EURELECTRIC Position Paper on Congestion Management

November 2000

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This position has been drafted by the *EURELECTRIC* Working Group "Market Regulation & System Tariffs" and approved by the *EURELECTRIC* Board of Directors on 2 November 2000 in written procedure.

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EURELECTRIC position paper on congestion management

Executive Summary

The Union of the Electricity Industry-EURELECTRIC considers that the costs raised by the congestions should be made explicit, charged to the users of the congested elements of the grid and taken into account when designing the transmission pricing schemes since those congestion management mechanisms cannot lead to uncontrolled sources of revenue for the TSOs.

For any congestion management mechanism to be effective, it should be clearly ensured the independence of the TSO. Moreover, TSOs should be able to guarantee an adequate degree of firmness to the exchanges accepted and compensate those users that could lose their access rights. It is therefore necessary that an incentive system be also designed so that TSOs can increase the available capacity and the net transmission capacity. As a mid-term technical solution EURELECTRIC proposes the use of FACTS (flexible alternative current transmission systems).

EURELECTRIC considers that congestion methods should be harmonised in Europe as much as possible and strongly favours the market-based mechanisms since they are considered to be more transparent and efficient.

From the different possible market-based approaches for the allocation of capacity, EURELECTRIC believes that although market-splitting would be the ideal solution, it would not be possible to implement it at present in all the EU. Therefore, explicit auctions together with counter-trade and re-dispatch could be applied in those countries where market-splitting is not yet possible.

EURELECTRIC recognises that as regards auctioning, stringent safeguards are needed if the TSO is not adequately unbundled and where potential exists for dominant positions leading market abuse. However, we also believe that the combination of liquid secondary markets with the "use it or lose it" principle would guarantee the efficiency of the system without discriminating among potential participants in the auction. Other principles should also be ensured as stated in the present position paper.

Concerning counter-trading and redispatch, these methods, that are specially well suited for real-time operation, require a complete independence of the TSO, since the latter will be developing a commercial role buying and selling energy.

As regards the DC links, we consider that for congestion management problems the same treatment should be given as for AC links while protecting at the same time the legitimate rights of the investors.

Finally, on the long-term supply and transmission contracts, EURELECTRIC considers that they can remain in place with the progressive development in parallel of congestion management mechanisms and financial contracts.

Introduction

The Regulators meeting in Florence on 30-31 March 2000 concluded that congestion management should be based on market solutions that give proper and justified incentives to both market parties and Transmission System Operators (TSOs) to act in a rational and economic way.

It was agreed to adopt, at the Forum meeting in November 2000, if possible, common guidelines concerning allocation of interconnection capacity. Those guidelines could then form the basis of a Community-wide approach that would also take into account the subsidiarity principle.

Congestion is the consequence of the lack of capacity of a network to accommodate the transport of all electricity flows desired by the market. Although with the full liberalisation of the energy markets regulatory barriers should disappear, physical constraints will not, and so allocation of capacity and congestion management will still be required.

The basic general principles that any congestion management method should follow are:

- Non-discrimination.
- Economic efficiency: charges to users of the interconnection capacity in question should be based on the costs actually incurred by TSOs and interconnection capacity should be allocated to those that value it most.
- Transparency and non-ambiguity.
- Feasibility of implementation.
- Compatibility with the different types of trading arrangements, contracts and levels of market development.

Key issues related to congestion management

Congestions impose costs, since they prevent the optimal use of production capacity. These costs should be made explicit and appropriately charged to the users of the congested elements of the grid. Moreover, since the transmission system is a monopoly, those congestion charges or costs must be taken into account when designing the transmission pricing schemes: congestion management mechanisms cannot lead to uncontrolled additional sources of revenue for the transmission system.

Congestions must be dealt with in different time horizons, that is, through allocation mechanisms in days, weeks or months ahead, and in real-time situations to relieve or prevent the constraints while keeping the security of the system. Different congestion management mechanisms can be appropriate in these different time horizons.

EURELECTRIC also considers that some basic pre-requisites need to be implemented to ensure the effectiveness of any congestion management mechanism:

- Independence of the TSOs, since the application of a congestion management system can require a significant commercial role for the TSO.
- Maximum transparency and harmonisation of the technical criteria for the calculation of the available transfer capacity (ATC). This calculation procedure should be made known to all players and, specially, to regulators, who should supervise the computation to prevent the TSOs from being too conservative or too aggressive in estimating the available transmission capacity.
- Improvement of the information exchange among the TSOs.
- Consideration of the existing contractual arrangements.
- Existence of appropriate balancing arrangements at both sides of the congestion.

