERBUND purchased, and will provide reports at regular intervals during operation, not just at beginning of life.

The Results

Independent verification of data provided by the integrator

The information provided by TWAICE in the Digital Commissioning report enabled VERBUND to independently verify the information provided by the integrators of the energy storage systems. For example, Figure 1 shows the usable capacity for one of the BESS. The Digital Commissioning report showed that the usable capacity of the system is more than what was promised by the manufacturer (indicated with the black line).

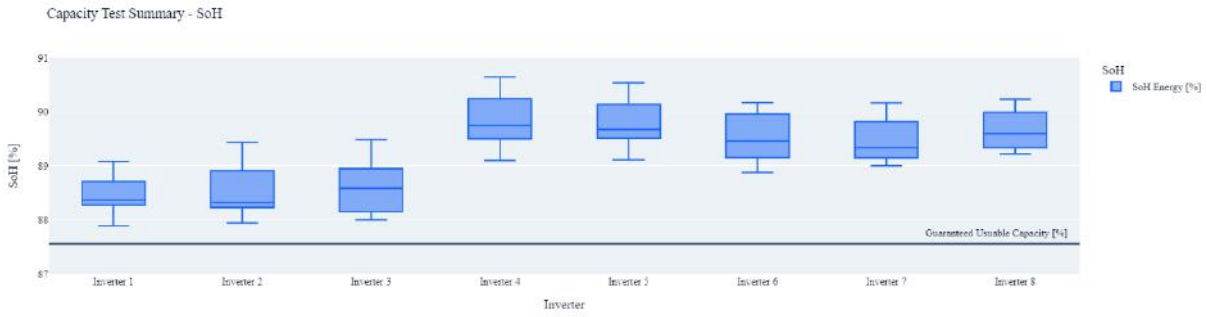


Figure 1: Capacity

Enabling comparison of different storage systems

TWAICE's Digital Commissioning Report is based on a standardized process, meaning the KPIs provided such as SoH, RTE and DCR are calculated in the same way for different energy storage systems from different manufacturers. This provided VERBUND with a clear comparison of the status of all their energy storage systems. This comparability will be increasingly important to evaluate system performance and aging, as VERBUND increases the number of BESS in the field.

The icing on the cake: identifying anomalies

An additional advantage of Digital Commissioning is that it involves clustering and analyzing a huge amount of data, which is not possible on-site or with additional hardware measurements, especially with ever increasing BESS sizes. This means that Digital Commissioning can identify anomalies that cannot be detected with on-site commissioning or with BMS alerts. The amount of data analyzed meant that weak cells or temperature

hot-spots could be found, whereas conventional commissioning generally takes place at the inverter level, meaning anomalies within strings or cells are not identifiable.

Example 1: High voltage spreads

High Cell Voltage Spreads in high and low SoCs can lead to exceeding the cell voltage boundaries set by the manufacturer, which can lead to safety and warranty risks during operation. In one of the inverters, shown in Figure 2, several strings showed particularly high voltage spreads. This indicates there were weak cells in this string which were reaching their voltage limit more quickly, a trend that will continue to increase over time, leading to increased risks.

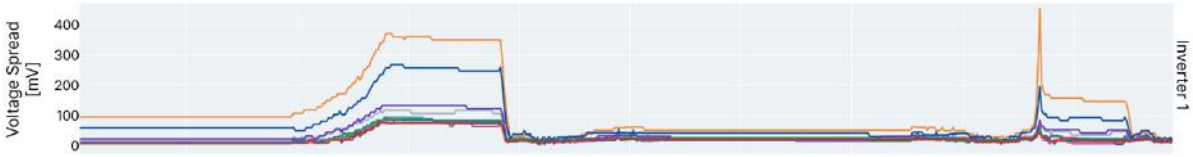


Figure 2: Voltage spreads

Example 2: Temperature anomalies

Hotspots were identified, with certain cells exceeding 40 degrees Celsius. This resulted in high temperature spreads, indicating cooling system problems. Furthermore, TWAICE was able to identify a pattern, showing that the same strings were reaching high absolute temperatures as well as high temperature spreads, which indicates a flawed cooling system design.

