

## M. Sc. Thesis: Coupling a Battery Energy Storage with a Parking Area of Electric Vehicles

A description of a project for a Master's Thesis at the Institute of Energy Systems, Energy Efficiency and Energy Economics (ie<sup>3</sup>), TU Dortmund University.

### Background and Motivation of the Thesis

Locating a battery energy storage next to a parking (and charging) area of electric vehicles (EV) may have advantages. To be an economically sound alternative, the battery should serve as many purposes as possible.

Firstly, the battery could serve as a “power buffer”. It means that the battery can charge itself by taking its energy from the electricity distribution network (0.4 kV) with low power. Then, it could be used as a fast charger for EVs. The advantage would be to avoid expensive reinforcement of the low voltage network.

Secondly, the battery could serve as a “price buffer”. The operator of the battery (a distribution system operator or the operator of the EV charging stations) could charge the battery during the hours of low-price electricity and distribute it to the EVs when needed.

Thirdly, the battery could give “peak-shaving services” to the distribution transformer, helping to overcome peak hours of power demand during the winter time. The battery can also store excessive energy from photovoltaic power generators located in the same low voltage network.

### Tentative Work Plan

The main objective of the thesis is to develop an economically sound concept of a battery-powered parking and charging area for EVs.

- 1) A review of already available configurations and real-life cases.
- 2) Design of a simple concept of a battery-powered parking and charging area for EVs based on commercially available components including a price estimation.
- 3) Creation and acquisition of the required data for further analysis (charging data of EVs, hourly electricity prices, etc.).
- 4) Definition and analysis of the use-cases. Creation of Key Performance Factors or a practical method that can be used to estimate the techno-economic feasibility of the concept.

**Please note:** The project is vast and has many possibilities. Thus, it requires self-imposed motivation, creativity and the ability to keep the focus on the final objectives.

## The Profile of the Student

The thesis is suitable for a motivated student with background in electrical engineering and interest in new smart grid technologies and electric mobility. Familiarity with economics is appreciated. The student will learn to plan a techno-economic concept and a feasibility analysis based on a very actual topic. When the Thesis is carried out with success, the results are guaranteed to be interesting from the industrial viewpoint. The thesis is encouraged (but not obligatorily) to be written in English.

## Supervision

The work is supervised by Kalle Rauma. Co-supervisors may be included if considered necessary.

## Further information

Please contact Kalle Rauma ([kalle.rauma@tu-dortmund.de](mailto:kalle.rauma@tu-dortmund.de)) for additional information.  
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