In any case, the reduction of congestion requires the adequate incentives for the reinforcement of interconnections, but this is only a long-term solution. Allocation mechanisms are needed in the short-term.

TSOs should guarantee an adequate degree of firmness to the accepted cross-border exchanges providing compensation to those users that could lose the access rights that they previously obtained. Moreover, the same treatment should be ensured for all users, within and outside the country. This should be linked to an incentive system designed to ensure that the TSO make an accurate estimate of the available capacity and try to increase it by making use of the appropriate operational measures.

EURELECTRIC considers that, as much as possible, congestion management methods should be harmonised in Europe.

Congestion management solutions

There are both market-based and not market-based congestion management mechanisms.

Non-market based mechanisms are strongly opposed by EURELECTRIC members. In our view, those mechanisms, although can be implemented in a transparent and easy manner, are inefficient: they do neither contribute to reduce power production costs, nor offer the best offers to consumers, since the capacity is not allocated to those who value it most.

On the contrary, market congestion management approaches are considered to be more transparent and efficient. Different methods are possible: explicit or implicit auctioning, market splitting, counter-trade and re-dispatch (see annex). **For EURELECTRIC, the best solution for the EU is a combination of these methods depending on the time frame in which they need to be applied and the local conditions.**

EURELECTRIC has made a comparative analysis of the different above-mentioned market-based congestion management mechanisms (see annex). The basic criteria used to make that comparison were the economic efficiency in the allocation of revenues and costs, the potential for market power problems, the feasibility of implementation, the compatibility with existing commercial and regulatory arrangements, the complexity and the potential for market distortions derived from the commercial role of the TSOs.

The result of this analysis, and therefore the position of EURELECTRIC, is the following:

Market splitting would be the ideal solution. However, it is considered a method too difficult to implement in the short-term for the whole EU, due to the existing regulatory differences, since it requires the existence of exchange or power pool-based arrangements in both sides of the interconnection. Moreover, it would first require the solution of significant practical problems, such as the adequate coordination of the detailed design of the different exchanges (their timetables, bid format, market clearing procedure and other elements should be compatible) and the adequate definition of the borders among them in which the price separation would exist.

Explicit auctions would be the preferred and more acceptable option for capacity allocation in the mid term horizon. Explicit auctions are, in our view, an effective method of allocating capacity. However, stringent safeguards are needed where the TSO is not adequately unbundled from generation and supply interests and where potential exists for dominant positions leading market abuse.

To ensure that auctions work properly, an appropriate design and regulatory framework must be established. This should include:

- an adequate organisation of the auction in time horizons,
- the provision for secondary liquid capacity markets, giving each market participant the possibility to re-sell previously acquired access rights,
- the adequate consideration of simultaneous flows in opposite directions, that increase the net transfer capacity of an interconnection,
- the necessary co-ordination of auctions in time and format in the different interconnections of a meshed system to avoid international trade being paralised,
- the penalties for interruption of firm capacity (as mentioned previously) and measures to address anti-competitive behaviour.

Moreover, the principle of "use it or lose it" should be implemented so that if a market agent acquires transmission rights in an auction, it should have the obligation to re-sell it if it is not going to use them, and should face a penalty if it does not comply with this requirement.

The combination of liquid secondary markets with the "use it or lose it" principle would guarantee an adequate efficiency of the system, without requiring any discrimination among potential participants in the auction.

The existence of secondary markets is especially critical in meshed networks, where a market participant will typically require securing access rights in different interconnections.

Counter-trading mechanisms could also be an appropriate solution for capacity allocation in meshed networks with relatively small congestion problems, but their implementation requires a high degree of independence of the TSO, given the commercial role that it will have.

Counter-trading or re-dispatching are the most suitable mechanisms for congestion management in the very short term and the real-time operation. This will require the adequate implementation of real time reserve and balancing mechanisms, based on market principles whenever possible. The existence of real-time reserve and balancing markets in different countries proves the feasibility of the application of market principles to the real time operation of the system. However, special attention must be paid to the potential for market power in these markets.

Available capacity and the development of the network

EURELECTRIC considers that the convenience of mixing congestion management with incentives to TSOs for reinforcing the networks is unclear. In most cases, mechanisms for the extension of the transmission system already exist and, in fact, if no new investments are made is mainly due to environmental constraints.

