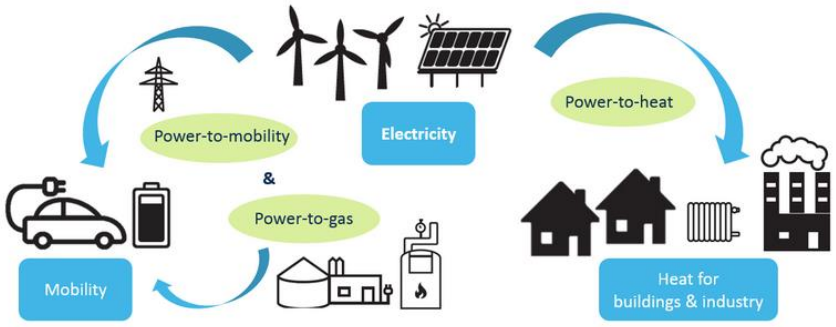
Chair of Renewable and Sustainable Energy Systems
Department of Electrical and Computer Engineering
Technical University of Munich

Master's Thesis (de/en)

Optimization of final energy demand in Europe

Background

There are strong tendencies for decarbonization of the energy sector. However, currently especially in heat and transport sector the energy demand is mostly met by fossil fuels and in a very small share by renewable resources. Sector coupling between heat, electricity and transport sector will be inevitable to achieve the high goals of green gas emissions reduction. Furthermore, energy demand forecasting plays a crucial role in power system planning because it directly sets the requirements the power supply has to meet. Technologies we use to meet this demand have to be optimally chose to meet the policy goals and keep the costs of our energy system as low as possible.



Source: https://www.cleanenergywire.org/factsheets/sector-coupling-shaping-integrated-renewable-power-system

Goals

There are three models which have to be coupled: 1. *endemo* model which forecasts useful energy demand in sectors industry, households, commercial, trade and services (CTS), and transport, differentiating between the electricity, heat, hydrogen and mobility demand; 2. Transport model in linear optimization program *urbs* which optimizes transport fleet to meet the mobility demand; 3. Heat model in *urbs* which optimizes technologies which have to be expanded and operated to meet the heat demand.
Basic understanding of the models is to be obtained. Heat model is to be evolved for further heat producing technologies and European countries. The coupling of the models implies using the output of the *endemo* model as an input for the two other models. Thus from forecasted useful energy demand the final energy demand under optimal costs will be calculated. Subsequently the results are to be transferred to an existing European energy system model also in *urbs*, containing supply side of the energy system.

Requirements

- Interest in energy system modelling
- Knowledge of at least one of: Python, MATLAB, some other programming language
- Knowledge about heating systems is a plus

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