Congestion Management

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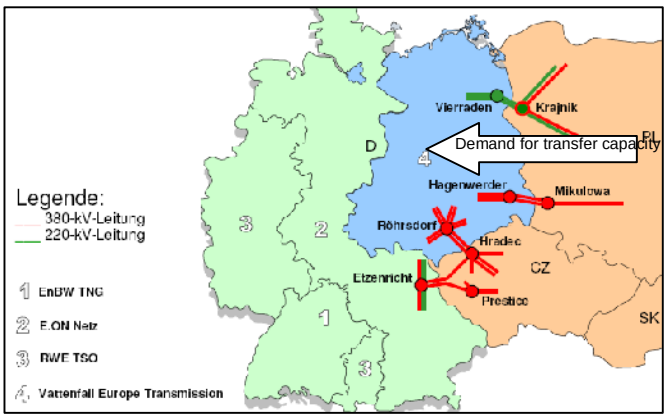
Transmission system operators are required to prevent congestion when transmitting electricity - this is stipulated in EC Regulation on Cross-Border Trade in Electricity (1228/2003) and in the various National regulations.

The tools available to transmission system operators (TSOs) to prevent congestion include technical and commercial measures to influence cross-border electricity flows. Where congestion does occur, TSOs will manage it on the basis of non-discrimination, using market-based and transparent methods.



Key to symbols
380-kV-Leitung à 380 kV overhead line
220-kV-Leitung à 220 kV overhead line

What actually is congestion?

Congestion occurs if and when the demand for cross-border transfer capacity cannot be fully served. It should be borne in mind here that reserve capacity has to be maintained to ensure safe and secure operation of the system. This spare capacity cannot be marketed. It must be available for the TSO to prevent any single fault (e.g. an outage in one system of an overhead transmission line) from triggering further outages. The system operators call this the first contingency “(n-1)-criterion” on which the stability and security of the transmission system is built. Congestion will also occur if the system operator has valid reasons to expect that the first contingency criterion cannot be met without special measures although the operator has considered all known or forecasted notifications of electricity trading activities (so-called operating schedule notifications) in network operations. In order to avoid and remedy congestion, the system operators are entitled to take special measures. These interventions to both prevent and overcome congestion are called congestion management.

Take for example the extra high-voltage system of Vattenfall Europe Transmission borders on the Polish and Czech transmission systems in the east and southeast of Germany. As the demand for capacity transfers is currently high, and increasing

amounts of wind energy are fed into the system while network capacity is limited at the borders to Poland and the Czech Republic, congestion is common here (see figure).

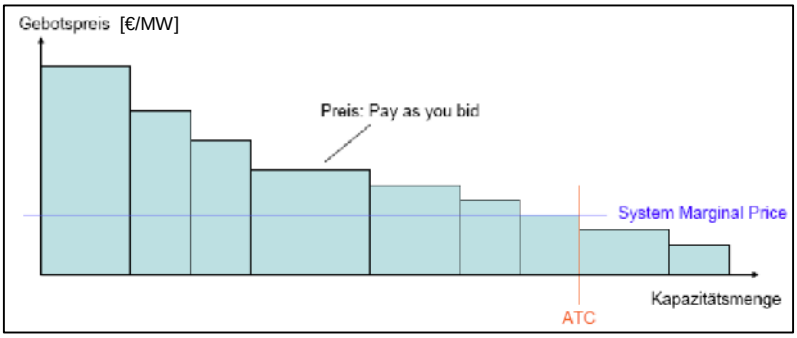
Congestion management is generally seen to break down into **four phases**:

In **phase 1**, network computations are carried out to calculate - subject to a share of the capacity being deducted for system security purposes - the marketable transmission capacity, the so-called net transfer capacity (NTC).

In **phase 2**, this net transfer capacity (NTC) is offered to the market players via various market based tools. In the case of VE-Transmission, a coordinated, so-called explicit auction handles the congestions on the Polish and Czech borders. This free capacity is split into annual, monthly and daily auctions. Before each auction, the available capacity is updated by taking account of the already allocated capacity (AAC). What can be offered to the market is the remaining marketable transmission capacity, the so-called available transfer capacity (ATC; where ATC = NTC – AAC). Another “bottleneck“ is the D. C. cable link to Denmark. It is managed on the basis of an implicit auction procedure.

How do explicit auctions work?

According to this method, the auction participants file their bids that specify the amount of transmission capacity required for the period under review, and indicate how much they are willing to pay. The bids are sorted according to the highest price until their total has reached the transmission capacity still available (ATC). The price of the last accepted bid that has not yet exceeded the ATC amount forms the so-called standard system marginal price (SMP) for the entire auction. Requests for capacity carrying a lower bid price will be declined (see figure).



Gebotspreis à Bid price
Preis à Pay as you bid
Kapazitätsmenge à Amount of capacity

After the transmission capacity has been allocated, the transmission system operators carry out current system security computations in **phase 3**, with the operating schedules, generation schedules and wind power input forecasts taken into consideration.

If risks or disturbances to system security are recognized in the course of these network security computations, the transmission system operators have to proceed to measures providing relief to the system in **phase 4**. In Germany for example, the Energy Industry Act (EnWG) stipulates in what sequence these relief measures must be taken: As a first step, network-based measures (corrective switching etc.) must be taken before market-based measures can be opted for, e.g. the use of control energy, changes in the operating schedule (the so-called re-dispatch), coordinated re-dispatch on both sides of the bottleneck (so-called countertrading) or contractually agreed load shedding. If, however, the risk or disturbance cannot be eliminated in time despite all these measures, the German TSOs are entitled and obliged to adjust all electricity feeding, electricity transits and electricity take-off in its control area. Taking such measures serves the purpose of keeping the transmission system stable and avoiding large-scale blackouts in the interest of all system customers. Focused congestion management is an essential tool for TSOs to live up to the system responsibility it bears according to European and national legislations.

Reduction of congestions in the long term

Decisions on the reinforcement of the grids, including of the interconnection lines, aiming to increase the interconnection capacities and reducing congestions can be justified if there exist a sound economic basis weighting costs, advantages and environmental impacts. Grid reinforcements take time, mainly if the construction of new lines is involved and, therefore, significant increases in interconnection capacity are not easy to get and will only be reached after a significant number of years.

Sources:

(1) VDN TransmissionCode 2007; ETSO “Definitions of transfer capacities in liberalised electricity markets” (2001)

(2) CONSENTEC “Analysis of Cross-Border Congestion Management Methods for the EU Internal Electricity Market” (2004)