Development of representative time series for the optimization of multi energy carrier systems in cities

Master Thesis

In the German energy transition, the energy supply of our cities is pushed more and more into the spotlight. Sector coupling gains importance to reduce the emissions in the heat and mobility sectors, but the required infrastructures for electricity, gas, and heat are widely planned and expanded separately so far. In the future, the supply technologies and grids need to be optimized in an integrated and cross-sectoral fashion.

The optimization of municipal energy supply systems incorporates a multitude of quarter-hourly time series, e.g. for the electric and thermal energy demand. Due to the problem complexity, the operation of the system cannot be computed for all time steps.

The objective of your master thesis is to develop a method for the generation of representative time series. This method shall compress a set of dependent time series to less time steps without affecting the result of the optimization too much.

Key tasks and objectives of your thesis:

- Analysis and understanding of methods for time series clustering
- Development of the method and implementation into MATLAB®
- Validation of the method and interesting studies

Your profile:

- Interest in the energy transition and in the future energy supply of our cities
- Ambition to dive into a new field as well as a structured way of working
- Experience in using MATLAB® beneficial, but not mandatory

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Focus topics

- Municipal energy systems
- Time series clustering
- Optimization models
- Matlab programming