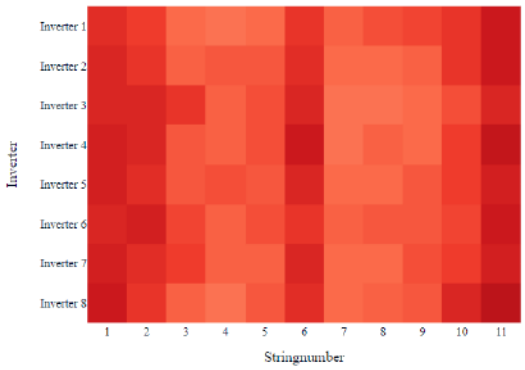


Figure 3: Absolute maximum temperature

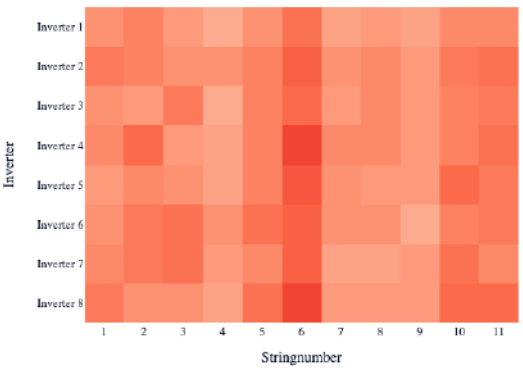


Figure 4: Temperature spreads

Benefits

Digital Commissioning proved to be a valuable tool that will assist VERBUND in scaling its energy storage projects and help delivering 1 GW of BESS until 2030. It provides VERBUND with a quick and easy way to check the performance of energy storage systems and verify the information specified by the integrator. It provides comparable results across different energy storage systems enabling more efficient asset management, which will become increasingly important as more and more energy storage systems are deployed.

Furthermore, Digital commissioning can scale along with ever larger BESS systems, whereas the cost of conventional commissioning with additional measurement equipment increases rapidly with plant size, both financially and in terms of the time required. The fact that VERBUND gets alerted about the anomalies early means they can make warranty and deficiency claims, as well as replace weak modules before operations starts. If these errors would not be identified beforehand, turning the system off to replace modules or perform rework would result in several days of downtime, as well as potential penalties. It would have also been necessary to coordinate with the trading department and could have led to trades being cancelled. Finding the faulty modules early prevents this.

