NAME : ILISIU DOINA
COUNTRY : ROMANIA
REGISTRATION NUMBER : 1062

GROUP REF. : C2
PREF. SUBJECT : PS2
QUESTION N° : 2.1

Flexible balancing power services within four control zones, using e-trading platform – FutureFlow* project

Four European TSOs of Central-Eastern Europe (Austria, Hungary, Romania, Slovenia), associated with power system experts, electricity retailers, IT providers and renewable electricity providers, designed unique regional cooperation scheme, aimed at opening Balancing as aFRR (frequency restoration reserves with automatic activation) markets to new sources of flexibility. Balancing simulations and analyses cover different situations: FRP (frequency restoration process) as control demand or control target, type of reserves – harmonized standard products (5 minutes as full activation time- FAT) and specific products (10 minutes FAT) of balancing energy, different cross-zonal capacity calculation approaches: NTC (net transfer capacity) based and Flow based, and different strategy for payment of activated balancing energy bids: pay as bid and marginal pricing.

As basis for the simulation data the realised responses of aFRR controls, balancing energy bids and ATC (available transfer capacity) values were use, which were provided by TSOs, from the period 6th – 31st March 2017. Flow based-like available cross-zonal capacities were calculated based on representative network models from that period.

The evaluation of cost savings was performed for a selected target model implementation. The target model selected was based on control demand and 5 minutes FAT standard product and was compared with same product in each country but without cross-border cooperation, considering the following indicators: amount of activated aFRR balancing energy, aFRR balancing energy prices and total costs of activated aFRR balancing energy. Analysis was performed using the obtained simulation results regarding March 2017 data for these two cases. Imbalance settlement period was defined to be 15 minutes. The result of pricing of activated balancing energy was analysed in two potential principles as harmonized approach: pay-as-bid method – for all BSPs (balancing service providers) receiving settlement price that they submitted and local marginal pricing - all BSPs receive settlement price set by the most expensive activated bid within that control area.

For upward direction the implementation of aFRR cross-border cooperation reduced the prices of TSO-BSP settlement from (58-92) EUR/MWh to (55-82) EUR/MWh range. Highest impact is observed in Austria, with price decline of 24 EUR/MWh, followed by Slovenia and Hungary, with price decline of 10 EUR/MWh and 7 EUR/MWh. In Romania, price remained almost on the same level, since Romania is mainly exporting, and level of aFRR activated bids stays similar to the one observed in reference case. From regional perspective, costs for activated aFRR upward energy decreased for around 9 EUR/MWh with regional cooperation. (Figure 1).

For downward direction the implementation of aFRR cross border cooperation increased the weighted average prices of TSO-BSP settlement from (-75-6) EUR/MWh range to (-18-7) EUR/MWh range on regional level. This represents positive effect and implies overall cost reduction. Highest impact is observed in Slovenia with 57 EUR/MWh, followed by Austria with 26 EUR/MWh. Hungarian price almost converged to zero, while in Romania, modest effect of 0.4 EUR/MWh is observed. From regional perspective, average price for activating aFRR downward energy increased from -18 EUR/MWh to 0.5 EUR/MWh. Overall, total aFRR balancing costs on regional cooperation decline.

