Bachelor- / Semester- / Masterarbeit

(Theoretical)

Consideration of uncertainties in a district energy system with stochastic optimization

Description:

Energy system optimization models are a widely used tool to provide useful information on the pathway to achieve carbon reduction targets. Based on the given assumptions as well as the defined boundary conditions of the model, the most cost-effective pathway to reach climate goals is determined. Accordingly, these models are often used to support regional energy planning. Due to the high uncertainties in the development of certain input values such as energy carrier and investment costs, the investment decisions in models do not consider the reality of uncertainty. In the real world, decision-makers do not have accurate information about the development of future prices and costs. Especially because of the increasing coupling of the electricity, heating, cooling, and mobility sectors and the volatility of renewable energy supply, conventional energy system planning methods used in practice are reaching their limits. Stochastic programming is a popular method that is used to model systems that contain a high level of uncertainty. In previous work, an energy system model and a stochastic optimization approach were implemented. The aim of this work is to consider all influencing parameters with their probabilities using the stochastic optimization of the energy system.

Prerequisites:

- Interest in energy systems optimization,

- High motivation and independent, structured way of working.

- Experience in programming with Python (PyPSA) and knowledge of optimization is a plus.

Arbeitspakete:

- Literature research on stochastic optimization and probability distribution for influencing factors of the energy system

- Mapping of various influencing factors via stochastic optimization

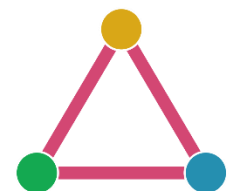- Analyzing and comparing the results with a deterministic optimization

Fig. 1 Python-Package: PyPSA Python for Power System Analysis

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