

EEI-KOLLOQUIUM

The Power Trading Agent Competition

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Cauerstraße 9, Raum 4.14

Diskussionsleitung: Prof. Dr.-Ing. R. Weigel

Power TAC is a competitive simulation that models a “liberalized” retail electrical energy market, where competing business entities or “brokers” offer energy services to customers through tariff contracts, and must then serve those customers by trading in a wholesale market. Brokers are challenged to maximize their profits by buying and selling energy in the wholesale and retail markets, subject to fixed costs and constraints. Costs include fees for publication and withdrawal of tariffs, and distribution fees for transporting energy to their contracted customers. Costs are also incurred whenever there is an imbalance between a broker’s total contracted energy supply and demand within a given timeslot.

The simulation environment models a wholesale market, a regulated distribution utility, and a population of energy customers, situated in a real location on Earth during a specific period for which weather data is available. The wholesale market is a relatively simple call market, similar to many existing wholesale electric power markets, such as Nord Pool in Scandinavia or FERC markets in North America, but unlike the FERC markets we are modelling a single region, and therefore we do not model location-marginal pricing. Customer models include households and a variety of commercial and industrial entities, many of which have production capacity (such as solar panels or wind turbines) as well as electric vehicles. All have “real-time” metering to support allocation of their hourly supply and demand to their subscribed brokers, and all are approximate utility maximizers with respect to tariff selection, although the factors making up their utility functions may include aversion to change and complexity that can retard uptake of marginally better tariff offers. The distribution utility models the regulated natural monopoly that owns the regional distribution network, and is responsible for maintenance of its infrastructure and for real-time balancing of supply and demand. The balancing process is a market-based mechanism that uses economic incentives to encourage brokers to achieve balance within their portfolios of tariff subscribers and wholesale market positions, in the face of stochastic customer behaviors and weather-dependent renewable energy sources. The broker with the highest bank balance at the end of the simulation wins.