Conclusion

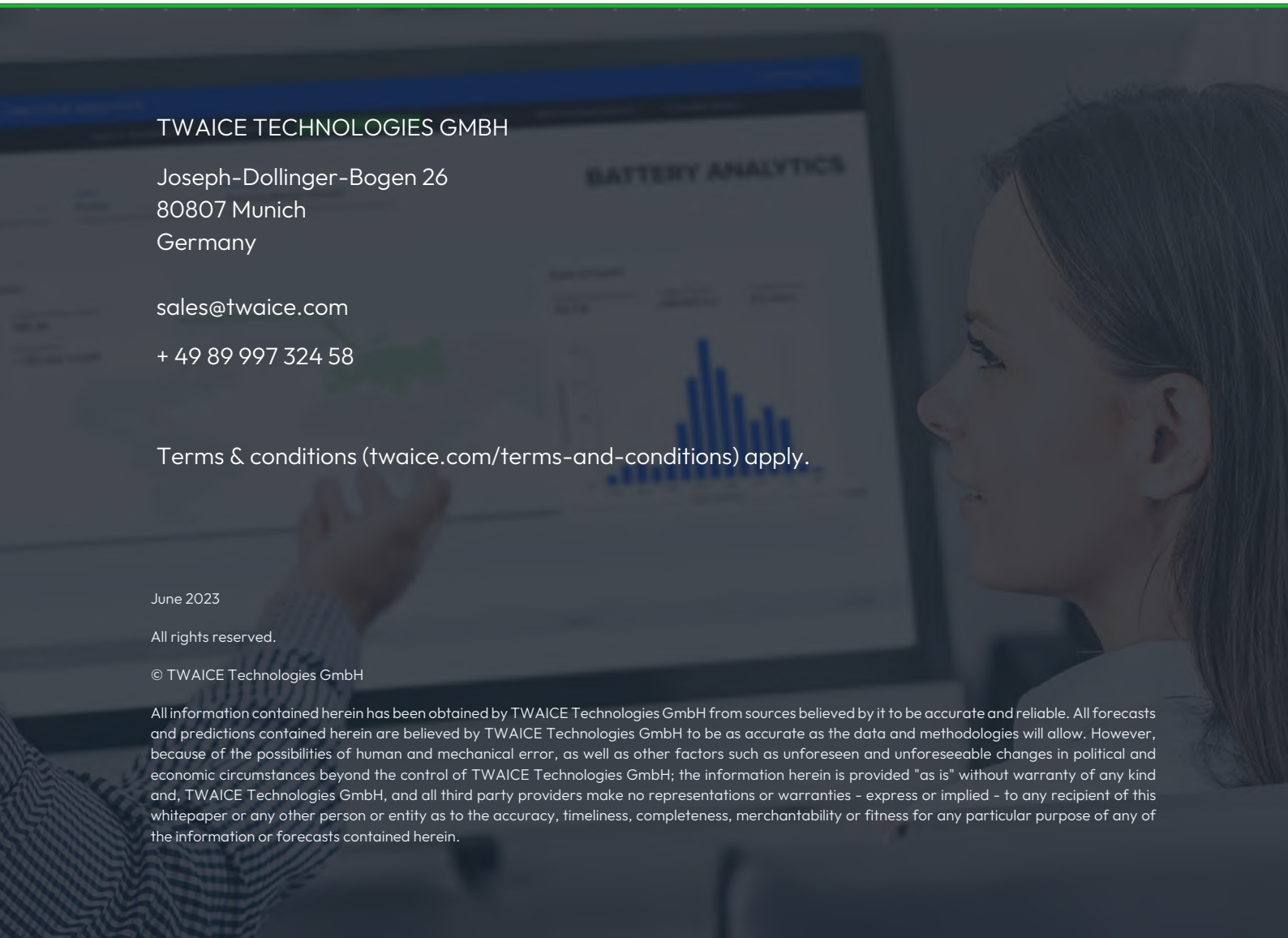
Karl Potz, Head of Center Battery at VERBUND, stated:

"TWAICE's Digital Commissioning helps us to overcome the challenges resulting from an increasing heterogeneous system-integrator landscape and ever larger BESS systems. A must have for baselining performance at BoL and identifying deficiencies before operation starts".

Overall, TWAICE'S Digital Commissioning is providing asset owners with a valuable way to verify BESS performance with minimal effort, helping owners get a standardized and comparable overview of BESS performance at the beginning of life, and identifying possible anomalies. Digital Commissioning helps asset owners scale up their BESS deployment and provides insights that wouldn't be possible with conventional commissioning.

About TWAICE

TWAICE provides predictive analytics software for companies working with batteries to eliminate risks and enable opportunities. Customers using TWAICE outperform their peers by saving time & costs while increasing battery performance & lifetime. Uniquely combining deep battery knowledge and artificial intelligence on a scalable analytics platform, TWAICE generates actionable insights at every step of the battery lifecycle. In addition to enabling TWAICE products, the analytics platform is a launchpad for customer and partner solutions, leveraging an entire ecosystem of market leaders. TWAICE is committed to increasing the lifetime, efficiency, safety, and sustainability of the products that power the economy of tomorrow.



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