Master Thesis - Economic EV charging through optimal battery sizing and ancillary grid services

Motivation

Charging points for electric vehicles (EV) are operated together with stationary battery energy storage systems (BESS) and distributed energy sources (DER), mainly photovoltaic (PV). Within this set-up, BESS can also provide ancillary grid services, which offers the opportunity of further profit pathways for investors. This in turn could incentivise a bigger battery size, which is useful in reducing the average waiting times and achieving peak shaving at the EV chargers. Determining the optimal PV installation size based on a techno-economic analysis is therefore an interesting challenge. In a previous master thesis, Sonnen, one of the world-leading BESS producers, has developed a simulation tool for charging points and stationary BESS. This existing framework should now be extended to include an optimal BESS + PV sizing tool.

Tasks

- An extension of the existing tool to include PV systems and various load profiles (commercial centers, industry parks and public charging infrastructure).
- A literature review of ancillary markets for BESS in the updated EnWG laws for grid services such as, voltage regulation, inertia for local network stability, reactive power support, black start and islanding capability [1] among others.
- Integrating the most lucrative market options into the optimized BESS sizing tool.

Requirements

- Electrical, Mechanical or Informatics background is preferrable.
- Coursework experience on power system planning, operation, energy markets and optimisation is helpful.
- Experience with MATLAB, Simulink and OOPs.
- Ability to work independently.
- Good team-player and a desire to learn.

Contact

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References

[1] H. Hesse, M. Schimpe, D. Kucevic, and A. Jossen, “Lithium-Ion Battery Storage for the Grid—A Review of Stationary Battery Storage System Design Tailored for Applications in Modern Power Grids,” Energies, vol. 10, no. 12, p. 2107, Dec. 2017, doi: 10.3390/en10122107.