

Characterising electricity markets for a flexible power production out of biogas – current situation, key factors and trend analysis



BIOGAS



NEXT KRAFTWERKE



Motivation

The running out of fixed feed-in tariffs, granted from the Austrian Green Electricity Act, leads to the situation that biogas plant operators have to search for new business models, in order to keep their plant in operation. At the same time, increasing wind and PV power installations lead to an increasing need of control reserve and balancing energy. At the same time this development causes movement on other electricity markets. As higher revenues can be achieved on those electricity markets, compared to base load operation, a flexible operation and marketing of the produced electricity could be an option for biogas plant operators to find an alternative electricity marketing strategy.

Control reserve

Biogas CHP engines are technically capable of providing positive and negative secondary control power. An economic assessment for marketing of control reserve for biogas plants in Austria has not been done yet. The first step to address this task, is to characterise the intended market and identify key factors, which have to be considered for a participation.

Control reserve is needed for the stabilization of the net frequency at 50 Hz. The Austrian Transmission System Operator (APG) acquires control reserve by holding weekly auctions, in which providers can place their bids for negative and positive products. Depending on the allowed delay between call and delivery of control reserve, primary, secondary and tertiary control reserve can be distinguished. Another difference exists between peak (08:00 – 20:00) and off peak (00:00-08:00 and 20:00 – 24:00) products. After the auction is closed, the bids are ranked in the merit order. Lowest bids have a higher chance to be called than higher bids. For the operator, the revenues are split between the price for provision of power the actual delivery of energy.

