Master Thesis: Optimization of local energy systems (pumpstorage) using AI

1. Project description:

We are experiencing a local energy transition, where the local energy systems are no longer just consumption points but also energy generators (i.e. solar panels) or flexible actors (i.e. batteries or electric cars). In this new environment, there is potential that local energy systems can optimize their consumption and generation in order to manage energy imports & exports based on the energy spot market price. For this purpose, it is required to forecast the local energy generation (i.e. solar irradiance) and consumption (i.e. day of the year / weather) and then to optimize the flexible actors based on the energy price forecast for the minimization of the daily energy costs.

2. Goal of the project:

The goal of the project is to evaluate the potential of AI/Machine Learning for the optimal energy dispatching of a local energy system. The case of an existing pumpstorage power plant will be considered, for which there exist other optimization methods like stochastic dynamic programming and extensive data both on the operation in the past and the inputs to the system (e.g. water inflows). For this project a literature research is required, in order to evaluate & benchmark different AI optimization algorithms that fit the goal of the master thesis. An optimization model should then be developed & tested that yields both the optimal dispatch of the consumption (pumping of water) and production (turbining of water). As a conclusion, the results will be compared with the existing optimization methods.

3. Timeline & Content of the Thesis:

a) Define Thesis plan (what should be done, when & how)
b) Literature Research
c) Benchmark of different optimization algorithms
d) Develop an optimization model for the pumpstorage power plant
e) Evaluate and compare the quality of the method for a previous year of operation with existing optimization methods.
f) Conclusions & presentation

4. Contact BKW

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