Opening Europe's balancing power markets

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Balancing power is an essential element of a liberalised energy market and an important factor for both security of supply and settlement of energy transactions. The market segment is not very significant, but the margins for the service providers can be lucrative. Prices for balancing energy should be transparent and cost reflective.

The requirements of a well functioning balancing market are complex as the various stakeholders have divergent interests. Generators require adequate returns, regulators want to encourage competition to drive prices down and TSOs require sufficient balancing power to keep the system in balance.

This article describes the operating requirements concerning balancing power in various countries, discusses the implemented market rules and elaborates on some achievements and shortcomings of recommendations for better harmonized balancing markets in Europe.

Technical framework for load-frequency control

The synchronously operated European transmission network UCTE is divided into different control areas each operated by a single transmission system operator (TSO) responsible for keeping the power balance and for facilitating cross-border exchanges.

As shown in figure 1 the balancing of the UCTE system is carried out in a three-stage control process whose different phases overlap chronologically to some extent.

1. The primary control immediately restores the balance between generation and demand within the synchronous area. The joint action of all interconnected generators subject to primary control, system frequency is kept in permissible limits and stabilised at a quasi-steady-state value different from the frequency set point value. Primary control is activated automatically and immediately by the deviation in the system frequency.

2. Secondary control adjusts the frequency offset and restores cross-border exchange to the values agreed between companies. Thus primary control reserve is fully available again. Secondary control is automatically applied to selected generator sets in the control area affected by the power imbalance.

3. Tertiary control is used to free up secondary control reserve. Tertiary control reserve also referred to as "minute reserve" is the responsibility of the TSO and usually activated manually by the affected TSO. In principle it is possible to activate minute reserve located in another area other than the affected control area if sufficient transmission capacity is available. But from an economic point of view the TSO will prefer to use the transmission capacity for trading transactions.

Inside the UCTE network, UCTE rules describe these three technical products for the physical balancing of the system. Outside the UCTE different rules are applied with major differences in secondary control. For example in the UK and Wales the specification of secondary control describes a technical product which is regarded as a part of primary control in terms of UCTE. Within the Scandinavian NORD Pool system the term secondary control is used for manually activated reserve which is similar to the definition of minute reserve by the UCTE.

Recapitulating this section the following types of control reserve can be distinguished in general:

- automatic frequency control (primary and secondary reserve);
- manually activated tertiary control reserve or minute reserve.

Development of balancing markets

Based on its strategy paper of March 2003 and subsequent market developments, the European Commission and most analysts agree that the development of regional energy markets is the way forward for liberalisation and the creation of a pan-European electricity market.

Ensuring sufficient interconnection capacity and eliminating bottlenecks on high voltage lines inside member states is key to avoiding congestion on
interconnectors and creating such regional energy markets. Based on well interconnected neighbouring countries, the EC expects the development of regional harmonization of tariffs, market opening, rules for bilateral trading as well as congestion management methods.

Balancing power is identified to be one of the crucial parameters to a well functioning market. Further improvements regarding the balancing power market are foreseen for 2005 and 2006. At present the existing and necessary control areas are a barrier to the exchange of current types of balancing power. The International Federation of Industrial Energy Consumers claims that the TSO must purchase the balancing power in a transparent way without unjustified advantage to incumbent suppliers.

**International models for provision of balancing power**

In general there are two models for the provision of balancing power:

- Provision on a mandatory basis, against payment or for free
- Provision based on bilateral contracts or markets. Payment can be market-based or regulated.

In several European countries it is mandatory for power plants exceeding a predefined power rating to offer and supply primary balancing power. This is implemented with cost-based revenues such as in France and the UK. In Austria, Spain, Italy, the Netherlands, Switzerland and Slovenia it is obligatory to supply primary balancing power without compensation. There is no obligation to offer and supply secondary balancing power in any European country except France. In France the supply of secondary balancing power is paid cost-oriented. In Germany, Poland, Norway, Denmark and Sweden there are no mandatory bidding systems for any balancing power.

In case of a payable provision of primary balancing power, payments are calculated on the basis of demand rates in all markets. Secondary balancing power is paid with the help of demand rates for provision and kilowatt hour rates for the energy supplied. Tariffs are usually negotiated, and in some cases must be approved by regulatory authorities.

Both primary and secondary balancing power are automated control systems used to ensure a secure operation of the transmission network. Only to a small extent are they suitable for market based trading actions. This fact is also shown by the duration of the contracts. Internationally they are valid.
up to one year for primary and secondary balancing power and therefore last much longer than contracts for minute reserve.

In all countries it is obligatory to provide minute reserve although again in most countries the TSO is allowed to direct the generation units to supply balancing power in the case of abnormal system conditions. Usually there is a strong relationship between the minute reserve market and spot market. In the case of Great Britain, tenders for the spot market and the balancing power market are done together. In the Netherlands and Norway balancing power market clearing will be done after clearing of the spot market.

The following section gives a brief overview of option markets for minute reserve. Option markets are a possibility to introduce more competition in the provision of minute reserve and simultaneously make a contribution to ensure a secure system operation.

Participation in minute reserve markets is usually optional. To ensure sufficient offers an option market is set up such as in the case in Norway. By an option the supplier is obliged to provide a fixed amount of minute reserve for a certain period of time to the balancing market, in general the conditions for participation in the option market are similar to those for participation in the balancing power market.

Analysis of the current practise of procuring balancing power in the EU shows that there are de facto national submarkets with different market rules. Competition is not sufficient and as a consequence balancing power is not supplied at the most reasonable price available. The following section describes two options to introduce more competition in balancing power markets.

Introducing competition in balancing markets

The first option to introduce more competition in balancing power markets is to separate the markets for minute reserve and balancing power. For the minute reserve an option market is established. The ISO uses the option market to procure an option on his individual amount of minute reserve. It is obligatory for the supplier selected by this option to provide balancing power.

The main aim of the minute reserve option market is to ensure stable system operation. Therefore the period of time the contracts are awarded for should be longer than for balancing power markets and if necessary tenders can be staggered annually, quarterly, monthly and weekly to enable proper planning for all participants.

In the balancing power market every undertaking which meets necessary technical prerequisites can participate. Both generation units as well as large customers are allowed to put in a tender to the balancing power market if they are able to supply the appropriate balancing power within a few minutes. The advantage of this concept is that there is no need to allocate transmission capacity on cross border lines on a long term basis to ensure the provision of balancing power.

The second option is the exchange of balancing power between the TSOs of different control areas. In order to ensure the use of balancing power at the most reasonable price it is necessary to introduce standard procedures for the exchange of balancing power between the TSOs. Only via standard procedures is it possible to prove transparently that the use of balancing power is carried out at least cost. The advantage of this concept is the avoidance of confusing relationships between the TSOs and the providers of balancing power across various control areas.

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