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TOWARDS MARKET BASED CONGESTION MANAGEMENT IN THE EUROPEAN ELECTRICITY MARKET
THE NEXT STEP: FROM TECHNICAL TO VALUE BASED DISTRIBUTION OF CROSS-BORDER CAPACITY?

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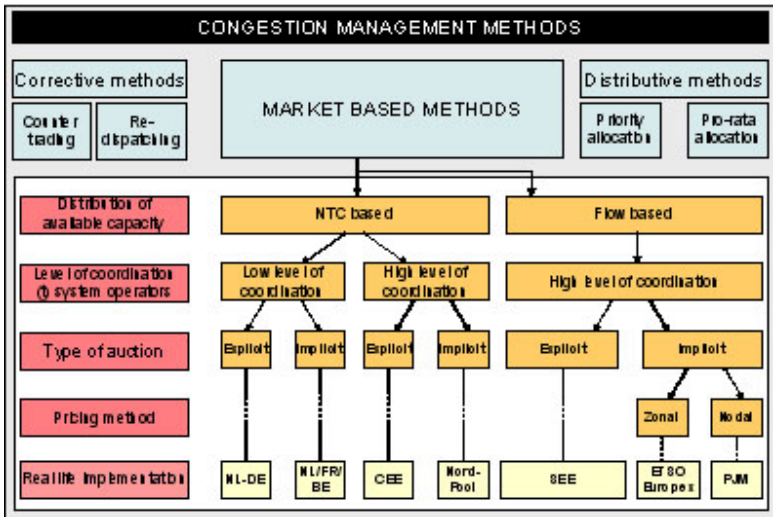
Overview

Recent regulation by the European Commission prescribes that congestion management methods implemented by member states should be market based. More precisely, capacity should be allocated through an explicit (capacity) or an implicit (capacity and energy) auction1 (Commission Decision, 2006). While a single internal market is a long-standing goal of the European Union, the idea that the development of regional markets is a necessary preceding stage to the creation of a single European electricity market has become broadly accepted in recent years. As a result, diverging approaches to the allocation of cross-border capacity emerge throughout Europe. For example, in Central-Eastern Europe a new method of coordinated explicit auctioning became operational in 2006 (CEPS, E.ON et al., 2006). In the Nordic market implicit auctioning (in which allocation is based upon bids in the electricity spot market on the other side of the congested interconnection) in the form of market splitting has been implemented. North-Western Europe recently introduced a capacity allocation concept in which implicit and explicit auctioning (in the form of market coupling) coexist on the same interconnection (DTe, 2006).



[1] Old-established distributive congestion management methods, such as first-come-first-serve or pro rata allocation, currently still exist on congested European interconnections.

At the moment, however, commercial transactions are still managed with a contract path method, i.e. the transaction path is more or less arbitrarily chosen and parallel flows are not considered (Purchala, 2005). The introduction of flow based methods, which take into account the interdependence of physical flows on different border crossings, has recently been presented as an important improvement and will therefore be examined further. A question that emerges is how the available transmission capacity is distributed over the various borders (or even cross-border transmission lines). Due to the existence of parallel flows, increasing the amount of transmission capacity that is made available to the market on one interconnector will decrease the useable capacity of parallel interconnectors.
Until now, it has always been the transmission system operators (TSOs) who determine, merely based on technical criteria and on a border-to-border basis, which amount of capacity is available on which interconnection. However, one may argue that in a liberalized electricity market not the TSOs but market participants should determine how capacity is distributed over the interconnections (of course within safety margins). After all, a megawatt of capacity on interconnection A may have more market value than a megawatt of capacity on interconnection B. An option that has not received much attention until now is the introduction of a more market-value based system of distributing available cross-border capacity among parallel interconnections. By combining the willingness to pay for capacity with a reliable flow based model, it is possible to develop an approach for assigning the capacity of parallel interconnectors in a more market oriented manner.
A prerequisite for such an approach is that member states need to leave behind national welfare interest in favor of regional welfare optimization. Considering the current political debates on the development of the European Union this may prove to be a larger challenge than the techno-economic implementation of such an approach.

Methods
This paper provides a brief outline of recent developments regarding congestion management in Europe (e.g. the new, legally binding congestion management guidelines which entered into force 1 December 2006). Furthermore, we analyze the concept of value based distribution of available transmission capacity by using a simple electricity transmission network.
In regard to this simple transmission network, we model the functioning of Flow Based Market Coupling (FBMC). This is a new method for cross border congestion management which combines commercial energy bids with physical reality to optimise network use with respect to market value (ETSO-EuroPex, 2004). Commercial energy bids and available capacity are evaluated simultaneously in an iterative process which should lead to a more efficient use of transmission capacity with respect to commercial value. Optimization is performed based upon commercial bids and the linear relation between accepted bids and the physical flows on flowgates (defined in the PTDF-matrix).
Based on this analysis, we determine the minimum criteria (techno-economic, institutional and organizational) for such an approach of flow-based calculation and value-based distribution of available transmission capacity and identify the questions still to be answered from a political (regulatory) perspective.

Results / Conclusions
For regulatory authorities, who in general must approve of the congestion management method to be used, the introduction of a more efficient method such as FBMC seems to be an attractive option. However, the functioning of the method is quite complex, the sensitivity of the system unknown and the effects (on national level) difficult to predict. Various questions remain unanswered at this moment, such as:

What could be the effect of such system on security of supply (as no capacity at all could be distributed to a certain border if market value is low)?
What is the effect on national welfare as the (market) value based system optimizes regional welfare?
How fast is the iterative process between commercial value (based on commercial bids) and the distribution of capacity to a certain flowgate? In theory, no capacity at all could be assigned to a certain border. However, this will raise the price in the area concerned, increasing the commercial value of available capacity on its borders, which then will increase the capacity assigned to this borders, and so on.
What is the effect on welfare if one reserves a certain minimum amount of capacity on a specific flowgate e.g. for security of supply reasons?
How sensitive is the system for the choice of a specific set of PTDF's and bottleneck constraints?
These questions prove that the concept of value based distribution of available transmission capacity is a political sensitive issue. The introduction of such approach could not only influence the level of security of supply but also lead to a significant reduction of the available transmission capacity on the borders of a specific country (i.e. as capacity has limited market-value on these borders). Consequently, the actual introduction of such approach will prove to be difficult considering the political and economic interests at stake and the multi-national agreement needed.

References

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