GENERAL GUIDELINES FOR JOINT CROSS-BORDER REDISPATCH

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SUMMARY

In parallel with the development of the Internal Electricity Market in Europe, it is important for TSOs to develop and implement co-ordinated and jointly executed procedures for congestion and security management up to real time operation. In general, the process of congestion management is necessary in case of scarce transmission capacity. It is primarily performed during the period when the planning of electricity transactions and the allocation of cross-border capacities are done. Due to the highly meshed grids in Continental Europe a co-ordination of congestion management measures among TSOs is of significant importance. During the yearly, monthly and day ahead allocation processes in the electricity markets several options for congestion management exist, such as pro rata allocation, co-ordinated auctioning and co-ordinated use of power exchanges (market splitting or market coupling). The result of this process is a set of transactions for which, according to the latest congestion forecast, no congestions are foreseen in operation. This set of transactions is therefore normally accepted by TSOs as being **firm transactions.**

In fact however, during **real time** operation, many parameters in the electricity system, such as production scenarios and load patterns, may change. This can lead to real time congestion that was not foreseeable in the day ahead congestion forecast. TSOs in such circumstances need appropriate measures to cope with this real time congestion. These measures are generally network topology adjustments and redispatch of generation or load. A special ETSO paper [1] deals with the classification of the available methods and provides the definitions that are the basis also for the present paper.

The goal of congestion management during real time operation is to secure operation of the network and, as far as possible, to **guarantee the firmness** of the accepted transactions and especially of the cross-border capacity allocation. In this paper, the need for a joint cross-border redispatch procedure for congestion management during real time is outlined. It is shown that in the case of joint redispatch a well defined decision making process among involved TSOs and market actors is necessary. All parties need a clear understanding of the procedural steps of the congestion management process as a whole and specifically during operating planning and in real time, the so-called **congestion and security management** (CSM).

Furthermore it is important to define responsibilities and cost sharing principles. The paper gives some main guidelines in order to successfully implement joint cross-border redispatch among TSOs. Reference is made to the potential financial risks for TSOs and the regulatory issues related to joint cross-border redispatch.

1. INTRODUCTION

The TSOs' business processes related to cross-border capacity consist of the following sequence:

1) determination of available capacity
2) allocation of capacity
3) day ahead congestion forecast (e.g. the DACF-procedures applied in the UCTE area) and day ahead congestion management
4) congestion and security management (CSM), intraday and in real time operation.

From the above outlined distinction between day ahead congestion management and congestion management intra day and in real time, it is clear that the CSM is applied, if necessary, once the process of allocation of capacity has been finished.

In the electricity markets in Europe, it is increasingly important that TSOs establish joint procedures on congestion and security management. CSM is applied by TSOs in the operational planning phase and during the day of operation to solve congestion. The current state-of-the-art is that TSOs are able to detect congestion problems by using a co-ordinated day ahead congestion forecast procedure. Experiences have shown that this procedure has been adopted among TSOs with success.

The next step for TSOs is to solve the congestion problems which have been detected within either the operational planning phase or real time operation. Solving congestion problems within a meshed grid such as the one in Continental Europe also requires a co-ordinated, and preferably jointly applied, approach by TSOs.

The aim of this paper is to:

- Introduce and promote the idea of joint cross-border redispatch within ETSO as a measure to guarantee the secure operation of the network and the firmness of transactions
- Describe the main principles of joint cross-border redispatch in real time operation
- Mention possible cost sharing principles for joint cross-border redispatch
- Describe implementation issues of joint cross-border redispatch.

2. MAIN ASPECTS OF JOINT CROSS-BORDER REDISPATCH

2.1 Definition of joint cross-border redispatch

Redispatch in general is a particular congestion and security management measure aimed at relieving congestion in real time. For the distinction between this and other congestion measures see [1]. If the redispatch takes place among TSOs acting in their own control blocks within a single country following a joint determination of the redispatch measures, it is called joint redispatch. In case of a joint approach among TSOs in different countries it is a joint cross-border redispatch.