However, as stated before, we also believe that there is a need for incentives to adequately estimate and increase the net transmission capacity through operational measures.

EURELECTRIC considers that, in the mid-term, some investments on "small" elements of the circuits can increase the capacity of the lines. A special example of this are FACTS (flexible alternative current transmission systems, electronic devices that can be used to control power flows in a transmission network, thus increasing its capacity). These elements do not present public acceptance difficulties, since can be installed, in the mid-term, in existing substations, and help to solve constraints on the transmission networks. An interesting example of FACTS application is the Phase Shifting Transformer that has been installed in Pragnères, on the France-Spain interconnection.

In any case, **congestion costs or charges must be taken into account when designing transmission pricing schemes at national level, to ensure that the TSO received the desired level of revenues but do not benefit from windfall profits derived from congestion management.**

DC Links

EURELECTRIC considers that, **since DC links differ from AC links in some respects, its treatment can be differentiated**. The cost of a DC link is several times the cost of an AC link due to the converter stations. Because of this, the feasibility of a DC line requires long-term supply and access contracts; otherwise, nobody would have an interest in investing on it. As a consequence of this, the rights of utilisation are kept by the link investors on a long-term basis, and the DC link is not treated as a normal element of the transmission system.

Nevertheless, although the allocation of capacity and identification of users is easier than on an AC network, **from a congestion management perspective, DC links that are interconnector lines can be equivalent to AC links.**

Balancing these two approaches, while protecting the legitimate rights of the investors and ensuring a maximum access to DC links by market participants, requires a combination of:

- Respecting the physical access rights to a certain extent. The investor should have the right to use its capacity for its own purpose or to trade it. Of course, if the investor is a TSO, the capacity must be allocated on a non-discriminatory basis as it is the case for any AC link.
- Opening the DC link to other users by transforming the investors' physical access rights into financial rights (i.e., the right to receive revenues from the link users, such as the proceedings of the auction used to allocate the capacity).

The combination of these two possibilities could change in time, with a gradual transformation of the physical rights into financial rights.

However, the potential for stranded costs that this change in the treatment of DC links could raise should also be taken into account. Moreover, it should also be possible to consider the same treatment if AC links are developed by network users.

Long-term supply contracts and transmission access

EURELECTRIC considers that long-term contracts might reduce the available transmission capacity. However, incumbents have access rights acquired with those existing long-term contracts that have mixed supply and transmission access, that should not be reviewed without measuring the consequences both for the incumbents and for the consumers. Moreover, EURELECTRIC considers that existing contracts can remain in place together with the progressive development in parallel of congestion management mechanisms and financial contracts.

Therefore, the available transmission capacity should be evaluated taking these previously existing supply contracts and their associated access rights into consideration. These "previously existing" access rights should also be subject to the "use it or lose it" principle: incumbents have a priority right of access to the network only for the existing supply contracts. But, as soon as they know that they are not going to use the transmission capacity associated to the long-term supply, they must release that capacity to the TSOs. This capacity becomes available and can be, for instance, auctioned as any other available capacity.

In the future, new long-term supply contracts will perhaps exist but their execution will have to take into account a transmission risk.

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Congestion management and allocation of interconnection capacity

Annexes

WG Market Regulation and System Tariffs
SG on Cross-Border Transactions
September 2000

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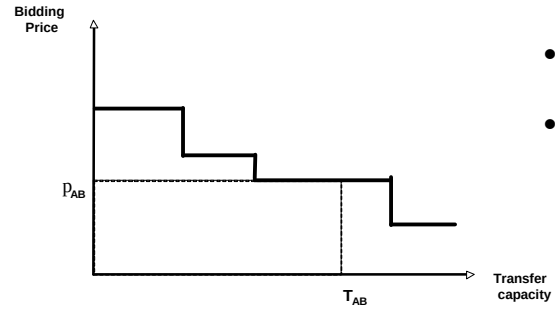
- Solution methods: definitions
- Attributes analysed
- Example of FACTS application

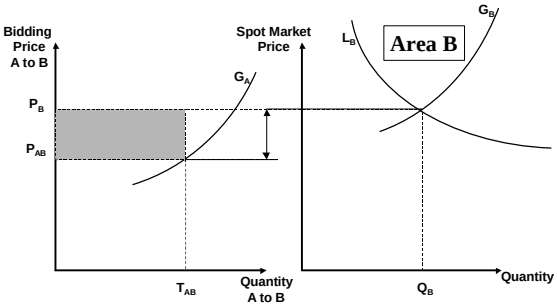
Solution methods
Explicit Auction Method



