CONTROLLING ACTIVE CONSUMER FOR DSO BALANCING COST REDUCTION

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ABSTRACT

The paper presents the use of active consumers to reduce the balancing cost of an DSO. The first part of the paper shows a practical balancing case on a Romanian DSO and the second part explains the system architecture and the real life approach to cost reduction by active control. Together with the conclusion short considerations on social impact of the active balancing mechanism are made.

INTRODUCTION

The Romanian law asks for the DSO to trade and balance its own consumption. As could be seen in figure 1, the market mechanism includes long term contracts and day ahead adjustments as most of typical EU market mechanisms [1].

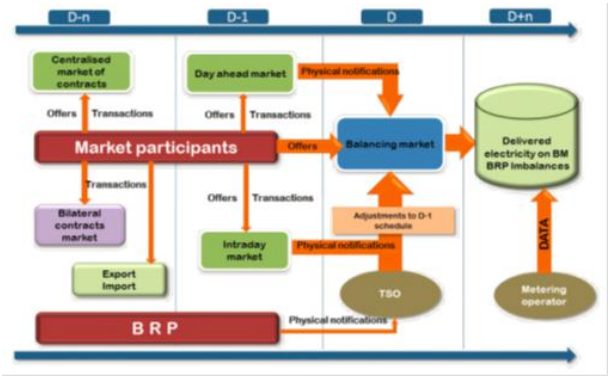

Figure 1 Romanian market overview [2]

DSO's as well as TSO's must compensate losses through BRP (balancing responsible party) as seen in figure 1. Typical process for this includes:

- Losses forecast based on overall consumption in the DSO area and load profiles defined by special customers;
- Energy acquisition in 'Centralize market' based on losses forecast
- Daily analysis of the imbalances estimation and Day Ahead Market (DAM) adjustments;
- Balancing Market deal confirmation through a BRP (balancing responsible party).

It is obvious that the process of representing in the balancing market the DSO has some uncertainties and a rough analysis for a limited area in the Transvilvania Sud county leads to a situation of the excess and deficit as described in figure 2.

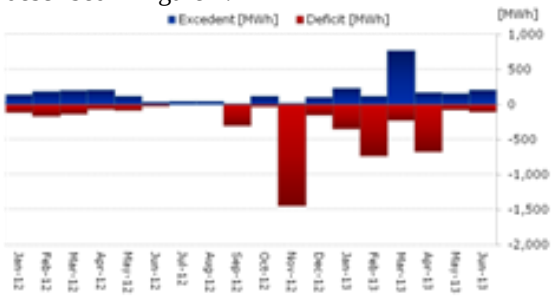

Figure 2 one year and a half monthly losses imbalance analysis for Transilvania Sud DSO

The imbalances in figure2, determines costs for the excess and/or deficit transactions of the DSO in the balancing market. Figure 3 shows an estimation of the 2012,2013 costs taking DAM as reference.

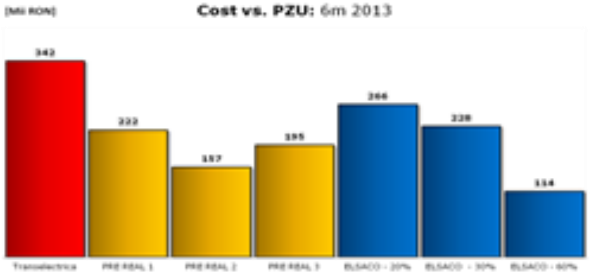

Figure 3 the balancing costs of the DSO during the 18 month survey period

The estimations were made in two major scenarios passive vs. active BRP(s). The active BPR is supposed to have 20%,30% and 60% efficiency. If we correlate the information from figure 2 with the information in figure 3 we can determine that one of the problems of the balancing costs is the lack of predictability. As could

be seen in figure 2, from one month to another the quantity in excess and or deficit could multiply many times.

ACTIVE BALANCING ARCHITECTURE

Typical BRP collects the quantities of energy contracted by the BRP participants and communicates it to the balancing market platform.
On the platform, the deals are compared and validated. After the market closure the information is forwarded to the national dispatch. Based on the quantities anticipated by contracts, the national dispatch is programming the system management for the next day.
BRP is no longer involved in system management.

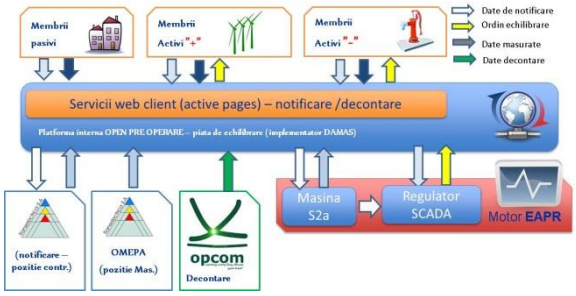

Figure 4 Active BRP system

In order to do the active balancing, the BRP must collect the information regarding availability of the active consumers. Based on this information a rough programming is done, and depending on the excess and/or deficit, balancing orders are sent.