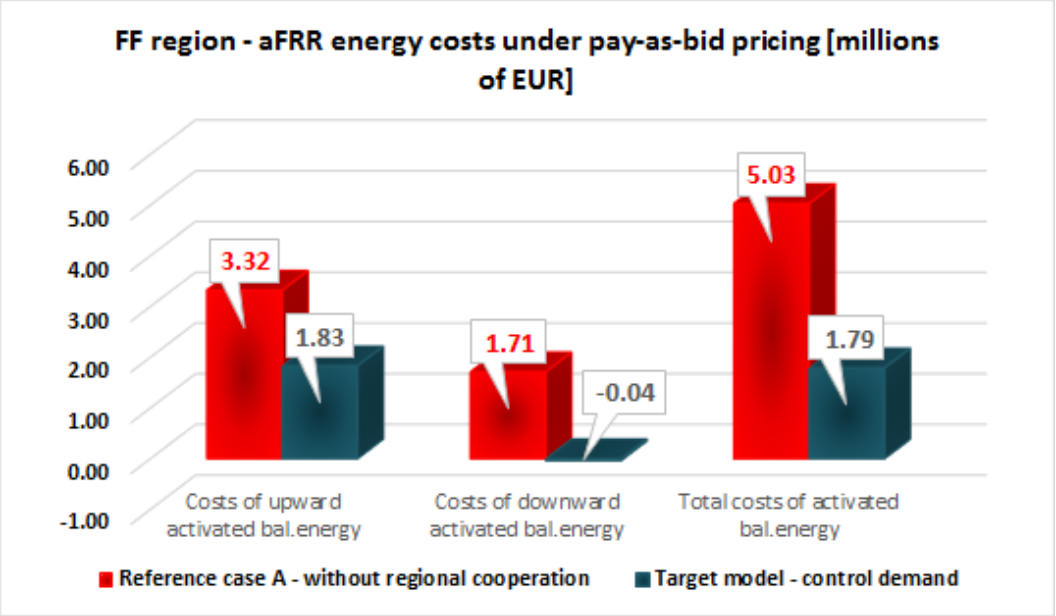

Figure 1 – aFRR energy costs under pay-as-bid pricing scheme

At first glance it can be noted that introduction of marginal pricing produces sharp increase of TSO-BSP settlement prices compared to pay-as-bid mechanism.

In case of marginal pricing scheme, for upward direction, on a country level, with local marginal pricing, notable greater price differences between countries are observed compared to pay-as-bid pricing. The ratio between the most expensive (APG) and the cheapest (TEL) is 9:1, compared to the 1.6:1 ratio observed in pay-as-bid mechanism. For downward direction there are similar effects, with average prices of TSO-BSP settlement changing from -265.5EUR/MWh to -109 EUR/MWh. This produces the drop of aFRR balancing costs for downward direction.

Overall, total aFRR balancing costs (Figure 2) on the level of regional cooperation decline and the local marginal pricing mechanism indicated the significant cost savings potential.

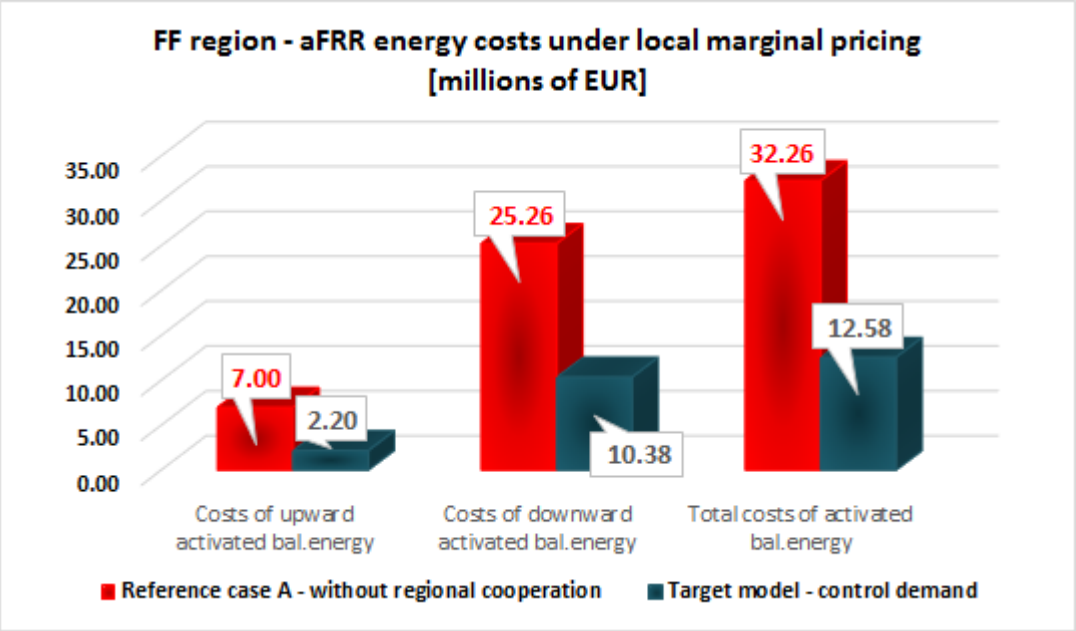

Figure 2 – aFRR energy costs under local marginal pricing scheme

It can be concluded that for both pricing schemes, benefits from introducing the regional cooperation under the selected target model are rather high, with potential cost reduction of more than 60%. It is important that the potential savings incorporate joint benefits of both imbalance netting and common

merit order list (CMOL) activation, since selected target model based on control demand and standard products, envisages that imbalance netting process is implicitly embedded within the Control Demand optimisation. In this way also, more efficient usage of CZCs is enabled.

