



Master Thesis

Gas Transmission Network Modelling - Sector-coupling in Highly Renewable Energy Systems

Fulfilling the Paris climate accords means reaching net-zero carbon dioxide emissions by mid-century. To find the most cost-effective pathways to achieve these targets, researchers build optimisation models of the energy system. Future energy networks will become increasingly tightly coupled: gas will be generated from renewable electricity and fed into the gas network for heating, power production, and transport fuels. Such sector-coupling is desirable because flexibility can be shared across sectors. Under-utilised existing gas network assets may – due to a reduced use of fossil natural gas – provide storage capacity for renewable gas, serve as alternative means of transporting renewable energy, and facilitate energy imports from outside Europe. In this project, you will investigate the future role of gas networks in a European-scale decarbonised energy system.

Objectives:

- Survey the literature on gas network modelling and governing equations.
- Investigate storage potentials, constraints on gas composition, and more.
- Retrieve grid data on transmission routes and capacities from official sources.
- Build and integrate the European gas transmission network model into an open-source model of the European energy system (PyPSA-Eur).

Personal Qualifications:

We are looking for motivated students interested in energy systems, data processing and numerical optimisation. Basic knowledge in these topics is desirable, as well as experience with object-oriented programming.

Energy System Modelling Group:

We are a young, international and friendly research group that is committed to preventing catastrophic global warming. We look forward to working with you!

Literature:

doi.org/10.1016/j.apenergy.2013.08.071

doi.org/10.1007/s11067-011-9160-0

<https://www.gas.scigrid.de/>

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