The measures of a joint cross-border redispatch consist of changing physical injections on specific locations in the transmission system by shifts of generation, and eventually by a reduction of load. Purchase and selling power related to generation shifts or load reductions are always equal quantities leading to two or more new exchange programs between TSOs which always sum zero.

It is the responsibility of TSOs to co-ordinate the shifts of generation (redispatch) as required to solve a congestion in real time operation. A joint cross-border redispatch allows the use of more resources and a wider optimisation, hence allowing congestion management in these cases at minimum costs.

2.2 Parties involved

The joint execution of cross-border redispatch takes place among TSOs in a previously agreed manner. Each TSO then has to ensure that the agreed redispatch of generation is performed in its area. Therefore, joint cross-border redispatch needs a contractual framework among TSOs, and between TSOs and generating companies and participating big consumers in each TSOs area. The latter can be realized either directly or via a balancing market-based mechanism. Such a mechanism can provide program responsibility for market participants and a bidding procedure for providing reserve power which can also be used for joint redispatch purposes. While applying joint cross-border redispatch, TSOs will leave market transactions unaffected.

2.3 Driving forces for joint cross-border redispatch

The main driving force for the implementation of joint cross-border redispatch is a shared interest among involved TSOs, to give market participants the maximum opportunity to use all available cross-border capacity, and in particular to secure the firmness of previous capacity allocations.

The benefits of introducing joint cross-border redispatch are:

- A secured quality of offered products
- Ensuring congestion relief in cases where internal redispatch within one control area only does not solve the problem

- Costs minimization because of the greater availability of more resources compared with the situation of internal redispatch in one control area only, allows a better power flow redistribution as well
- Increased firmness of cross-border allocated capacity (the maximum cross border capacity value has been previously evaluated and possibly agreed among the involved TSOs).

2.4 Prerequisites for application

Joint cross-border redispatch is applied by TSOs having an agreed shared interest and responsibility to relieve congestion problems. TSOs could in the future also share a co-ordinated capacity allocation mechanism, offering and guaranteeing firm capacity rights for cross-border transmission capacity. In such a case the co-operation among TSOs is even stronger and more efficient.

In order to attain this aim, TSOs have to jointly agree on and to co-ordinate the following items:

- Capacity assessment process
- Extensive information exchange for day ahead congestion forecast (DACF, on-line data exchange, cross-border schedules etc.)
- Product definition (e.g. degree of firmness)
- Capacity allocation process
- Understanding and acceptance of each TSO's operational criteria and regulatory obligations
- Operational procedures
- Cost sharing principles.

2.5 Decision making process

A general procedure for joint redispatch or more generally for CSM which has to be agreed upon among TSOs within a binding co-operation contract consists of the following steps:

1. Detection of a congestion
2. Technical risk assessment
3. Information exchange among involved TSOs regarding detected congestion
4. Determination of the possible set of joint co-ordinated measures
5. Decision whether a trigger for starting up of the co-ordinated CSM procedure has to be activated
6. Decision on which measures to activate
7. Measures activation
8. Clearing and settlement of costs

The steps have to be taken within a fairly short time period, which means that control centre personnel need to be well-trained and briefed on a regular basis.

The CSM or more specifically the joint redispatch steps as described above may be further elaborated as follows:

1. TSOs previously define and agree a set of triggers to start the use of joint congestion and security management measures in case of a detected congestion problem. Examples of such triggers are congestions on cross-border lines as well as internal transmission network elements within areas. TSOs together decide whether one of the triggers for the start of the use of joint congestion and security management has been activated.
2. The TSO that detects or experiences a congestion in its part of a cross-border line or on an internal network element takes the initiative to communicate this to the other involved TSOs.
3. TSOs share their view on the risk assessment of the detected congestion.
4. The TSO who is taking the initiative to relieve the congestion asks for information from the other TSOs on the actual possibilities for joint measures (expected risks, efficiency of measure, when, how fast and during which time period the measure can be activated, estimated costs). The investigation of the best possible solution is performed, and possibly TSOs not directly involved are asked for support as well.
5. TSOs agree and decide on which measures to take based on the aforementioned evaluated exchanged information.
6. TSOs apply the decided measures within their systems.
7. TSOs log the joint co-ordinated measures i.e. time period during which the measures have been activated, the related costs and the effect of the activated measures caused on the network conditions for settlement purposes.

