

SE-24.2 Multi-purpose Use Cases for Distributed Grid-size Battery Storage Systems – Experiences with SchwarmSpeicher Allgäu (A)

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Energy transition remains to be a challenge for the electricity sector in Germany. Especially distribution grids face significant challenges. On the one hand, those grids have to cope with peak generation from renewable sources while there are limited loads. On the other hand, peak demand from industrial customers has to be met even at times with limited renewable generation. With the further increasing share of renewable generation the need for more flexibility in the energy system becomes obvious. Battery storage systems can provide flexibility to distribution grids. In particular they are used to balance out generation and load by adding peak shaving and load shedding capacity to the grid. However, despite predicted price drops, battery technology remains to be rather expensive, hence making lots of business cases unfeasible.

A possible solution to overcome the barrier of high investment costs are multi-purpose use cases for battery systems. For grid-size storage systems comprehensive business models have to be crafted to take different use cases into account. “SchwarmSpeicher Allgäu”, a distributed grid-size battery storage, is such a project. egrid realized “SchwarmSpeicher Allgäu” for the Allgäuer Überlandwerk, a power utility in the southwest of Bavaria. egrid developed the comprehensive business model and delivered this project as a turnkey provider.

What is meant by distributed grid-size battery storage? The storage system contains of five Lithium-ion batteries with a power of 500 kW and a capacity of 340 kWh each. Those five batteries are distributed within a radius of 25 km across the distribution grid. Following the concept of a virtual power plant, one central controller operates all five batteries as one plant. The combined system has a power of 2.5 MW and a capacity of 1.7 MWh.

Three main reasons put forward the decision to establish a centrally managed, grid-size battery storage across five locations:

- (1) Systems in size of 340 kWh can be integrated in existing properties of the local distribution grid operator. It is even possible to use existing substations. This approach reduces the required infrastructure investments.
- (2) Furthermore, grid extensions can be avoided. It was possible to integrate the battery systems without any grid enhancements in all five locations. In contrast, the integration of a single storage system with a power of 2.5 MW in one location would not be possible without grid enhancements.
- (3) Having five different locations leads to risk distribution, too. In case of a grid outage in one location the other four locations can still be operated to support the remaining grid.

The swarm controller enables multi-purpose applications. The main purpose of the storage system is to stabilize the regional distribution grid with primary control power. The storage system successfully passed the necessary qualification procedure. The second application is to shave single peaks to reduce the load on the grid. Especially during the annual peak load the battery storage system supports the grid. Both applications contribute with a significant revenue stream to the business model. Furthermore, the system complements emergency power supply systems in existing conventional power plants. In three out of five locations planned investments in single purpose uninterrupted power supply batteries could be avoided thanks to the “SchwarmSpeicher Allgäu”.