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Masterarbeit

Economic assessment of utility-scale energy storage for grid applications

As part of the energy transition, intermittent renewable energies, in particular photovoltaic and wind power plants, are being increasingly deployed. This intensifies the challenge of ensuring the necessary balance between power generation and demand at all times. For this purpose, various approaches, such as. network expansion, demand flexibility or storage technologies are considerd viable solutions. In addition to short and medium-term fluctuations, seasonal bottlenecks (e.g. greatly reduced sunshine in winter) and the so-called “Dunkelflaute”, a weather phenomenon characterized by weak wind and lack of sunlight that can last for several days, are putting additional uncertainty on the electricity system.

Seasonal storage can make a decisive contribution to security of supply and pave the way to an electricity sector consisting of 100 percent renewable energy.

This thesis aims to analyze and compare current remuneration mechanisms for the provision of system and network-related services in Europe. Moreover, it should result in an optimization model quantifiying the value-stream and the life-cycle-cost of the energy storage.

Optimization skills in Java or Python are welcome. Basic understanding of programming is required. The thesis is expected to be written English.

Empfohlene Einstiegsliteratur:

- Dunn, B., Kamath, H., & Tarascon, J. M. (2011). Electrical energy storage for the grid: a battery of choices. *Science*, *334*(6058), 928-935.
- Fares, R. L., & Webber, M. E. (2018). What are the tradeoffs between battery energy storage cycle life and calendar life in the energy arbitrage application?. Journal of Energy Storage, 16, 37-45.
- Sidhu, A. S., Pollitt, M. G., & Anaya, K. L. (2018). A social cost benefit analysis of grid-scale electrical energy storage projects: A case study. Applied energy, 212, 881-894.

Betreuer: Haupt, Leon M.Sc.