- The available transfer capacity is auctioned
- Agents interested in using interconnectors have to bid for the interconnection capacity
  - Participants in bilateral contracts
  - Participants in spot transactions and power exchanges

- Auctions can be organised in different time horizons
- Users of the interconnection must pay the resulting price (either a marginal price or using a pay-as-bid approach), that gives them access to the capacity
  - Net revenue is $p_{AB} \times T_{AB}$ (if marginal pricing is used)

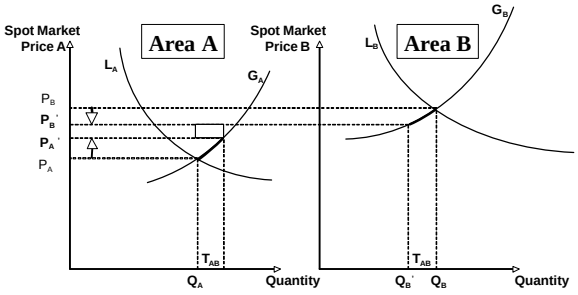
Solution methods
Implicit Auction Method



- Let B be the importing area and A the exporter
- An organised market (exchange) is required in B (i.e., on the other side of the congested bottleneck)
- Agents requiring the use of the interconnection send bids to the exchange in B

- Bids presented from A are sorted according to the bid price
- They do not receive the resulting B price (P_B), but a lower clearing price (P_{AB}) that results in acceptance of those bids that can fit in the available interconnection capacity
- Net revenue is $(P_B - P_{AB}) \times T_{AB}$

Solution methods
Market Splitting Method



- Requires power exchanges (pools) in both areas
- There are different price areas according to the actual congestion
- Area A's price is P_A and Area B's price is P_B'

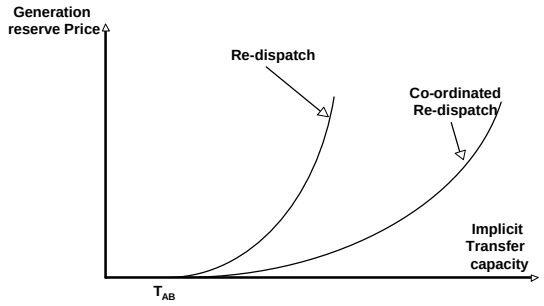
- Area prices are computed to adjust flows between areas to available transfer capacities
- Net revenue is $(P_B'-P_A') \times T_{AB}$

Solution methods
Counter trading

- TSO provides access to the interconnection A-B to all interested agents
- If requested capacity RC > available capacity AC, contracts counter-flow (RC-AC) in sense B-A
  - i.e., TSO goes to market and contracts the flow with generators traders or other market participants
- Cost of contracted counter-flow is charged to agents that requested capacity in A-B

Solution methods

Re-dispatching and Cross border Co-ordinated Re-dispatching



- Re-dispatching: TSO modifies generation schedule in its area to increase available capacity
- Co-ordinated re-dispatching: several TSOs jointly act on generation on their areas
- Cost of re-dispatching is "socialised" (distributed among all users of the network)

- Generators called for re-dispatching may have bid into a dedicated market or have signed long term contract with their TSO
- Conceptually equivalent to counter-trading, but more flexible/close to physical reality and with costsocialized

Contents

- Solution methods: definitions
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1 Revenues

Explicit and implicit auction
Market splitting

- These three mechanisms cause revenues that are initially collected by the TSO
- Since the TSO activity is a monopoly, it should not directly retain these revenues
  - This would create a perverse incentive to increase congestion
  - Therefore, revenues should be paid-back to network users through a reduction of network tariffs
- However, the regulator, based on these revenues, could implement an incentive system for the TSO for:
  - Increasing NTC with operational and other short term measures
  - Making good forecasts of available capacity
  - Guaranteeing the firmness of access to the interconnection

1 Revenues

Counter-trading, Re-dispatching

- There are no revenues collected by the TSO

2 Costs

Explicit and implicit auction, Market splitting

- There are no explicit costs borne by the TSO

2 Costs

Counter-trading, Re-dispatching

- These mechanisms make explicit some costs that are initially borne by the TSO
- Since the TSO activity is a monopoly, it should not directly bear these costs
  - Therefore, costs should be charged to users of the interconnection (counter-trading) or socialised (re-dispatching)
- However, the regulator, based on these costs, could implement a penalty system for the TSO for:
  - Increasing NTC with operational and other short term measures
  - Making good forecasts of available capacity
  - Guaranteeing the firmness of access to the interconnection

