

Bachelor / Master Thesis

Analysis of the Influence of Heat Pumps in Future Smart Grids

Sector coupling and the associated electrification of the mobility and heating sectors pose major challenges for current distribution grid operations. The increasing number of new volatile loads is increasing their utilization and thus also the need to expand the grid. Heat pumps in particular are currently the focus of grid planning issues for grid operators. To estimate the consequences of sector coupling, the load profiles of these technologies must be suitably modelled.

In research, measurement time series are often used to map the load profiles of heat pumps. While such time series are based on real data and therefore allow a good representation of the specific heat pump behaviour, their range of application is limited. For example, the load profile of a heat pump is heavily dependent on the type of heat pump, its output scaling, the building parameters, the local weather conditions and the year under consideration. Using a model to generate synthetic time series, on the other hand, allows specific conditions and use cases to be modelled, which makes it more versatile.

The aim of this thesis is to develop a model in Python for modelling inverter-based heat pumps to determine the electrical load behaviour. The load profiles resulting from the model will then be used to analyse the effects of electrification of the heating sector on grid operation in smart grids.

Aim of this Thesis:

The basis of this work is a detailed search of existing models and publications. Based on this, either an existing model is to be further developed or a new implementation in Python is to take place. The resulting time series will then be checked for plausibility and analysed in an example network.

Your Profile:

- Degree in engineering or industrial engineering (electrical engineering, mechanical engineering, energy technology) or computer science
- You are interested in current research topics relating to the energy supply of the future
- Basic knowledge and initial experience with programming tasks in Python
- You are interested in modelling technical contexts.

We Provide

- Intensive and reliable support during your thesis
- Flexible time management and your own air-conditioned workplace with good IT equipment
- A great atmosphere with lots of activities for students and assistants
- Lots of industry contacts and help with finding internships
- The possibility of a subsequent doctorate or employment if you perform very well

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Focus

- Programming in Python
- Modelling
- Power flow calculation