Lehrstuhl Steuerung, Regelung und Systemdynamik

Master Thesis

Literature research, Programming and Simulation

Enhancing the efficiency and lifetime of lithium-ion batteries for community-level energy storage

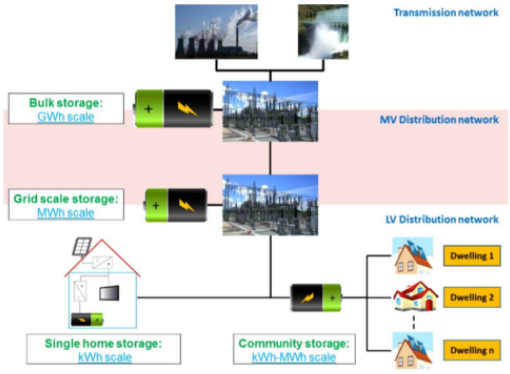
Keywords: Storage system, Li-ion, End of life, CES, Charging and discharging, SOC, DOD, SOH

Conditions:

Duration:	6 months
Requirements:	Strong MATLAB knowledge
Language:	English
Target group:	Master students

Contents:

Community energy storage (CES) systems play an important role in integrating renewable energy resources and stabilizing energy flow. Lithium-ion batteries are a common choice for such applications due to their energy density and flexibility.



[Parra et al., 2017]

One of the important points to improve the working of the storage systems is adressing the efficiency and life-related features of the batteries, which is a crucial step toward optimizing their performance and conserving vital materials. However, conducting physical experiments to attain these improvements can be hard to achieve. For thie reasons, simulations have emerged to be a promised alternative. In this work, the primary objective is to employ simulations to investigate and propose methods for enhancing the efficiency and lifetime of lithium-ion batteries specifically for community-level energy storage systems, by adressing multiple points related to storage system (temperature control, state of charge (SOC) and debth of discharge (DOD) management, state of health, aging modeling, etc.).

The goals/steps of this work are:

- Based on literatur review: Defining the different engineering and physical characteristics related to efficiency and life time for lithium-ion batteries
- Based on literature review: Refining the different usage goals and scales in a community-level application
- Generating methods using machine learning and control approaches to adress the problem
- Simulation and comparison of the methods using MATLAB/Simulink
- Evaluation and validation of the developed methods using real datasets

Complete and detailed documentation/presentation of the research results

Supervisor:	I. Benrabia M.Sc.	Univ.-Prof. Dr.-Ing. D. Söffker
Office:	MB 361	MB 341
Telephone:	(0) 203 / 3 79 - 1734	0203/379-3429
E-Mail	imene.benrabia@uni-due.de	soeffker@uni-due.de