In most cases, applying joint cross-border redispatch will not influence the original exchange schedules of market participants. Power balances of areas may be affected and in that case the TSOs taking part in solving congestion will adjust their load frequency control program. These program adjustments have to be settled between TSOs afterwards.

2.6 Cost sharing principles

The general cost sharing principles for joint cross-border redispatch which have to be agreed upon among TSOs within a binding contract are:

- Solving a congestion is a common responsibility of involved TSOs
- Involved TSOs are liable for the costs related to joint cross-border redispatch.

Each TSO has obviously to consider his regulatory obligations that exist for the mentioned issues as well.

An overview on possible methods to be adopted in order to perform the redispatch cost sharing shows three possibilities:

1. Cost sharing contractually agreed among two neighbouring TSOs as far as a single border is concerned

2. Cost sharing contractually agreed among more than two TSOs as far as a border of common interest is concerned

3. European wide multilaterally agreed sharing of redispatch costs through an inter TSO compensation and clearing mechanism similar to the CBT mechanism.

Under all three options the decision on the method of charging market participants for redispatch costs on an national level (e.g. charging special transactions, socialization on all users) is left to subsidiarity to be decided by each TSO, complying with his regulatory obligations.

Following the ETSO vision on a co-ordinated congestion management in Europe, in the future various transmission products will have to be allowed, including trade among non-neighbouring countries. TSOs may have to contribute to solve congestion generated elsewhere, out of their own responsibility, and bear the related redispatching costs.

Considering these circumstances, a form of redispatching cost clearing and settlement mechanism (option 3) appears to be a desirable solution in order to adopt a fair cost sharing principle.

3 CONTRACTUAL ISSUES

When organizing joint cross-border redispatch the following implementation issues are encountered:

- Organizational issues
- Information exchange
- Recovery of costs.

3.1 Organizational issues

When TSOs decide to implement the instrument of joint cross-border redispatch (or CSM in general) a contract among these TSOs should be signed for that purpose.

Sometimes there is no balancing mechanism introduced yet in a TSO's area. In such a case the TSO should make separate contracts with generating companies for the possibility of shifts of generation when asked by the TSO.

Detailed operational procedures are needed for different control centre personnel. It will be useful to discuss practical experienced cases and evaluate the joint cross-border redispatch process. Such evaluations should lead to possible improvements.

The application of joint cross-border redispatch can be organized either in a centralized or in a decentralized way. The decentralized approach requires a lot of information sharing between TSOs, including process data.

3.2 Information exchange

The most critical step within the CSM procedure is to detect the possible shifts of generation that have to be performed in order to relieve the detected congestion. TSOs have to provide their control centre personnel with the necessary guidelines about the decision to be taken. In order to improve and quicken this step, previous joint studies should be performed, in order to detect the most frequent congestion that may occur across a border, thus detecting a predetermined set of possible shifts of generation which have influence on particular cross-border lines or other internal lines affecting the interconnection. Such a set of information is determined by performing sensitivity analyses. An optimal power flow program (OPF) can be used to evaluate the optimal redispatch based on predicted bids and availability data. Based on this information, control centre personnel can more easily decide which generation shift is suitable to solve congestion when it is detected, taking into account the actual bids and availabilities of the generation plants.

TSOs have first to share knowledge regarding all possible non-redispatch CSM measures, like topology changes, to be applied in a co-ordinated way before the generation redispatching. This means that control centre personnel know in advance which possible CSM measures can be activated by other involved TSOs .

In order to attain the high coordination level required, TSOs have to exchange even more on-line data from their control systems than regularly practiced nowadays (including real-time remote measurements and signals). This will be necessary not only to detect congestion problems and to monitor the effects of activated joint cross-border redispatch measures but also to foresee the evolution of potentially dangerous situations.

