



Organization of the Balancing Electricity Trade in Russia

The balancing market of electricity in Russia is an aftermarket to the day-ahead market. It is a real-time market organized by the System Operator (SO) of Russia with the main objective of minimizing the costs of deviations of actual electricity consumption and production from the planned day-ahead market trade schedule. The auctions of participants' offers in the balancing market are held by the SO twelve times during the day of actual delivery of electricity. In the balancing market auctions, the SO utilizes the same concept of bid-based, security constrained economic dispatch with nodal prices which is employed in the day-ahead electricity market of Russia. The nodal prices obtained in result of optimization in the balancing market auctions are called "indicators of balancing market". Similar to the day-ahead market's nodal prices they also include the costs of marginal energy, marginal losses and transmission congestions.

Price offers of market participants

As opposed to the day-ahead market auctions in which customers are allowed to make their price bids, the short-term electricity demand in the balancing market is forecasted by the SO, and customers with non-dispatchable load are not allowed to bid into the auctions. In addition, the bids of generators that they have posted earlier to the day-ahead market are utilized by the SO for the second time in the balancing market auctions. Nevertheless, producers and customers with regulated consumption have right to modify their price offers by sending to the SO "quick" price taking offers for change of their production and consumption amounts. The offers must be submitted to the SO at the latest on 90 minutes before the next balancing market auction takes place. When submitting a price taking offer, a producer must specify the amount of electricity to which he is willing to increase or decrease his production irrespective of prices that will be formed in the balancing market auction. Similarly, a customer with regulated consumption must specify the amounts to which he is willing to increase or decrease his consumption irrespective of the future auctions prices. The modified offers are then utilized by the SO to establish optimal production schedule of generators sufficient to meet the forecasted demand over a next two hours horizon.

Those generators which stay off-line after the unit commitment procedure, can be turned on in the balancing market in case there is a need for their production in real-time optimal power dispatch for the system. In accordance with the market regulations, uncommitted generators can optionally submit their day-ahead market price offers to the commercial operator. The offers, however, should contain additional information about start-up costs of the respective generation units. These offers are not taken into account

during the day-ahead market auction but they are transferred by the Administrator of Trade System to the System Operator, which can utilize them in the balancing market auctions.

Types of deviations in the balancing market

The real output of generator and real consumption of customers always differs from their production and consumption schedules obtained in the day-ahead market. In compliance with the market rules, all deviations between planned and actual trade schedules at nodes can be attributed to *internal* and *external* initiatives of market participants. Deviations in production schedule of a generator are attributed to his *external* initiative when they are caused by his participation in the balancing market trade, off-scheduled commands received from the SO and operations of automation control devices in the power system. If a generator fails to produce in accordance with his day-ahead market schedule for some other reasons, then deviations in his production are attributed to *internal* initiative of the generator. Deviations between planned and actual consumption of customers with non-dispatchable load can be attributed to their *external* initiatives only if they are caused by operation of power system automation. In all other cases, changes in consumption amounts of customers are attributed to their *internal* initiatives.

Settlement in the balancing market

The prices charged to market participants for their deviations depend on types of incentives that caused these deviations. For instance, if a generator breaks down and fails to produce the scheduled amount of energy at the very last moment before the hour of actual delivery begins, he must buy the required amount of electricity in the balancing market in order to fulfill his obligations in the day-ahead market. In this case, it is considered that a generator has decreased his production on his *own* initiative. Therefore he must pay the purchase of electricity off at the maximum value of the day-ahead market price, balancing market price or his day-ahead market price offer. Similarly, if a generator overproduces electricity at his own fault, he must sell his surpluses at the minimum value of day-ahead market price, balancing market price or his day-ahead market price offer. Table 1 shows the general principles for setting prices of deviations depending on the types of initiatives.

Table 1. The prices for deviations invoiced to market participants

Incentive type	Suppliers with price offers	Suppliers without price offers and suppliers with "quick" price taking offers	Consumers with dispatchable load
<i>External, up</i>	Max (BM price, own DA price offer)	BM price	Min (BM price, own DA price offer)
<i>External, down</i>	Min (BM price, own DA price offer)	BM price	Max (BM price, own DA price offer)
<i>Internal, up</i>	Min (BM price, DAM price, own DA price offer)	Min (BM price, DAM price)	Max (BM price, DAM price, own DA price offer)
<i>Internal, down</i>	Max (BM price, DAM price, own DA price in offer)	Max (BM price, DAM price)	Min (BM price, DAM price, own DA price offer)

The producers whose generation units were prescribed to turn on in the balancing market must receive compensation for "cold starts" of the units. The start-up costs of the generators are distributed among the customers and producers in proportion to their total monthly amounts of deviations caused by *internal* initiatives.

It is important to note that, owing to different prices charged to market participants for deviations in production and consumption at their nodes, the total financial obligations and requirements of market participants in the balancing market do not coincide. If a positive imbalance takes place i.e. the total financial obligations of market participants exceed their total requirements, the excess is distributed among those market participants whose deviations were caused by *external* initiatives and among the customers which carefully plan their consumption. If a negative imbalance takes place i.e., the total financial obligations of market participants are less than their total requirements, the deficit is collected from those market participants whose deviations were caused by their *internal* initiatives.