

MODELING BATTERY ENERGY STORAGE

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Energy storage is an essential component of emerging smart grids, and can be used to incorporate renewables into the grid or for balancing electricity demand across the day. The increased attention for such storage has resulted in a wide range of models for storage technology, each highlighting particular aspects of storage behavior, while ignoring others.

We focus on battery energy storage, and first discuss how battery type and charging pattern (charging rate, fraction of the capacity utilized) affect battery properties like lifetime, capacity and efficiency, and propose various approaches to modeling this interaction. We then consider a setting where the storage is used for energy arbitrage, and study for these different battery models the profit-maximizing policy for battery charging and replacement. We evaluate the performance and demonstrate that battery modeling has a significant effect on the optimal policy.