

DISCUSSION PAPER ON CONGESTION MANAGEMENT

1. Experience with the congestion management guidelines thus far

At present the capacity allocation methods for cross-border trade of electricity vary considerably, some of the interconnectors are handled like in the pre-liberalisation period, for some others rather sophisticated methods of allocation are used. The following list gives an overview of the methods, and the key interconnectors where they are applied:

- **Retention:** Capacity is reserved for the network company, vertically integrated, being also a generator and/or supplier. This method is applied by the Swiss companies and is also used in practise for most of the long term contracts concluded before liberalisation, namely France/Switzerland/Austria – Italy, Germany/France – Netherlands and France – Spain.
- **First come, first serve:** The capacity is allocated according to the requests until all capacity is booked. This method is applied at the France – Germany and France - Belgium borders.
- **Curtailement:** Market participants make requests for capacity and then the demand for capacity is curtailed on pro-rata basis to fit the available amount. This method is applied in Italy in the year 2002 (for the capacity exceeding the reservation for long term contracts).
- **Explicit auctioning:** The capacity is auctioned for different time periods (for example year, month, week, hour). Bids are accepted starting from the highest, the price all accepted bids have to pay is usually at the level of the bid that makes to fill the interconnector (pay at lowest accepted bid). The method is in use at the Germany/Belgium – Netherlands borders (co-ordinated auction), at the France – UK DC link, at the UK-Ireland border and at the Denmark – Germany border.
- **Implicit auctioning:** Allocation of the cross-border capacity is based on generators' bids into the electricity spot market situated on the other side of the interconnector, where they compete with local bids. The interconnector capacity is allocated to the cheapest bids until it is full. The possibly remaining price difference between these bids over the interconnector and the bids from the local generators is retained by the TSO as the profit made from its “brokering” activities. A variant of this method is in use at the Portugal – Spain border. Implicit auctioning requires at least one power exchange in the area importing from the interconnector in question. However, because most countries, even net exporters, are likely to import at some point in time, such an approach really requires power exchanges in all areas.

- **Market splitting:** Allocation is based on generators' bids into the electricity spot market. A price is then determined for each area on the assumption that no connection exists. Market splitting means that cross-border capacity is automatically allocated such that price differences between the two areas in question are minimised. The implicit price paid to the TSO for access amounts to the remaining differences between prices in the two markets since this will be the profit made by the TSO from its "brokering" activities. The Nordpool system works on the basis of a single Scandinavian spot market with regional prices. Such a system could feasibly be replicated each side of an interconnector using power exchanges in their national markets.

Explicit and implicit auctions as well as market splitting are market based options. Every method has several possible variations, they are not discussed here in detail.

2. Application of the guidelines in principle

The Congestion management guidelines agreed in the 6th Florence Forum¹ stipulate that the congestion management problems should be addressed with market based solutions. The above list of the methods and interconnectors shows that only a limited number of key interconnectors is applying at the moment market based methods.

There are plans about using capacity auctions at the Italian borders, at the France – Spain and at the France – Belgium border, but these plans have not yet been implemented. The situation at some other key borders like at the France – Germany and at all Swiss borders is unclear, no market based allocation methods at these borders have been announced.

There seems to be multiple reasons why the implementation has been slow even if plans exist. Some parties claim that the difficulty to reach an agreement in a relatively large group of parties involved, (at least) two TSO's and two regulators, has been an important factor to delay the process.

Another reason for delay has been the difficulty to agree on allocable capacities between interconnectors. Especially there is a dispute about the capacity available from France to Italy and from Switzerland to Italy, as there is a strong interrelationship between these two interconnectors.

Market parties have made several complaints against the practises at the interconnectors still using non-market based methods like first-come, first-serve. Two major issues are raised:

- Information on available capacity and factors influencing it (for example outages due to maintenance).
- Firmness of the allocated capacity (in some cases the TSO has cut capacity informing that the capacity allocated was non-firm).

¹ Conclusions of the 6th Florence forum, "Guidelines on Congestion management", 9.-10.11.2000

The delay in implementing the planned auction systems has created a very unclear situation at certain borders (like the Italian and Belgian borders) and has seriously prevented non-incumbent market parties to operate.

3. Difficulties encountered in applying the guidelines

The interconnectors where the congestion management guidelines are currently applied, are the following:

- Belgium/Germany-Netherlands Co-ordinated explicit auctioning
- France-UK Explicit auctioning
- Denmark-Germany Explicit auctioning
- Nordel area Market splitting
- UK - Ireland Explicit auctioning

Congestion management at these interconnectors is generally considered as working properly. There is a high level of transparency to the market parties.

