SoC-Temperature-Based Power Sharing Algorithm for Battery Racks in Grid Ancillary Services

The state-of-charge (SoC) and operating temperature severely affect the battery pack's lifetime. This thesis aims to improve a real-time SoC-temperature balance power-sharing algorithm for the battery racks to optimize battery life. The control scheme takes into account both SoC disparity and temperature deviation simultaneously to calculate the active power set-points for battery energy storage system (BESS) units. This thesis will build upon the previous work [1] and quantify the weights for temperature and SoC deviation from the mean values.

Recently, there has been a trend towards extracting the battery state of health (SoH) and sharing power proportionally. However, SoH estimation is data-intensive. Furthermore, the previous usage pattern of second-life batteries is not available, making it difficult to utilize them for grid services.

The proposed algorithm shall serve as an alternative to state-of-health (SoH) based power-sharing algorithms. This method can be particularly useful for second-life batteries, which often exhibit significant heterogeneity in age, internal resistance, and capacity, necessitating a generic yet robust control strategy for optimal utilization and minimizing degradation.

Requirements:

1. Background in Electrical Engineering.
2. Knowledge of Simulink/Typhoon HIL.
3. Willingness to learn and team player.

If you are interested in this topic or have any questions regarding the subject matter, please don't hesitate to reach out.

Contact: Prashant Pant

prashant.pant@tum.de

[1] P. Pant, H. Hesse, V. T. Tanjavooru, M. Cornejo, T. Hamacher and V. S. Perić, "SoC-Temperature Based Power Sharing Algorithm for Battery Racks in Grid Ancillary Services," 2023 4th International Conference on High Voltage Engineering and Power Systems (ICHVEPS), Denpasar Bali, Indonesia, 2023, pp. 422-427, doi: 10.1109/ICHVEPS58902.2023.10257507.