3 Incentives for reinforcement of the interconnection

Explicit and implicit auction, Market splitting

- The revenues collected by the TSO could be used to implement a scheme to fund reinforcements the interconnection
- However, the convenience of this incentive is unclear
  - In most cases, reinforcing the transmission system is not made difficult by lack of incentives, but for environmental or social reasons
  - There are mechanisms in place in some member states for the development of the transmission network
  - The mere implementation of a mechanism directly providing additional revenues to the TSO hoping that this will lead to more investment should be avoided

4 Economic assessment

Explicit and implicit auctions

- Does not present specific market-power issues
  - Use-or-lose it and secondary liquid markets to re-sell the access rights are enough to prevent market abuses by blocking capacity
- The separation of transmission from commodity, introducing additional complexity

Market splitting

- Equivalent to joining two markets into one, therefore market power problems are reduced

4 Economic assessment

Counter-trading, Re-dispatching

- The application in short-term and real time can present specific market power issues, since flexible generation can be scarce
- The application of counter-trading in mid and long term does not present specific market power issues, although poses problems with the comercial role of the TSO if it is not sufficiently independent

5 Time horizon

- In any case, available interconnection capacity should be defined and published as early as possible.

Explicit and implicit auction

Market splitting

- These methods are applicable in the short and mid term horizons, not in real time operation, because of their complexity

5 Time horizon

Counter-trading

Re-dispatching

- These methods are, in principle, applicable in any time horizon
- These methods are specially well suited for real time

6 Compatibility with market arrangements

Explicit auction

- Compatible with any market arrangement

Implicit auction

- Requires organised power exchange at least in the importing area

Market splitting

- Requires power exchanges in both sides of the interconnection

6 Compatibility with market arrangements

Counter-trading, Re-dispatching

- Compatible with any market arrangement
- Gives commercial role to the TSO. It can be undesirable to have TSOs bidding into a power exchange

7 Compatibility with network topology

General remarks on net transfer capacity (NTC)

- at least three methods rely on NTCs (explicit and implicit auction, market splitting)
- NTC is an “ambiguous notion” (ETSO)
- any ambiguity in the definition and/or computation of NTC is likely to appear in the allocation of NTCs
- the ambiguity of the definition and computation of NTCs increases with the complexity of the network
  - simple: two zones linear network
  - moderately complex: multizone linear network
  - complex: meshed network
- transactions that are compatible with the NTCs are not necessarily feasible for the network

7 Compatibility with network topology Explicit auction

- Meshed network (e.g. France, Italy, Switzerland)
  - Because of loop flows a trade from France to Italy requires
    - » NTCs on the intertie France-Italy
    - » NTCs on the interties France-Switzerland and Switzerland Italy
  - The feasibility of the explicit auction in meshed networks requires
    - » Close co-ordination of the TSOs will be needed to indicate the amount of NTC necessary on the different interties
    - » Either
      - The auction will have to be conducted on all interties simultaneously (combinatorial or simultaneous multiround auction) - there is no point in procuring NTCs on France-Italy if one does not also procure NTCs on France-Switzerland and Switzerland-Italy
      - There will be a secondary market for the acquired interconnection capacity, so if the interested party gets capacity France-Italy and does not get it in the other interconnections, it can re-sell that capacity

7 Compatibility with network topology Explicit auction

- Linear network (e.g. France Spain)
  - A transaction from France to Spain only needs NTCs on the intertie France-Spain
  - If NTCs are well defined (is not an ambiguous notion) , one needs to conduct a single auction on a single service. This can be done

7 Compatibility with network topology Explicit auction

- Transit flow: linear network (France-Spain-Portugal)
  - A transaction from France to Portugal requiresNTCs on the intertie France-Spain and Spain Portugal
  - This transaction will compete with transactions France to Spain (and Spain to Portugal) forNTCs on each of these interties.
  - The auction will have to be conducted on allintertie simultaneously or a secondary market for interconnection capacity will be needed to ensure that the unused capacity can be sold
- Transit flow: meshed network (e.g. Belgium to Italy via France and Switzerland)
  - The feasibility conditions are the same as for meshed networks

7 Compatibility with network topology Implicit auction

- Meshed networks: conditions necessary for the implicit auction to be feasible:
  - Closely coordinated pool-based organisations are required in all the involved markets. In meshed networks that can affect several countries.
  - The feasibility of the implicit auction in meshed networks requires close co-ordination of theTSOs to indicate the amount of NTC necessary on the differentinterties
- Linear network (e.g. France Spain)
  - A transaction from France to Spain will bid into the Spanish pool and be granted access exactly as specified in the implicit auction mechanisms.
  - The implicit auction seems to be exactly designed for this case and is indeed feasible for the case.

