

Bachelor/Master-Thesis:

Effects of Battery Degradation Models for Power Balancing Applications in City Districts

Context:

An important aspect of the task of reducing CO₂ emissions is in the decarbonization of the energy sector. As part of this task, the EU aims to significantly increase the share of renewable energy sources in the power grid. However, the introduction of such fluctuating energy sources and the simultaneous reduction of dispatchable power plants leads to challenges in grid operation. In particular, the flexibility offered so far on the generation side has to be provided in other ways in future energy systems.

Among the sources of flexibility are stationary lithium-ion batteries and electric vehicles that adjust their consumption depending on external factors. Unfortunately, offering such flexibility leads to costs due to losses, wear and tear because of grid beneficial operation. In this work, models considering these downsides should be reviewed. Effects on power scheduling problems with these models should be compared with the Model Predictive Control (MPC) assessment framework `pycity_scheduling`.

Your Tasks:

- Literature review of losses and wear and tear modelling for lithium-ion batteries.
- Evaluation of performance metrics for MPC applications using these models
- Evaluation of differences in the use of flexibility, customer costs and prolonging of device lifetime using these models

Your Profile:

- Student of Electrical Engineering at RWTH Aachen University
- Good knowledge of Python
- Fundamental knowledge of power systems
- Interest in optimization theory
- Good German and English language skills

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