

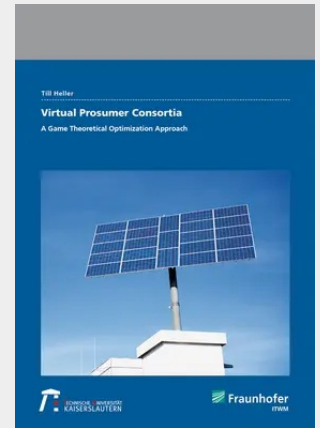
Virtual Prosumer Consortia - A Game Theoretical Optimization Approach

The current energy system is undergoing major changes. Due to flexibilization and decentralization, approaches that allow the integration of small prosuming units are more and more important. The goal of this thesis is to model an auction platform and to study the mathematical problems that arise.

First, the Winner Determination Problem (WDP) is modeled as a two-stage robust flow problem. In addition to complexity results, we compute exact solutions and discuss the efficiency of our methods. An alternative model for the WDP is based on a combination of the Set Cover and the Hitting Set Problem. We consider different problem variants and investigate both a generalization as a graph-theoretical problem and an application as a cooperative game.

Next, we discuss a flow problem in a time-expanded graph with additional constraints in order to model an almost even distribution over time. We develop polynomial algorithms using parametric search techniques.

Last, we study the connection between the Vickrey payments and the Egalitarian Allocation. We then give a characterization of the latter for a class of flow games, which allows a computation in polynomial time.



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