7 Compatibility with network topology Implicit auction

- Transit flow: linear network (France-Spain-Portugal)
  - A transaction from France to Portugal will bid both a supply (from France) and a demand (from Portugal) in the Spanish pool.
  - Closely coordinated pool-based organisations are required in all the involved markets. In meshed networks that can affect several countries.
  - Demand side bidding should be possible in the Pool. If not, another mechanism will need to be foreseen for the transit flow.

7 Compatibility with network topology Market splitting

- All networks (fixed zones assumed)
  - Pool-based organisations are required in all the involved markets. In meshed networks that can affect several countries.
  - Supply and demand bids are made in each zone
  - Close co-ordination of the involved pools is requires to make the best use of the NTCs between the zones on the basis of these bids. This gives zonal equilibrium prices and congestion fees between the zones.
  - This allocation can be carried out in a more or less sophisticated way.
    - » One possibility is to only rely on totalNTCs between zones.
    - » Another possibility is to account for loop flows and to perform the allocation taking into account the mix of NTCs that transactions between zones require.
    - » A last possibility is to rely on a OPF
  - These different methods will produce different violations of network constraints and hence different needs to resort to corrective measures (counter trading)

7 Compatibility with network topology Counter trading

- Note: counter trading is here understood in the sense of bilateral counter trading
- Meshed network (e.g. France, Italy, Switzerland)
  - Because of loop flows bilateral counter trading on one intertie has an impact on the other interties.
  - By definition, bilateral counter trading supposes that there is no supra zonal co-ordination
  - It is impossible to ascertain the global outcome of the process.
  - Moreover it is impossible to determine an economic sound way of allocating those costs to the transactions responsible for counter trading
  - In case of tight intertie, pure bilateral counter trading may thus be ineffective in meshed networks.

7 Compatibility with network topology Counter trading

- Linear network (e.g. France Spain)
  - Bilateral counter trading will relieve congestion at each intertie in linear network.
  - But there remains a difficulty for finding an economically sound allocation of counter trading costs to the transactions responsible for counter trading (domestic transactions also induce loop flows and hence use of NTCs on the inter ties)
  - Bilateral counter trading is thus a workable method but raises questions of congestion cost charging

7 Compatibility with network topology Counter trading

- Transit flow: linear network (France-Spain-Portugal)
  - The remark on linear networks applies here: bilateral counter trading will relieve congestion at eachintertie in linear network.
- Transit flow: meshed network (e.g. Belgium to Italy via France and Switzerland)
  - the remark on meshed network applies here. Bilateral counter trading may be ineffective in case the needs for constraint relief are important
  - In both cases, there remains an issue of (counter-trading) cost allocation.

7 Compatibility with network topology Re-dispatching

- Note: re-dispatching is here understood in the sense of cross-border co-ordinated re-dispatching involving co-ordination of all the zones
- All networks
  - By definition, cross-border co-ordinated re-dispatching rescheduling takes into account the crossed effects among different interties
  - It is thus a viable method to relieve congestion on theintertie
  - Cost is “socialised”, allocated to all the users of the network

8 Requirements for TSO
Technical sophistication

- Definition and computation of NTCs
  - Because NTC constitutes an ambiguous notion, the methodology (assumptions) for computing NTCs must be made explicit.
    - » There should be no invocation of subsidiarity to hide any part of this methodology.
  - Because the computation of NTCs does not involve any re-dispatching, this methodology should only involve load flow computations under different assumptions of contingencies.

8 Requirements for TSO
Technical sophistication

Explicit auction

- TSOs need to be able to indicate the amount of NTCs required by a transaction on different interties. This is of the same degree of difficulty (load flow) as the computation of the NTCs.
- as indicated above, a combinatorial or multi-round auction can be needed. This requires special expertise.

Implicit auction

- The running of the implicit auction can be made with different degrees of sophistication depending on how the constraints of the network are taken into count. A simple account of NTCs is not difficult, a full account of network constraint is of the OPF-with-contingencies type.
- The new issue is to run this auction in a combinatorial or multi-round context. This requires special expertise.