In case there is no balancing market mechanism, TSOs have to agree upon the necessary information exchange with generating companies willing to participate in joint cross-border redispatch.

3.3 Recovery of costs

Details of any division of costs among TSOs related to joint cross-border redispatch have to be fixed contractually and previously decided and agreed with regulatory bodies.

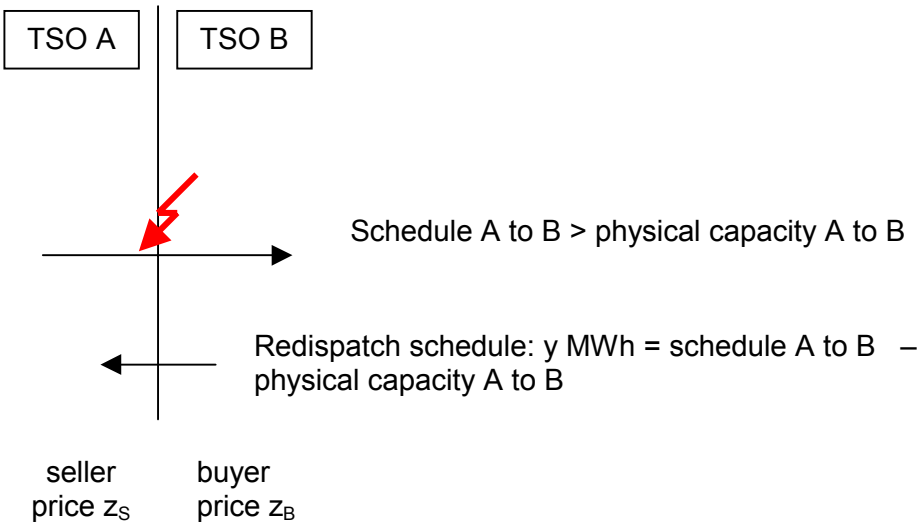
In case a TSO has to shift generation downwards it implies that the TSO may receive a remuneration from the production company. The TSO that has to shift generation upwards has to pay the involved production company. When a balancing mechanism is already operational within a control area the prices related to bids for shifts of generation are known.

TSOs need to discuss the issue of recovery of the costs of joint cross-border redispatch measures with the regulatory authorities and market participants. Possibilities for remuneration of incurred costs are either through grid tariffs to be applied to the allocated cross-border capacity in order to guarantee its firmness, or by using the revenues from the applied allocation mechanism (e.g. an auction). There is a price attached to the additional service of guaranteeing the firmness of cross-border capacity.

There is also a financial risk which depends on the volume of capacity rights which are allocated or auctioned in advance. If this risk is borne by users, this volume should be determined by a transparent and agreed process. If it is borne by TSOs (firm capacity allocation), perhaps under incentive agreements, they should have the ability to manage the risks.

A specific and simple example for cost division of cross-border redispatch between two TSOs is shown next[1].

Situation in hour x:



I. Costs for TSO B: CB = y MWh * zB
II. Income for TSO A: IA = y MWh * zS

TSO A compensates TSO B for income IA
Remaining costs for TSO B: RB = CB - IA

If TSO B is “responsible” for the congestion in the sense of being liable to bear the costs and to charge it according to his national rules: TSO B covers RB alone.
If TSO A is “responsible” for the congestion: TSO A compensates TSO B for RB.
When there is no definitive answer to the question as to who is responsible for the congestion: TSO A compensates TSO B for RB/2.

4. REFERENCES

[1] Notice on Counter Measures for Congestion Management, ETSO June 2003

[2] Definition of transfer capacities in liberalized electricity markets
ETSO, March 2001

[3] Procedures for cross-border transmission capacity assessment
ETSO, October 2001

[4] Co-ordinated congestion management, an ETSO vision
ETSO, February 2002

[5] Loadflow and congestion forecast
UCTE SG Network Models and Forecast Tool, July 2002

[1] Counter-trading is one special example of co-ordinated redispatch in Nordpool