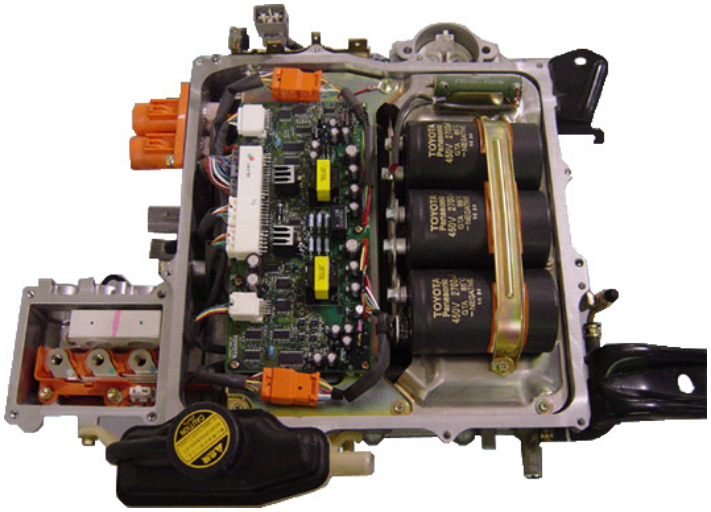
**Master Thesis:**
**Evaluation of Different Inverter Topologies and Implementations in Stationary Battery Second Use Applications**



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. Besides the battery itself, the corresponding power electronic system is a critical component of a B2U system.

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In this thesis, different inverter concepts should be evaluated in regard to their applicability in a grid-tied, stationary B2U application. The research will focus on the technological integration as well as the economical assessment of possible solutions. In detail, the following aspects should be covered:

- To get an overview of current solutions in the market, an initial literature research on available inverter systems should be conducted.
- The benefits and drawbacks of the different systems, especially in regard to cost, integrability, and flexibility in the given application should be stated.
- In regard to maximization of the recycling rate, reusing not only the battery but also the drivetrain inverter of an EV seems to be a promising solution. Therefore, the technological suitability and necessary adjustments to the automotive inverter should be pointed out for this solution (voltage stabilization of the dc-link, output filter, grid synchronization). Moreover, the related cost structure should be evaluated.
- As an alternative solution, the usability of currently available inverter systems, such as solar inverters and bidirectional EV chargers, should be assessed.
- For all options, the current and future costs should be analyzed.

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