

Master thesis

Research area: Network simulation, modelling of integrated energy system

Development and Implementation of a Model for the joint Analysis of the Electricity and Heating Sector

The increasing use of combined heat and power plants (CHP), heat pumps (HP) and electrode boilers has resulted in an enhanced linkage between the electricity and heating sector. These interface-technologies can foster the integration of renewable energy sources (RES) into the energy supply system by transferring surpluses from the electricity sector to the heating sector via HPs and electrode boilers or, in the case of CHPs, by adapting the electrical and thermal power feed-in to the situation in the grid.

However, (expansion) planning and operation of electricity and heat networks is often still carried out separately. A joint, integrated examination of both systems can identify and evaluate cross-sectoral potentials.

The aim of this thesis is to develop and implement a model for the integrated analysis of the electricity and heating sector. For this purpose, suitable computational methods of electricity and heat network simulation need to be identified and selected for further examination. Subsequently, the modelling of electricity and heat network components as well as the implementation of the describing network state equations will follow. In principle, different solutions for joint modelling are conceivable and of high scientific interest.

The functionality of the model is to be proven by subsequent examinations of an integrated energy system. Afterwards, questions regarding the planning and operation of the respective networks can be addressed. The scope and specifications of the thesis are to be coordinated with the supervisors.

The following structure of the work is proposed:

- Literature research on the main topic
- Identification and selection of potential methods for joint modelling of the electricity and heat sectors
- Implementation of the model in Matlab
- Exemplary application of the framework/model to answer planning-relevant or operational questions

Following this thesis, a short presentation will be given on the results of the work.

This thesis is to be awarded to students of electrical/information technology and industrial engineering as master's thesis with immediate effect.

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