The Benelux area faces, however, serious problems due to the fact that only part of this highly meshed area is covered by the auctioning system. The system is so heavily interlinked that only a co-ordination of all the auctions in the area could provide a satisfactory solution.

Regarding the Germany – Netherlands border there is a dispute about netting. Power flows in opposite directions “net” each other. Netting will give more capacity to the market, if the TSO can rely that the flows in both directions really take place. The German TSO’s refuse netting arguing that netting would compromise network security.

4. Congestion charges

Table 1 gives a rough estimation of the potential for congestion charges at the main European interconnectors. The **overall potential** amounts close to **400M€** per year in the medium term, which is in the order of magnitude of 5% of the total value of the electricity in Europe (Market covered by the EU, Norway and Switzerland, at wholesale prices).

At the moment a high proportion of the interconnector capacity between areas with big generation cost differences is reserved for **long term contracts** concluded before liberalisation. The use of the interconnector is not charged separately but its economic value is embedded in the contract between the two (or more) parties involved.

Table 1 Potential yearly income from Congestion Management²

Connection	Rough potential for yearly income³
Switzerland-Italy	80M€
France-Italy	80M€
Germany/Belgium-Netherlands	80M€
Norway-Sweden-Finland-Denmark	30M€
France-Spain	20M€
France-UK	20M€
France-Germany	20M€
Denmark-Germany	10M€
France-Belgium	5M€
Spain-Portugal	5M€
UK-Ireland	2M€
Austria-Italy	1M€

When **market based methods** are used, there is a congestion charge reflecting the economic value of the interconnector. This is the case with the above listed borders using explicit auctions; and the market splitting price differential income in the Nordel area. The figures in the table 1 correspond to a situation where all the interconnection capacity is supposed to be allocated through market based methods.

In the congestion management guidelines agreed in Florence it is stipulated that the congestion rents should be used to relieve congestion by redispatching and/or by investing in the network. Remaining rents should be used to lower the network tariff more generally.

5. Further development of the guidelines – towards a common allocation methodology

There is a considerable amount of work still to be done in changing the present pattern of non market based allocation mechanisms to **market based mechanisms**. For immediate implementation, explicit auctions seem the most viable option (except for the Nordic market already using market splitting). However, work on implicit auctions and market splitting, the other market based mechanisms, should also be continued in parallel due to the evident benefits offered by these methods.

² The accession countries have several important interconnectors with the EU. Notably the connection from Poland and Czech to Germany, from Czech and Hungary to Austria and from Slovenia to Italy are of high importance regarding congestion management. The potential for congestion charges on these interconnectors is not discussed in this document.

³ The rough estimate of the potential income is based on year 2000 cross-border flows and the following price differentials compared to the German price level: IT and NL +4€, ES and UK +2€, B and PT +1€, CH and AT 0€, FR -1€.

ETSO has studied “**co-ordinated auctioning**”, an explicit auctioning concept, where capacities at different borders are allocated in a co-ordinated optimisation process. One major challenge in the co-ordinated auctioning is to agree on the share of congestion charges for each TSO. This co-ordinated approach can bring considerably more capacity to the market compared to a situation where everybody is selling capacity independently.

An innovative approach is to use different market based mechanisms in parallel, or “**capacity slicing**” as called in an ETSO paper⁴ discussing market models. This would bring several benefits: competition between various methods of allocation and a possibility to phase in new methods and volumes in a pace that developing power exchanges can handle. This would also reduce risks of sudden disturbances on the market due to bad market design.

The idea of “capacity slicing” is to fill the interconnection capacity with **layers** allocated through different methods. The allocation takes place in the following sequence:

- **long term contracts.**
- capacity sold in **explicit auctions** for different time periods (year, month, week, day).
- capacity allocated by **power exchanges** through **implicit auctions or market splitting.**

The directive on internal market on electricity does not prohibit **long term contracts** if they were concluded before the adoption of the directive. However, their validity remains to be considered under competition rules on a case by case basis taken into account foreclosure effects.

Explicit auctions allocate capacity in varying time periods allowing **bilateral contracts** over interconnectors. This gives stability to the market enabling longer time periods than hourly spot markets.

All the **remaining capacity** (also the non-used capacity from the other allocation layers) will be given for the allocation through the **hourly spot market** using power exchanges.