ACTIVE CUSTOMER IMPACT

The domain of active balancing is not new. Initiatives like Load control or load management, that in the past were known as demand side management (DSM), allowed the balancing the supply of electricity on the network with the electrical load by adjusting or controlling the load. In the end there is a direct intervention of the BRP in real time to influence consumer behavior. The effects of implementing active balancing on the economic operators' level, and especially on the territorial administration units (municipalities, prefecture etc.) level will occur after an average or long period of time (between 10 and 20 years) and will consist of:

- Increasing social responsibility regarding resources/energy management (both at the organizational level and individual level), because active balancing implementation comes along with a grants and penalties scheme (penalties for inaccurate estimates and grants for the exact ones). The constant use of this scheme type for a sufficient time period will convert "framing in the made and communicated to PRE predictions/ estimates behavior" in a social norm (rule). This process will be a long-term one, the required time interval largely depending on the cultural determinations of each community/populations. But, upon completion of this transformation process of the responsible behavior into social norm, it will be possible to quit the bonus/penalty scheme which initially generated the behavior.
- A strengthening of local communities and an increased of their importance in social space and in social structures, given that local authorities (mayors, prefecture, etc.) will use the active balancing systems, controlling both production and consumption capacity inside the managed community. Communities will win, in this situation, some energetic independence or, at least will be able of full management for their energy costs. The necessity of community's own adjustment of power/energy inputs and outputs will increase cohesion within the community. The energetic independence obtained will enhance the sense of belonging to the community and will determine a strong delineation of the community identity, especially in the context of competition between communities in getting the lowest costs for power/energy.

Regarding the introduction of active balancing in households (domestic consumers), this will be done using electronic components incorporated in home appliances, direct involvement of the individual being limited. The impact will be initially felt on the purchasing power of individuals, the new intelligent components leading to an increase of the price for home appliances. Subsequently reactions will occur at social level vis a vis the intimacy vitiation problem and the discomfort due to equipment intrusion in the routine and the privacy of individuals by reducing the control that the individual has on his own equipment in his home, and by transmission of data on energy consumption and usability of his home appliances. So the new electronic components along with the active balancing system could be blamed and even rejected by the masses. The intensity of these reactions will be influenced by the cultural dimensions characteristic for each community / society, but this makes the subject for other analysis.

PRACTICAL RESULTS COMING FROM ACTIVE BALANCING OF THE LOSSES

Energy balancing market is an important step in managing the electricity internal market. The dynamic environment of energy market in Romania requires particular attention to demand response and integration of renewable energy sources with the aim to increase their participation in balancing markets. More customers become interested in software tools that allow better efficiency and reduce losses in energy contracts.

Taking into account the area analysed, for one month we had a total of 418MWh imbalances in losses market compensation. That led to 302 thousand lei costs in the balancing market. The amount of money has a buy/sell deal behind each hour of the time frame analysed.

Table 1 shows the main parameters of the time series of the the losses imbalances during one month. One important figure in the analysis is the mean because this will be used to gather the active load for controlling imbalances.

Table 1 imbalances descriptive statistics

	Dezechilibru	*Exces*	*deficit*
Mean	-0.581	0.916	-1.497
Standard Error	0.121	0.057	0.087
Median	-0.195	0.000	-0.195
Standard Deviation	3.235	1.521	2.326
Sample Variance	10.468	2.314	5.408
Kurtosis	1.696	6.380	5.602
Skewness	-0.621	2.323	-2.158
Range	25.416	8.972	16.444
Minimum	-16.444	0.000	-16.444
Maximum	8.972	8.972	0.000
Sum	-418.651	659.272	-1077.923
Count	720.000	720.000	720.000
Largest(10)	7.106	7.106	0.000
Smallest(10)	-9.491	0.000	-9.491
Confidence Level(95.0%)	0.237	0.111	0.170

By using an active balancing capacity of 1,5MW for deficit and 1MW for excess we improve the financials from 302 thousands lei to 222 thousands lei by more than 30%.

CONCLUSION

Active control of the load could reduce DSO costs in balancing market.

References

[1] Booz & Coompany, Amsterdam, “BENEFITS OF AN INTEGRATED EUROPEAN ENERGY MARKET”,http://ec.europa.eu/energy/infrastructure/studies/doc/20130902_energy_integration_benefits.pdf

[2] Annual Report 2006 – Romanian Energy Regulatory Authority, http://www.anre.ro/informatii.php?id=354