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Applying deep learning techniques to design and control Battery Energy Storage Systems (BESS) in industrial users

The increasing penetration of renewable energy sources (RES) happens at the expense of technical challenges. Balancing demand and supply to maintain stability on the electricity grid becomes constantly more difficult. To counteract the stochasticity of both PV and wind power yield, energy storage systems, in particular BESS, can play a crucial role. In this PhD, the focus lies on BESS specifically applied for industrial end users. The main objective of the thesis is to develop an energy management system (EMS) for the BESS, integrating simultaneously different services i.e. (i) peak shaving, (ii) increasing RES self-sufficiency, (iii) dynamic energy pricing, (iv) flexibility services. An EMS incorporating such services requires advanced predictive analytics for the electric load, PV/wind yield and electricity price, supported by information–enriched datasets including weather data, production plans and local sensor data. Given the complexity and 'big data' context of those tasks, Deep Learning forms the primary candidate technique for building our forecasting models.