

Popular Scientific Summary

The surge in electric vehicle (EV) popularity is reshaping the automotive landscape, steering us towards a greener energy future. However, this transformation is not without its hurdles. A significant challenge lies in developing efficient EV charging infrastructure. Faced with limited grid capacity and extended lead times for grid connections, the rapid expansion of this infrastructure demands innovative solutions. This is where small-scale battery energy storage systems (BESS) enter the picture, offering a promising avenue to streamline the EV charging infrastructure setup, mitigate the impact of EV charging on the power grid and support the move from fossil fuels to renewable energy.

The master's thesis report, *Commercial Potential of Battery Energy Storage Systems to Charge the Electric Vehicle Market*, by Lea Öberg, delves into the European fast public EV charging industry, particularly focusing on the demand for BESS solutions. The study analyzes what different stakeholders need and demand from BESS solutions in the e-mobility sector, and explores potential technologies that can meet these demands. Moreover, it examines the market outlook for a Nordic BESS integrator, such as Northvolt, to be competitive in this arena.

The study shows that the EV charging market is intrinsically linked with the broader automotive and energy sectors. The global shift from fossil fuels to renewable energy parallels the automotive industry's move from conventional internal combustion engines to battery-powered EVs. This transition is challenging the power grid to adapt to increasing fluctuations in electricity generation and consumption, particularly with the rise of intermittent renewable energy sources and high-power EV charging demands. In this context, the market for BESS in the EV charging industry is expected to see substantial growth, playing a crucial role in enabling the electrification of the automotive industry within a broader green energy transition.

The study finds the BESS market in the EV charging sector attractive, particularly for established small-scale BESS integrators looking to expand into new markets. This market is expected to grow significantly in the coming decade, driven by the need for extensive EV charging infrastructure development coupled with grid capacity limitations. BESS integrators can enter this market either by 1) expanding their current product market, 2) developing a new versatile BESS solution with a broader market reach or 3) creating a specialized BESS solution for e-mobility.

Competitors in the BESS market for e-mobility offer a variety of solutions, with two primary functional architectures: 1) integrated system solutions and 2) separate setups with a distinct power control system module. These solutions primarily differ in material costs, scalability and system integration. Opportunities for differentiation in the BESS market are multiple, with integrators poised to leverage technological innovation, tailored solutions, and superior quality.

In the dynamic market of fast EV charging, the key players – charge point operators – seek BESS solutions that are seamlessly integrated into their setups, offering both flexibility and adaptability. The recommended BESS includes a separate power conversion system and scalable energy capacity, beginning from 300-500 kWh and a 0.5 C-rate. This approach mirrors the changing market demands, where today's preference for smaller, mobile systems for cost efficiency, may soon give way to larger, more stationary systems as the market blooms and usage increases. In essence, a versatile BESS solution, capable of adapting to the constantly evolving EV charging needs is the golden ticket.

To stay competitive, BESS integrators must focus on differentiation, emphasizing unique selling propositions like technological superiority, modularity, and advanced control capabilities. However, they must also navigate challenges such as the rapid pace of technological change, market uncertainty, supply chain complexities, and the need for effective distribution and sales channels. Adaptability is crucial in this ever-changing environment, with a strong emphasis on technological innovation being a vital component for staying ahead.

The development of the BESS market is closely aligned with European climate goals, aiming to limit the global average temperature increase to 1.5°C. The expansion of EV charging infrastructure, supported by battery energy storage, plays a vital role in this endeavor, enabling the widespread adoption of EVs and facilitating the shift to renewable energy sources. As we move towards a greener future, the synergy between EVs and small-scale BESS stands as a cornerstone of this transition, promising to address the challenges of today and power the innovations of tomorrow.