Energy Transition in Germany:
External Perspectives and EU-Integration

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Germany lies in the centre of Europe and its energy and especially power supply has physical as well as financial and legal interdependencies with the surrounding states: market liberalisation meets limited interconnector capacities; market power can be used for raised supply bids at stock markets and can be a mover for firm expansion plans. This project has three sub-projects which aim at investigating the German-European interdependencies.

Objectives
- Analysing medium to long term power and money flows to and from Germany with a high temporal and spatial resolution energy system model (DLR-S).
- Applying methods of functional data analysis to Actual Supply & Demand Curves from European power exchanges (ZEW).
- Analysing the effect of European market integration on Merger & Acquisition activities of firms (ZEW).

This poster focuses on the power and money flows to and from Germany in different scenarios of the European energy system development.

Method
1) Scenario definition (installed power generation capacities)
2) Develop a method to derive cross-border money flows from REMix model results (see box on the right hand side)
3) Linear optimisation model application:
   1) power plant dispatch \rightarrow marginal costs \rightarrow money flows
   2) Storage dispatch (and dimensioning)
   3) Transmission (dimensioning and dispatch) \rightarrow power flows
4) Sensitivity to parameter variations related to socio-technical scenarios

Exemplary results
Two descriptors from the socio-technical scenarios developed as a cross-cutting cooperation within ENERGY-TRANS that have major influence on the power and money flows in and over the borders of Germany are a) Development of the power grid (in Germany) and b) International integration of power grids. The figures below show two REMix results in which these influencing factors have been varied. Annual power flow balances for Germany are shown for two scenarios of the European power supply with high renewable energy shares.

Outlook
- Further sensitivities of conventional power plant models
- Selection and parameterisation of a conventional power plant model
- Definition of scenario variations related to socio-technical scenario descriptors
- Analysis of power and money flows in selected scenario variations


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