8 Requirements for TSO
Technical sophistication

Market splitting

- The computation of the zonal prices and hence the allocation of the transaction to the NTCs can be made with different degrees of sophistication depending on how the constraints of the network are taken into count.
  - A simple account of NTCs is not difficult, a full account of network constraint is of the OPF-with-contingencies type. It is understood that the simple account is what is done on the Nordic market.

Bilateral counter-trading

- is of the OPF type on two zones but with limited machines (those available for counter trading)

Re-dispatching

- is of the OPF type on several zones but with limited machines (those available for re-dispatching)

8 Requirements for TSO
Real time or reserve market

All methods

- The auction is a forward market which can be (by definition) conducted without resort to real time market. Similarly market splitting is a forward market. One can also conceive counter trading and re-dispatching as settled in a forward market.
  - Whether there is a need for reserve market or not depends on how the TSO accounts for reserve in the computation ofNTCs. There is a need for a reserve market if this market intervenes in the security criterion used by the TSO for computingNTCs.
- Needless to say the TSO needs both markets (a reserve market because TSO resorts to reserve during real time operation and a real time in order to price deviation from commitment) when it comes to the real time operation of the system. This comes after the closing of all forward markets.

8 Requirements for TSO
A commercial role for the TSO?

Implicit and explicit auctions and market splitting

- do not require a commercial role for the TSO
  - the TSO organises the auction and computes the zonal prices for market splitting.

Counter trading and re-dispatching

- TSO is a buyer of load relief services in the forward market

9 Risk exposure for users of the interconnection
Explicit auction

- The available capacity in day D can be finally lower than the capacity that was auctioned in day D-x: some buyers have to lose their rights
- Possible solution
  - Buyers that bid lower price (i.e., give a lower value to the capacity) can lose their rights first and receive as compensation the marginal price resulting from the auction
  - The compensation is paid (totally or partially) by TSO, to provide incentive for better ATC estimation

9 Risk exposure for users of the interconnection

Implicit auction

- The auction takes place in day D-1, therefore only the actual ATC is sold
- However, reductions can happen in real-time
- Possible solution
  - Buyers that bid higher price to exchange B can lose their rights first and receive as compensation P_B-P_{AB}
  - The compensation is paid (totally or partially) by TSO, to provide incentive for better ATC estimation

9 Risk exposure for users of the interconnection

Market splitting

- The auction takes place in day D-1, therefore only the actual ATC is taken into account
- However, reductions can happen in real-time
- Possible solution
  - Buyers that bid higher price to exchange B can lose their rights first and receive as compensation P'_B-P'_A
  - The compensation is paid (totally or partially) by TSO, to provide incentive for better ATC estimation

9 Risk exposure for users of the interconnection

Counter-trading

- No risk of capacity reduction
- Exposure to price risk: the cost of the counter-trades is only known ex-post
  - High level of transactions can lead to high cost of counter-trades, that will be borne by all users of interconnection
- Possible solutions
  - Make the scheduling of cross-border transactions dependent on resulting price (can be too complex)
  - Develop financial hedges for the counter-trade market (not realistic in the short term)

9 Risk exposure for users of the interconnection

Re-dispatching

- Exposure to price risk: very small
  - the cost of the re-dispatching is socialised

10 Feasibility of implementation

Explicit auction

- Implementation feasible in the short-term
  - Existing experiences
- Varied implementation alternatives and importance of the details
  - Time horizon of the auction
  - Volume of capacity auctioned
  - Guarantees

10 Feasibility of implementation

Implicit auction

- Implementation feasible in the short-term
- Requires exchange in one side: Spain, The Netherlands, Germany, UK

Market splitting

- Requires exchanges in both sides of the interconnection: Germany-The Netherlands
  - Not feasible in the short term in continental Europe

Counter-trading

- Implementation feasible in the short term

10 Feasibility of implementation

Re-dispatching, cross-border co-ordinated re-dispatching

- Implementation requires short term market (reserve, balancing)
- Cross-border co-ordination requires improved co-ordination among TSOs
- Implementation feasible in the short term, but complex

11 Overall evaluation
Explicit auction

- Non discriminatory and efficient
- Inefficiency derived from separation of commodity and transmission service
- Does not modify transfer capacity
  - It can even give incentive to TSOs to be more conservative in their ATC estimates
- Technically sound
- Implementation feasible, but need to pay special attention to many specific details

