Generation of synthetic load profiles for the aggregated electricity demand of e-mobility

Master/Bachelor thesis

Begin          Duration
immediately / by arrangement        6 months

Keywords: E-Mobility, Charging Infrastructure, Charging Time Series, Load Profiles, Electricity Demand, Security of Electricity Supply, Energy System Models

Topic

The decarbonisation of the transport sector is a key element for achieving the ambitious goal set by the Federal Republic of Germany of becoming greenhouse gas neutral by 2045. The electrification of mobility, which is still largely based on fossil fuels, represents a major strategy for the realisation of this objective. In this context, the market ramp-up of electric vehicles and the nationwide expansion of the charging infrastructure must be shaped together. The additional electricity demand from electric mobility places new requirements on the security of electricity supply in Germany. In order to assess these requirements in the long term and to estimate the impact on the security of electricity supply, it is necessary to model the electricity demand of electric mobility using synthetic load profiles. The objective for this thesis is to elaborate modeling approaches to generate synthetic load profiles for the electricity demand of the electric mobility sector in Germany.

Based on existing preliminary work and an initial literature review, the scope of this thesis will include the following research aspects:

≡ Familiarisation with existing approaches to forecast both, future energy consumption as well as the role of electric mobility
≡ Compilation of possible modeling approaches to predict the aggregated electricity demand from e-mobility (bottom-up modeling, top-down modeling, stochastic approach, machine learning, etc.)
≡ Identification of appropriate criteria for the comparison of the methods considered and selection of the most suitable approaches for answering the research question
Acquisition of the input data required for the respective models to model the electricity demand (e.g. charging infrastructure, charging profiles of individual user groups, vehicle classes, location/type of charging stations, etc.)

Implementation of the models for the generation of synthetic load profiles (conversion of the selected approaches into concrete models)

Generation of synthetic load profiles by applying the models and projecting electricity demand based on an example case (e.g. a fleet of electric vehicles)

Derivation of load profiles on an aggregated level in hourly resolution over the course of a year and taking into account the regional distribution (optional)

Qualifications
You are studying business administration and engineering, electrical engineering, mechanical engineering, business administration or a similar course of study with an interest in energy-related topics and e-mobility. You are looking for an interdisciplinary challenge, you consider yourself a quick learner and dispose of very good analytical skills. In addition, you are characterized by an independent as well as structured style of work and have a good command of German and English, both written and spoken. First experiences in the areas of quantitative modeling (e.g. Python) as well as e-mobility are advantageous, but not necessary.

Our offer
Our offer is to join a versatile, highly motivated working group with international character within one of the largest research institutions in Europe as well as extensive and flexible supervision. You will have the chance to actively participate in shaping the energy system of the future and the opportunity to expand your programming skills as well as your knowledge in modeling load time series in e-mobility.

Contact Information

Tender date
23.08.2021

Application documents
CV, certificates, transcript of records

Chair for Energy System Economics (FCN-ESE)
Institute for Future Energy Consumer Needs and Behavior
E.ON Energy Research Center

Contacts
📞 +49 151 46 379604                              📞 +49 170 26 04688
✉️ elias.ridha@eonerc.rwth-aachen.de                ✉️ marius.tillmanns@eonerc.rwth-aachen.de

We are looking forward to your application 😊