Previously conducted analysis is based on NTC-based target model, with network constraints for simulated period defined as ATC values per border. Calculated cost savings potential for the case of introduction of flow-based network constraints is presented in the figure below (Figure 3).

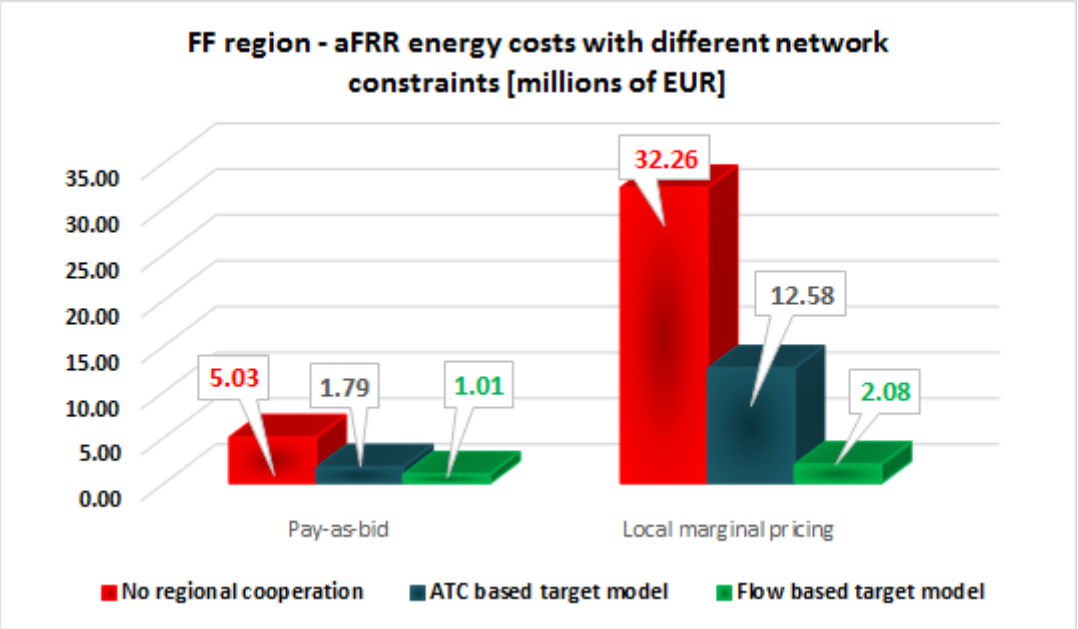

Figure 3 – aFRR energy costs under different network constrains

With introduction of flow-based constraints, which in this case resulted in unconstrained situation, higher potential for cross border trading in enabled, therefore more cheaper bids from one area are activated on account of more expensive ones in another area.

CONCLUSIONS AND WAY FORWARD

Significant improvement of overall ACE (area control error) quality compared to status quo situation without regional cooperation. The Integration Case based on Control Demand activation with Standard Product shows better ACE control quality indices than other two Integration Cases.

Integration Control Demand activation with Standard Product can be easily integrated into existing LFC (load-frequency control).

From reliability and backup procedure application point of view Control Demand activation with Standard Product is preferred solution.

Hybrid of Standard & Specific product would restore the size of eligible bids at the regional aFRR market. Having specific product as well, would increase liquidity as more resources is capable offering aFRR, but on the low side, as FAT 10 min in simulations inevitably reduce ACE performance, it is also important to limit the amount of specific products.

Introducing the regional cooperation under the selected target model has a potential cost reduction of more than 60%. Observed potential savings incorporate joint benefits of both imbalance netting and cross-border CMOL activation, since selected Control Demand activation with Standard Product envisages that imbalance netting process is implicitly embedded within the Control Demand optimisation.

- This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691777.