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REFORM POTENTIALS FOR CONGESTION MANAGEMENT IN EUROPEAN ELECTRICITY NETWORKS

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Short summary

One focus of European energy policy is on the efficient use of scarce cross-border transmission capacity. From network economics it is well-known that this requires that generators as well as consumers take the transmission costs of their network usage into consideration. But most European electricity wholesale markets (e.g. the energy exchange in Leipzig, EEX) do not take the opportunity costs of network access into consideration in their pricing schedules. As a consequence network operators have to apply inefficient repair mechanisms whenever injection and extraction schedules exceed transmission capacities. Therefore it is becoming increasingly important to find a method for efficiently allocating transmission capacities, not only within individual networks, but also between cross-border networks. Thus a consistent market framework which forces market participants to take the opportunity costs of network access into account should be applied.

Abstract

The aim of the paper is to provide a critical appraisal of congestion management methods (redispatch, market splitting, market coupling) currently implemented in the European networks and to highlight reform potentials to improve efficiency. Therefore the disaggregated nodal pricing framework developed in Knieps (2013) in the context of single networks is extended and applied to transmission between networks with particular focus on cross-border networks.

Within the traditional market design of European electricity networks generators have an incentive to inject electricity whenever the wholesale price is higher than their marginal production costs, disregarding the transmission costs of their injection decision. In contrast, within the disaggregated nodal pricing framework the market participants (generators and consumers) receive two decision relevant price signals. First the competitive uniform wholesale price sent by the day-ahead wholesale market, reflecting the total willingness to pay within a network. Secondly, transmission costs sent by the network operator reflecting the opportunity costs of network injection and extraction at each node. For producers injection is worthwhile whenever the wholesale price, which is the same for all nodes, exceeds the sum of the individual production and the node-dependent transmission costs. This results in the generalized merit order. Consumers have to pay the wholesale price and the node-dependent transmission costs.

The first part of our paper analyses the impact of the neglected role of node-dependency of transmission charges within a given network. It can be shown that currently implemented allocation management instruments are inefficient and thus should be avoided. This includes in particular redispatching, a prevalent form of remedial action, which is mandated e.g. by German energy law. In contrast, implementing disaggregated nodal pricing leads to an optimal allocation of scarce transmission capacities. Injection and extraction prices would then reflect the cost of network access at every node, resulting in efficient decentralized injection and extraction decisions by market participants. Furthermore, after implementing disaggregated nodal pricing arbitrage is not possible within one network, either between injection nodes or between extraction nodes. A wholesale market for each network should be applied, giving no incentives for market-splitting within a network.

The second part of our paper starts with an analysis of market coupling which is implemented in European cross-border electricity trade. In contrast to most national market frameworks transmission rights are implicitly auctioned between networks, improving the efficiency of transmission capacity allocation. In that context reform potentials according to the disaggregated nodal pricing framework are highlighted. Therefore the role of node-

dependent transmission pricing for cross-border networks is analysed. It can be shown that, as long as different networks are not fully horizontally integrated, arbitrage possibilities between different cross-border electricity networks arise. Low wholesale prices in one country will send incentives to trade to high-price countries, taking into account the opportunity costs of cross-border transmission access. This provides a large scope for efficient trading possibilities between countries.

Conclusions: Implementing disaggregated nodal pricing can have a strong impact on the efficiency of electricity markets. This holds not only within networks but also between networks. With regard to European energy policy, the goals of transmission efficiency, promotion of renewable energies and integration of European electricity markets can be achieved in a more economically well-founded manner. Inefficient congestion management instruments within and between countries have to be replaced by a consistent market framework taking the pricing of opportunity costs of network access into consideration. This also allows for welfare-improving trade between countries.

References:

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