11 Overall evaluation
Implicit auction

- No discriminatory and efficient
- Does not modify transfer capacity
  - It can even give incentive to TSOs to be more conservative in their ATC estimates
- Efficient: commodity and transmission solved in a single step
- Technically sound
- Implementation difficult, since requirespower exchanges

11 Overall evaluation
Market splitting

- No discriminatory and efficient
- Does not modify transfer capacity
  - It can even give incentive to TSOs to be more conservative in their ATC estimates
- Efficient: commodity and transmission solved in a single step
- Technically sound
- Implementation difficult, since requirespower exchanges

11 Overall evaluation
Counter-trading

- Potential market power problems
- Does not modify transfer capacity (if efficiently implemented)
  - Significant price risks can lead to lower use of interconnection
- Closer to theory than to efficient technical solution
- Implementation feasible, but need to pay special attention to commercial role of TSOs
- Well suited for real-time

11 Overall evaluation
Re-dispatching

- Potential market power problems
- Can increase transfer capacity
- Very close to efficient technical implementation
- Implementation feasible, but requires short term markets
- Well suited for real-time

Contents

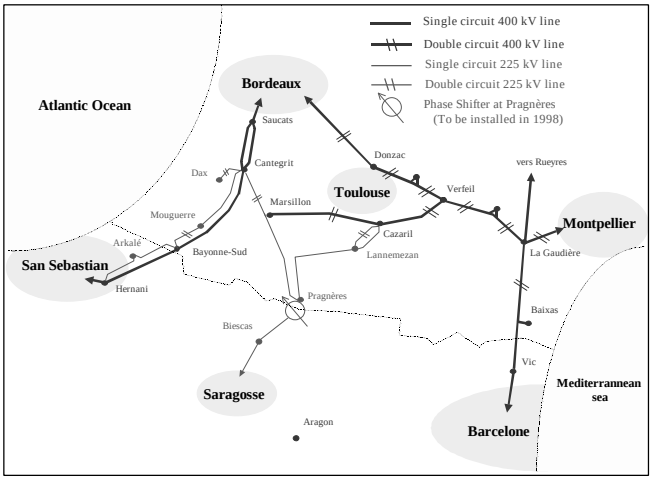
- Solution methods: definitions
- Attributes analysed
- Example of FACTS application

Increase the TTC with FACTS(1)

Example of the PST of Pragnères on the France-Spain Interconnection.

A partial alternative to a 400 kV line between France and Spain.

Increase the TTC with FACTS(2)



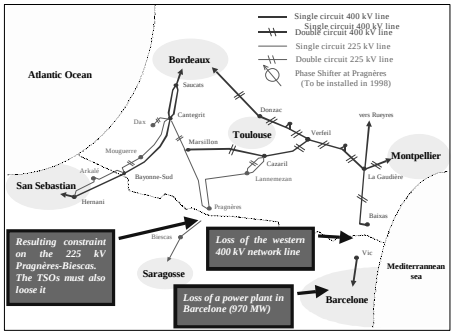
Source: "Evaluation of technical and economical benefits of a PST on the Interconnection between France and Spain"
IFAC/CIGRE Symposium on Control Power Systems and Power Plants-Beijing 1997

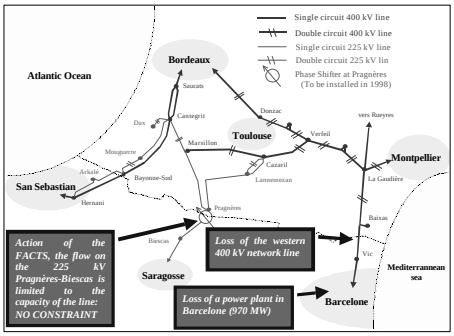
Increase the TTC with FACTS(3)

- Security conditions defining the capacity of the interconnection between France and Spain:
  - loss of on the two 400 kV circuits between France and Spain,

    AND
  - loss of the biggest Spanish power plant (one of the 970 MW plants near Barcelone).
- What happens with and without FACTS if this two contingencies happen nearly at the moment?

Increase the TTC with FACTS(4)





Without FACTS, the interconnection capacity depends on TWO lines:

- the Western 400 kV,
- the Western 225 kV.

With FACTS, the interconnection capacity depends on THREE lines:

- the Western 400 kV,
- the Western and the Central 225 kV.

Increase the TTC with FACTS(5)

- The example of the Pragnères FACTS shows that FACTS can be used to help to solve congestions on interconnections

BUT

- This is not a miracle solution.
- A FACTS gives less additional capacity than a new line.