Different Cost Perspectives for Renewable Energy Support: Assessment of Technology-neutral and Discriminatory Auctions

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Motivation

Auctions are the prevalent instrument for promoting renewable energy sources worldwide. Auctions enable the controlled deployment of renewable energy sources while reducing costs. However, there are different views on efficiency, relevant costs, auction targets, and their implications on the auction design.

Technology-neutral auctions are open to all RE technologies and do not discriminate (positively or negatively) among participants, whereas discriminatory auctions treat different classes of participants differently. Non-discriminatory technology-neutral auctions theoretically result in an outcome that minimizes the generation costs of RE sources. This, however, may conflict with other targets, particularly with the internalization of integration costs and the minimization of the support costs through a reduction of the producer rent.

We show that technology-neutral auctions are not a panacea. We analyze two types of discriminatory design elements that improve the expected auction outcome with respect to specific auction targets. By applying theoretical concepts to auctions for renewable energy support, we highlight how discriminatory auctions can prevent windfall profits and how to include an overall economic perspective in the auction design. We illustrate our results with real-world examples.

Short account of the research performed

We combine theoretic methods with practical examples and experiences from past auctions. We theoretically analyze different forms of discrimination and several discriminatory instruments to evaluate auction design options against the underlying economic principles for the future promotion of RE sources. That is, game-theoretic principles of auction theory and their application to renewable energy support are combined in an in-depth analysis.

In our analysis, we also take the trade-offs between different cost perspectives into account. The implementation of discriminatory elements in auctions allows pursuing targets of the internalization of integration costs and the minimization of the support costs. We consider two forms of discrimination, which both can reduce the total costs for the consumers, however, also may generate inefficiencies with respect to the minimization of generation costs.

We address the conflicting views on relevant costs and discriminatory auction design elements by providing a consistent definition of costs related to RE deployment. Here, the separation of the cost components is imperative for our analysis. Further, we present the variety of policy objectives for the RE support and relate these to the cost definitions. Based on these definitions, we analyze how the two approaches of discrimination, quality-based and cost-based discrimination, perform with respect to the policy objectives. We show that both approaches are suitable for the auctioneer to reduce consumers' overall costs, which is an argument for policy makers to take discriminatory design options into account.

Conclusions and policy implications

The reduction of greenhouse gas emission through the expansion of RE sources is undisputed, and auctions are becoming the prevalent mechanism for determining the support of RE sources. The current

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trend indicates more open auctions in which bidders from different technologies and/or from different countries participate.

Although non-discriminatory technology-neutral auctions minimize the generation costs theoretically, we illustrate the trade-offs associated with discriminatory auctions. Depending on the targets and available information, discriminatory auctions may be a reasonable choice because, for example, they can reduce the auctioneer's expenses for supporting RE sources.

The first type of discrimination differentiates between the bidders based on the different characteristics of their projects. This approach considers the implications on the overall system costs. The applicability depends on the available information. For a full implementation, the integration costs of every RE project are required. Nevertheless, even with less information, it can be implemented successfully and even be combined with other forms of discrimination. It has been proven in practice that it is difficult to retrieve the desired information, yet that discrimination mainly results in favorable outcomes.

The second type of discrimination involves reducing the producer rent by differentiating between the bidders based on their different cost structures. Discriminating against low-cost bidders in favor of high-cost bidders reduces the support level through absorbing the different profits of the different bidders and, thus, reduces the producer rent, resulting in a lower support level. It requires less information and allows for three theoretically equivalent implementations, which, however, are different from a practical and political perspective.

Concluding, the theoretical concepts of discrimination can be transferred to RE auctions, where they can have a positive impact on the essential expansion of RE sources with the lowest overall system costs. Although there are differences between the theoretically optimal concepts and the practice, examples show that the concepts can be implemented successfully.