Young Researcher Symposium IEEE Benelux Chapter IAS/PES/PESC,
April 24 – 25, 2014, Ghent, Belgium

POSITIVE BALANCING SERVICE BY SOLAR VIRTUAL POWER PLANTS

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Abstract. During the past years, a large amount of photovoltaic (PV) capacity has been installed in Belgium. The main driver for this was the abundant government support (GreenPower Certificates). However, during the last few years, the support for new installations has been withdrawn and new PV capacity ceased. In previous research, it has been proven that selling PV energy of existing plants directly on the wholesale market is not feasible due to the large share of green power certificates awarded to these plants. However, the price of green power certificates has dropped significantly and hence the balance between certificate and commodity revenue is restored. This paper investigates the possibility of providing positive balancing services to the transmission system operator by aggregating solar power in a technical Virtual Power Plant.

Keywords: Market access, Photovoltaic power, Virtual Power Plant.

INTRODUCTION

The last few years, photovoltaic solar (PV) power was seen as an attractive technology to produce environmental friendly electricity [1]. Government offered an abundant financial support scheme to investors, which resulted in a large expansion of the installed capacity. Due to the green and clean label of PV power, government awarded this (and other renewable energy sources) a privileged status. Renewable energy sources are largely excluded from balancing obligation and market participation. This resulted in a situation where most of the revenue of PV installations came from governmental subsidies (green power certificates) and not from the selling of energy. As investigated in [2], in the former subsidy scheme in Flanders (Belgium) the balance between commodity value and subsidy income makes it not feasible for PV owners to participate in wholesale market operation. The potential extra revenue is not up to the added risk of a volatile and uncertain market. However, due to the quick decline of the GPC price, for new installations it can become economically profitable to act in the wholesale market as average day ahead market price is generally higher than the fixed price offered by suppliers. However, the variability and the unpredictability of PV power makes it very hard to determine the available power to trade. As energy is traded in the day-ahead wholesale market one day before actual delivery and mismatch is penalised, trading the entire PV production is not without risk. In previous research (in publication phase), it has been proved that often the imbalance market can be more profitable than the day ahead market. In this paper, it is investigated if it could be profitable to omit the day ahead market entirely and provide only positive balancing services. This is verified by the data of 2013, provided by the Belgian transmission system operator Elia [3].

NEED FOR NEW TRADING STRATEGIES

During recent years, abundant financial support was provided for renewable energy sources. In Flanders (Belgium) for example, abundant green power certificates were awarded to e.g. wind and solar installations. However, today, new installations do not receive these high subsidies anymore. They are however still offered a protected market position, but for how long? To make the financial model of these technologies future proof, they need to be incorporated in the existing energy market and compete with traditional power plants.

As has been shown in [2], PV energy alone is hard to aggregate and sell on wholesale markets due to prediction errors. Wind power is better predictable, but also suffers from weather dependence. Thermal plants may lack the dynamic capabilities of power electronic interfaced units like PV and wind, but are more predictable and stable. Dynamic loads may have a large impact on user comfort and storage is expensive. However, by combining the benefits of different sources within a single VPP, the drawbacks of a single source VPP might be (partially) mitigated.

However, keeping solar power from direct market access enables this source to provide positive reserve capacity. As solar power has no moving parts, if sun is available, the power can be readily available. Hence, PV power could be an attractive source for balancing services. In this paper, the economic viability of providing positive balancing services is investigated.

CASE STUDY

As has been investigated in a concurrent paper, in 2013, the Belgian power system was often short (need for positive balancing power) [3]. As a result, for a lot of months, the average positive imbalance price was higher than the average day ahead price. In this paper, it is investigated if it would have been financially profitable to sell the PV power as positive reserve instead of selling it in the day ahead market.

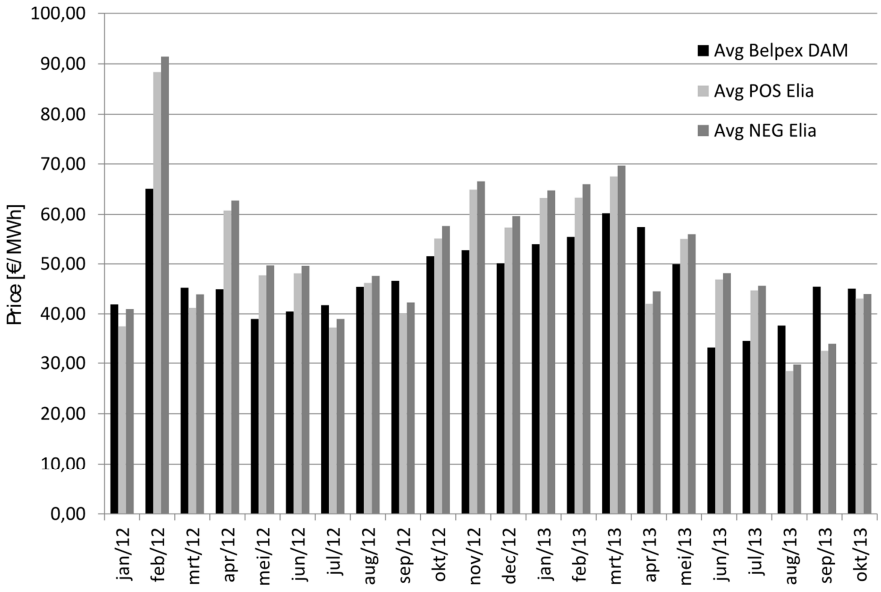

Figure 1. Monthly average imbalance prices.

Although the average price obtained for positive imbalance settlement is on average higher than the price of the day ahead market, due to the lower volumes which can be sold the total revenue could be lower. This depends on the simultaneity of the positive balancing requirements and the availability of solar power.

CONCLUSIONS

Trading solar power in the existing wholesale markets is not straight forward. Even if a VPP can aggregate enough power to meet the minimum requirements to participate in the markets or to deliver ancillary services, it should be decided how to trade the power. However, it seems to be preferable to combine solar power with other technologies to mitigate the uncertainties.

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