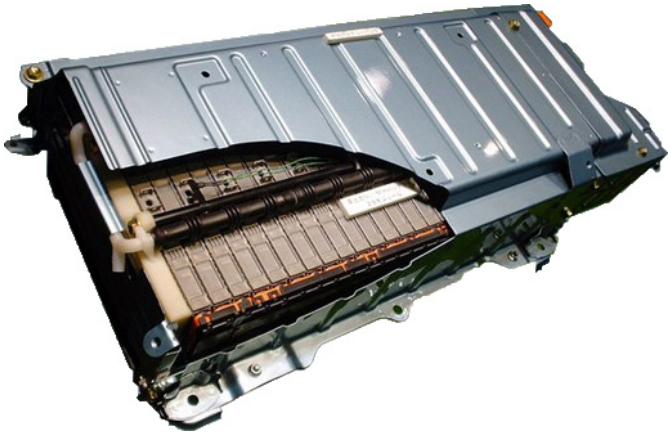
Master Thesis:
Modular Implementation of Stationary Battery Second Use Energy Storage Systems for Various Battery Types



With rising sales figures for electric vehicles (EVs), automotive OEMs increasingly need to evaluate the environmental impact of their vehicles well beyond their actual lifetime. Well over 90% of the materials of a conventional automobile can be recycled. Due to the entirely different drivetrain, OEMs have little experience about best practice recycling procedures for EVs. However, the latter are especially crucial for electric cars, as sustainability is required from cradle to grave in order to achieve the car manufacturers' emission targets and justify their marketing campaigns, which are oftentimes centered on the increased energy efficiency and sustainability of EVs.

It has been shown, that EV batteries still have a remaining capacity of 70-80% at the end of a vehicle's life time cycle. This, together with a lack of experience in large-quantity battery recycling, makes the usage of these batteries in a different application, referred to as battery second use (B2U), an attractive alternative. Yet, there are no corresponding product offerings currently available on the market. At the moment, no standards across all automotive OEMs exist regarding the cell format, battery management system and the employed power electronics. This makes it difficult to offer a universally applicable solution for the repurposing of the vehicle batteries.

Flick&Partner Unternehmensberatung PartG
Ohlmüllerstr. 40
81541 München
info@flickundpartner.de
+49 (0) 89 999 3987-0

In this thesis, possible solutions for a modular implementation of a stationary B2U energy storage system should be evaluated. An emphasis will be placed on the flexible integration of EV batteries from different manufacturers. The following topics should be covered:

- An overview of currently existing cell formats and vehicle battery architectures should be given and linked to the automotive OEMs, which employ the identified technological implementations in their vehicles.
- Preferable battery topologies for stationary energy storage systems should be identified and a suitable method for the repurposing of the used EV batteries should be proposed.
- An overview of battery management systems (BMS), which are currently used in the automotive market, should be given. The respective signaling interfaces need to be studied, in order to develop possible solutions for reusing the BMS in B2U applications.
- In close relation to the previous point, the required control for repurposed batteries, such as over-current protection, pre-charging, and safe discharging should be assessed.

Flick&Partner is an international management and strategy consultancy with activities in the fields of electric mobility, renewable energies, and smart grids. Besides the specific projects for our customers, we focus on independent research in order to always be able to provide up-to-date knowledge.
Therefore, we are continuously looking for highly motivated students who are interested in doing research with us. We offer the chance to work on some of the most relevant topics in relation to cutting-edge technology. A supportive working environment and the chance to gain practical experience are guaranteed. We are looking forward to receiving your application.

Flick&Partner Unternehmensberatung PartG
Ohlmüllerstr. 40
81541 München
info@flickundpartner.de
+49 (0) 89 999 3987-0