Karlsruher Institut für Technologie

Elektrotechnisches Institut

Master thesis

Operational Optimization of a Hybrid Energy Storage System with Artificial Intelligence

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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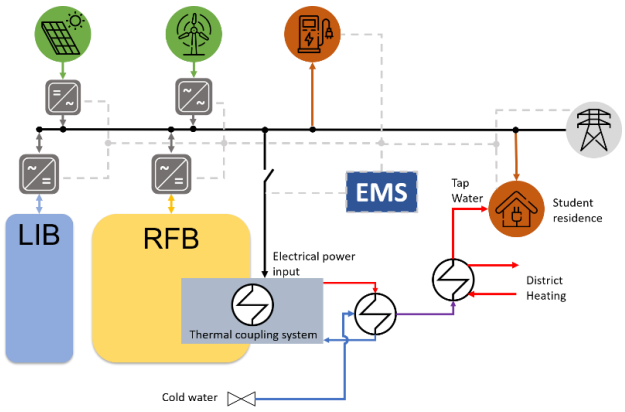
Motivation

As a part of the project, BiFlow an innovative stationary Hybrid Energy Storage System (HESS) is researched at ETI. The HESS includes a 60 kWh Lithium Ion Battery (LIB) and 120 kWh Redox Flow Battery (RFB) installed at Stage76, Bruchsal.



The HESS is used for self-consumption improvement of the building, where it stores surplus PV + Wind as per availability and gives back the energy when required. In order to dispatch the HESS economically based on the current scenario an optimized operation strategy is required. The optimization must be able to reduce operational losses of HESS by intelligently splitting the load between the two system, and also improve the profit of driving the HESS at the same time. Additionally, the optimization must also keep a check on the HESS aging and update the operation strategy accordingly.

Tasks

- Previous student works researched Multi-Integer Linear Programming methods for optimization of the system. This works aims at extending this work with Heuristic algorithms.
- Multiple possible Heuristic algorithms such as Particle Swarm Optimization, Genetic Algorithm, and others would be explored on Model-In-Loop simulation framework.
- Validations of the developed techniques using economic metrics.

Strong programming skills in MATLAB/Simulink is a must and good understanding of economic operation of multi-energy systems is recommended. Reliability, an independent way of working, fast comprehension and good German and/or English skills are appreciated.

Required Documents for Application:

- Motivation Letter
- Curriculum Vitae
- Certificates
- Enrollment of study