Karlsruher Institut für Technologie

Elektrotechnisches Institut

Bachelor thesis

Model-In-Loop development for simulation of energy storage systems with renewable energy

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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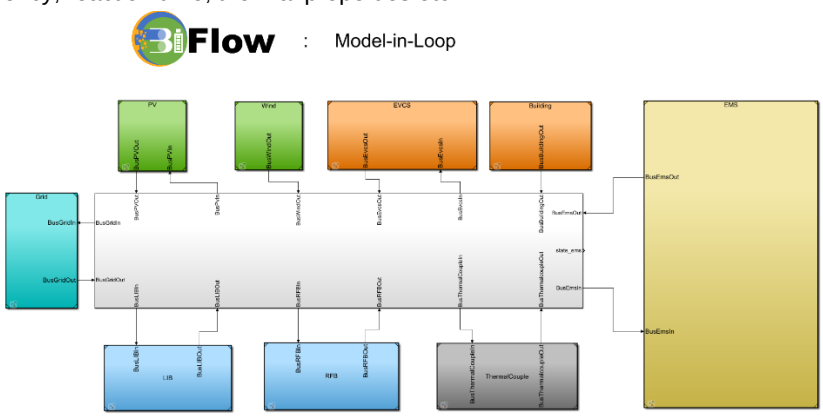
Motivation

At ETI there are various projects coupling renewable energy sources such as Photovoltaic with energy storage systems such as Lithium-Ion battery, Vanadium redox flow battery and others. To be able to test the control algorithms for such system in simulation environment, a Model-in-Loop (MiL) setup is required as defined in the image below. The building blocks of the MiL are the system models or in other words the digital twins of the systems which with-hold various characteristics of the real system such as efficiency, reaction time, thermal properties etc.



These building blocks usually are very similar among various projects with the difference being its parameters. Thus, as an effort to standardize the development among various projects these system models are developed and made available as ETI Simulink libraries which is the core focus of this thesis.

Tasks

- Further development of system blocks such as Lithium-Ion battery, Vanadium-redox-flow battery for the ETI Simullink library.
- Setting up the model-in-loop environment with the developed Simulink library models for one to two projects at ETI.
- Testing and documentation of the setup made.

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

Required Documents for Application:

- Curriculum Vitae
- Transcript of Records