

# **Demand-side management and benefits for the cross-border market integration**

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In the last decade, two main trends in electricity world are towards an increase in the use of renewable energy sources and more efficient use of energy. Both above-mentioned issues are motivated in the first place with the aim to reduce green-house gases (GHGs) emission and to reach well-known 20-20-20 targets until 2020: reduction of EU GHGs emissions of at least 20% below 1990 levels, 20% energy consumption from renewable resources and a 20% reduction in primary energy use compared with projected levels.

At the same time, the process of electricity market opening is still on its way and the role of high-voltage transmission system is becoming more and more important: as the linkage between centralized production and consumption centers and the main precondition for integration of national electricity markets. Additionally, another issue which becomes evident is increase of electricity production from distributed generation and renewable energy resources (wind and solar) which is strongly promoted by the different national energy policies. Energy production from wind and photovoltaic units is governed by the availability of the primary energy source, hard to predict and could bring the transmission and distribution system into insecure state and jeopardise the security of supply.

During some periods of year and in some network places, we can already observe an increase in the network insecure states (for example more often non-fulfillment of n-1 security criteria) and needs for network enhancement to bring the flexibility to integrate the variable generation. European energy policy, with the promotion of renewable energy resources, initiated also the need for flexible and fast-ramping generation for balancing purposes. One of the tasks of transmission system operator (TSO) is to balance the energy production and consumption in any moment of time in order to restore frequency to the predefined level and preserve security of supply. This task becomes more challenging with the liberalized market as balancing responsible parties (BRPs) are in charge of consumption forecast and intermittent resources are usually dispatchable as must-run units – whose production is not so easy predictable. One of the additional difficulties lies in the fact that each electricity producer can freely decide on which market segment he would like to sell available electricity (forward, day-ahead, intraday) and therefore TSO has to make sure beforehand that enough reserve is available for the system balancing in real time. This is assured over capacity market whose margins are also increased in the last few years as the installed capacity from renewable resources has reached the record levels.

The current trend will also be maintained in the future, as the proportion of the electricity generated by large conventional plants will be replaced by distributed generation, DSM and renewable energy sources. It is most likely that an additional stand-by capacity will be contracted in cases that the variable output of wind/solar ceases to generate power and there is not enough demand response to cover the unbalance which occurred. The special attention has to be paid to fulfillment of UCTE regulation – as for example - the coverage of biggest unit outage in each control area.

In the paper, a possible role of the demand side management (DSM) on the national balancing capacity and energy market has been described. It could be shown that with the DSM integration an additional capacity could be available for the system balancing purposes which would be especially important for small control areas. This will lead to the competition increase, decrease in market power and costs decrease. Further improvement and savings could be achieved with the integration of national balancing markets, especially if they operate with the different mix of technologies (hydro vs. thermo). This integration will lead to the social welfare increase for the integrated markets and costs and benefits distribution among market players.