

## Master thesis

# Ageing analysis and degradation tracking of a Lithium Ion battery based on real-life operation data

### Topic

Energiespeicher

### Focus

- Theory
- Literature
- Simulation
- Programming
- Construction
- Hardware
- Experiments

### Courses of Study

- Electrical Engineering
- Mechanical Engineering
- Mathematics
- Process Engineering

### Starting Date

As soon as possible

### Please send your application to:

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### Motivation

Electrical energy storage systems in conjunction with renewable energies can make a decisive contribution to the supply of electricity and achieving the energy transition goals. They are used as industrial and commercial storage systems and home storage systems in single-family homes. As the systems are operated, the battery ages and its usable energy capacity decreases. This decrease in energy capacity is caused by a variety of factors such as increased temperature, higher C rates, and others. Especially in real-life situations decrease in energy capacity happens due to all the factors together, but with dynamically varying intensities, thus making it extremely hard to track with traditional methods. Recently, with the assistance of comprehensive statistical analysis, including Incremental Capacity Analysis, in conjunction with sophisticated machine learning techniques applied to the data collected, the degradation could be not only studied in detail but also tracked online.



### Tasks

A 1.5-year-long operational data (system level down to individual cell level) of a 60 kWh Lithium Iron phosphate (LFP) battery will be provided.

- Initial data cleaning and processing will be carried out.
- A literature survey would be done to determine the best statistical and Machine learning methods to be employed on the cleaned data.
- Selected methods will be implemented based on which the major reasons for this drastic reduction in usable energy capacity will be determined.
- Based on the analysis an evaluation criterion for age-optimized operation of LFP must be derived, concluding with documentation of the work.

### Required Documents for Application:

- Motivation Letter
- Curriculum Vitae
- Certificates