

Topic Description

Master's Thesis

Automatized Optimization of Urban Energy Systems

Background

In order to become Germany climate-neutral by 2045, not only the power, transport and heating sector individually but also urban areas as a whole require low emissions solutions. As urbanization continues to accelerate, cities are grappling with the need to meet the rising energy demands of their growing populations while minimizing their environmental footprint. This is where the concept of automated optimization steps in, offering a promising solution to enhance the efficiency, sustainability, and resilience of urban energy systems. This new energy modelling approach can contribute to the transformation of the German energy system to become climate-neutral by 2045.

What are the goals of the work?

The goal is to automatize the energy modelling approach on a city level and point out customized paths for each urban area to become climate neutral. That implies that local circumstances and potentials such as renewable energy sources as photovoltaic, wind and geothermal as well as local demands need to be considered. As a result, the optimization shows for each urban area a cost-minimal path to reduce climate emissions. The described approach consists of the following steps:

- 1) Collect and preprocess data from various sources, different types and already existing tools (pyGRETA, UHP, dhmin) into a common database (Data build tool "dbt Labs", Ontologies)
- 2) Create and setup PostgreSQL database on linux server
- 3) Define and implement an interface from the database to the energy optimization framework urbs
- 4) Visualize the output of the optimization framework
- 5) Create report and summary about the optimal energy system for each urban area

What should you bring with you?

- Interest in energy systems, climate-neutral technologies as well as in standardization and automation
- Knowledge about database systems, graphical user interfaces and python
- Please attach your CV and grade report to your application

Contact

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