Bayesian Persuasion in Capacity Markets

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Abstract. In electricity markets, the public authority can design capacity markets (CMs) to bring market outcomes in line with social optimality. By pricing capacity as a separate good from electricity, CMs stabilize and complement the revenues of plants so to generate sufficient security of supply (i.e., having enough capacity available to avoid rationing) at potentially lower cost for end consumers. In decentralized forward capacity markets, consumers and/or retailers are required to secure capacity and information about likely capacity requirements is a crucial issue. The –welfare optimizing– public authority thus decides whether to make this information binding (ex ante requirements as in the PJM capacity market design of 1999) or to base capacity demand on realized market outcomes (ex post requirements as in the current French CM design). Adapting a Cournot oligopoly model from Roy et al. [2019], we analyze a capacity market where homogeneous buyers aim to comply with their capacity obligation under uncertainty regarding future realized demand. We thus consider a Cournot oligopsony in which the capacity buyers (mainly load-serving entities) are profit-maximizing agents engaging in strategic behavior. Heterogeneous capacity owners bid their valuation of capacity. As information disclosure reduces uncertainty on the one hand, but may also decrease precautionary capacity buying by load-serving entities on the other, we seek the preferred level of information precision, i.e., ex ante or ex post disclosure of capacity requirements. Counter-intuitively, the welfare-maximizing level can be lower than full precision of information. The model also highlights possible disagreements between capacity buyers and capacity owners in terms of preferred design, considering that dissemination of public information might affect their sur- pluses in different ways. In addition, when public consultations are organized, capacity owners are able to individually express their preferences. This may lead to divergence between the result of majority voting and aggregated profit maximization as not all agents are uniformly affected by different modes of disclosure. The particular case where the public authority chooses majority-voting as a decision rule is investigated in detail. Using German data from 2010, model parameters are set to mimic several plausible capacity market designs. Results suggest that ex ante requirements are empirically likely to be favored in the particular setting analyzed.