Masterarbeit

Architectural Performance Assessment of Hybrid Battery Energy Storage System

Written on 18. Okt 2019

Motivation

Hybrid battery energy storage systems have been studied using batteries with known reliability. The high cost of emanating new battery technologies led to investigations of using battery combination of different types encompassing new and/or aged batteries to provide an alternative energy storage capability. However, the reliability of the combined battery technologies is still unclear. There is need to get the maximum benefit out of the combined battery types while maintaining power quality, improving storage efficiency and lowering set-up cost.

Objective

Power converters are used to control reliability issues as well as power flow among storage elements. There are different ways of coupling different batteries using power converters. There are series, parallel, multiphase series-parallel architectures amongst others. The use of power converters and microcontrollers can be expensive. Argument has been on which architecture(s) would give the maximum benefits. Objective of this work is to do a performance assessment in power quality, storage efficiency and set-up cost of converter architectures under similar conditions for the above stated topologies. The superiority in the level of heterogeneity in voltage and chemistry will be analysed in terms of scalability, flexibility, and swappable capacity. Other tests for further arguments in the different architectures could also be done.
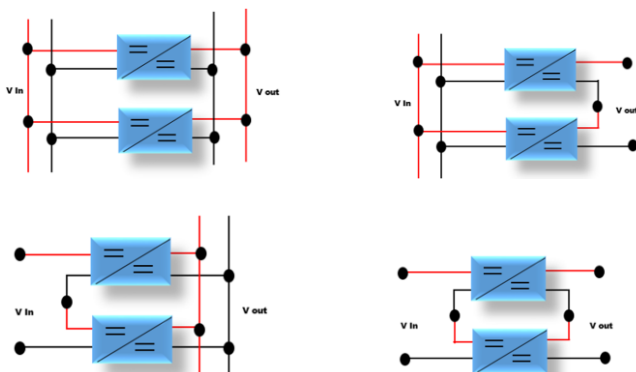
Tasks

- Review of the existing topologies for homogeneous and heterogeneous battery systems.
- Battery tests and parameter gathering from batteries of different types/chemistries
- Converter control modelling
  - cell voltage /current/temperature measurements.
- Implementation of the model in Matlab/Simulink
- Comparative analysis
  - Economic feasibility
  - Technical advantages

Start: now
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Note:

1. Two presentations are required; at the middle and at the end of the time period.

2. The topic could be focused to fit the interest of the student.