This approach could considerably increase the flexibility of the use of interconnectors and would potentially result in a more optimal use of them. The capacity allocated to power exchanges would automatically be used according to the price signals of the spot markets. The two stage process in the explicit auctioning (first reservation of capacity, then executing the energy transaction) has proved not always to follow the price signals of the spot markets, or doing it with delay. Examples of this kind can be observed on the Dutch-German border.

⁴ ETSO report: “Coordinated use of Power exchange for Congestion Management”, April 2001

Reserving a layer of capacity to power exchanges would strengthen their role and would speed up the emerging of real **price reference** through spot prices, allowing development of **financial products** based on them.

It is also important to note that the technical challenges for both co-ordinated auctioning and implicit auctioning/market splitting are basically the same, so there should be no reason why not to start a parallel development of both layers of the capacity allocation.

In the same spirit of “capacity slicing” the interconnector can contain some additional layers dedicated to **balancing power** flows between control zones and to **interruptible power**. The capacity reserved by TSOs for the secure operation of the network can be considered as the final layer on top of the others.

It is too early to say how much capacity should be reserved for each layer in capacity slicing. The optimal share for each layer might differ from interconnector to interconnector. An indicative target in mid term could be to allocate half of the interconnection capacity in explicit auctions and another half with implicit auctions/market splitting.

6. Redispatching

In addition to the above mentioned basic methods of congestion management, **redispatching** can play an important role in congestion management. According to the guidelines, occasional congestion should be taken care by co-ordinated redispatching (or counter trading) be used in order to increase available capacity in the interconnector. In redispatching the TSO:s increase generation in one location and decrease in another in order to reach a more optimal network usage situation. The generators affected are compensated for the increased/decreased generation.

Redispatching can be used as a **preventive method**, then it is a part of the calculation of the available capacity. An example of this is the redispatching used on the French-Spanish border. Redispatching is used at the stage of **scheduling the flows**, to better accommodate the overall demand to the network. Redispatching is used in several member states as the main congestion management method inside the control area. Finally redispatching is used during the **operation of the network** when the actual flows differ from the scheduled ones, in order to keep the system within security limits.

The situation regarding redispatching as a cross-border congestion management method is not very clear. At the moment it is used systematically at the French - Spanish border.

7. Increasing Capacity

Frequently congested interconnectors are subject to measures entitled to increase the interconnector capacity. The methods can be divided in two categories:

Soft measures which do not require hardware investments.

- Better use of physical infrastructure (for example allowing higher currents through more sophisticated temperature control of conductors).
- Better calculation of available capacity (for example taking into account the basic load situation).

Hard measures requiring investments in hardware.

- Investments in network components able to increase available capacity (for example phase shift transformers, additional conductors).
- Investment in new lines.

The Consentec/IEAW study gives an analysis of soft and hard measures capable to increase network capacity. Revised TEN-Energy guidelines contain a list of Priority projects of European interest, most of the projects are located in congested network areas.

8. Reliability and Risk

In the electricity transmission network **reliability** is a key requirement. Most of the measures to increase capacity are also beneficial regarding reliability, but sometimes there is a trade off between these two. Reliability cannot be compromised by any hazardous measures taken to increase capacity.

To cope with this balance of risk and capacity the Consentec/IEAW study suggest a “**risk levelling**” approach. At present sometimes unnecessarily high and/or multiple risk margins are applied to the transmission system. Reducing risk margins where they are over-dimensioned would increase capacity without loss of reliability. **Harmonising the overall level of accepted risk** could also be subject for European co-operation. Harmonising all details would not be necessary, or even desirable, as the systems and conditions vary considerably between member states.

9. Proposed actions

In the light of the above, the following actions are proposed :

- **Implement the existing guidelines** of congestion management (action 3 of the Infrastructure communication): **the Commission will benchmark and report back to next Forum.**
- **CEER, in close collaboration with ETSO, APEX, the Commission and other stateholders, are requested to revise the congestion management guidelines by the end of 2002 in order to improve and harmonise capacity allocation methods** (action 2 of the Infrastructure communication) **and come forward with details on how “capacity slicing” might be implemented.**

- **ETSO is invited to put forward proposals for discussion at the next meeting at the Forum to harmonise technical and administrative rules of the use of the network in order to increase the available capacity with “soft measures”; measures which do not require investments in the network (action 4 of the Infrastructure communication).**