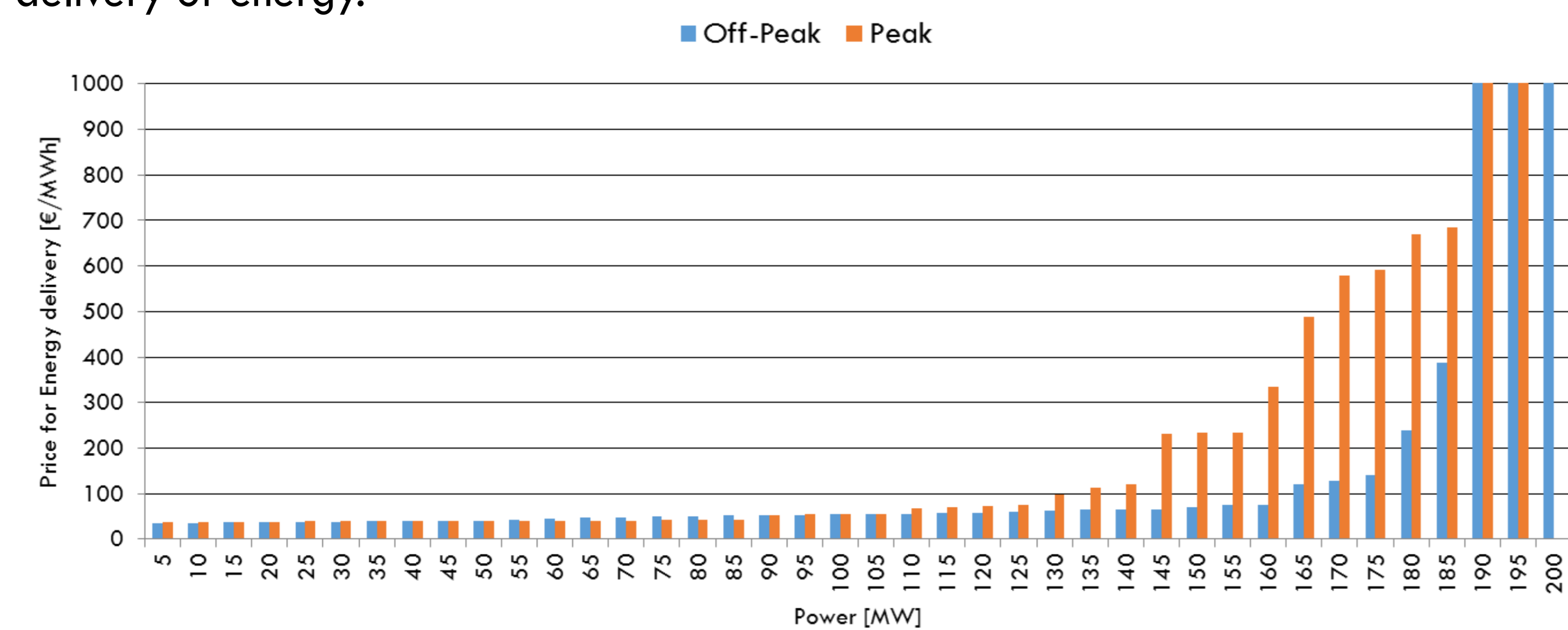


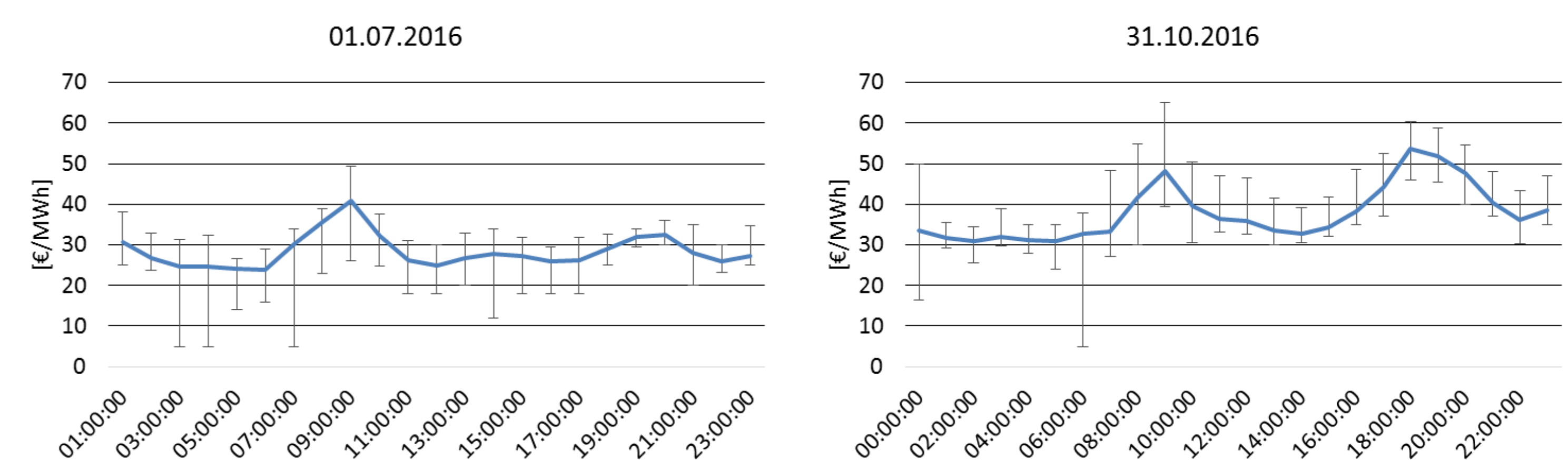
Figure 1: Merit order of the bids (delivery price) of secondary control reserve in week 32 of 2016. Highest bids are cut off for better visualisation.¹

For the operator, the chance for receiving a call can only be influenced by the price of the bids. Other factors are e.g. weather and accuracy of forecasts, which can't be influenced. Therefore it is extremely difficult to predict revenues from the participation on the control reserve market.

Spot Markets

On spot markets, like the EPEX (European Power Exchange) or EXAA (Energy Exchange Austria) different types of products are traded. In Day-Ahead auctions, electricity for the day after is traded either as block products (e.g. base load 0-24h) or as products on an hourly basis. In Intraday auctions, electricity for the same day is traded continuously, either on hour or quarter-hour basis.

Day-Ahead (hours)



Intraday (quarter-hours)

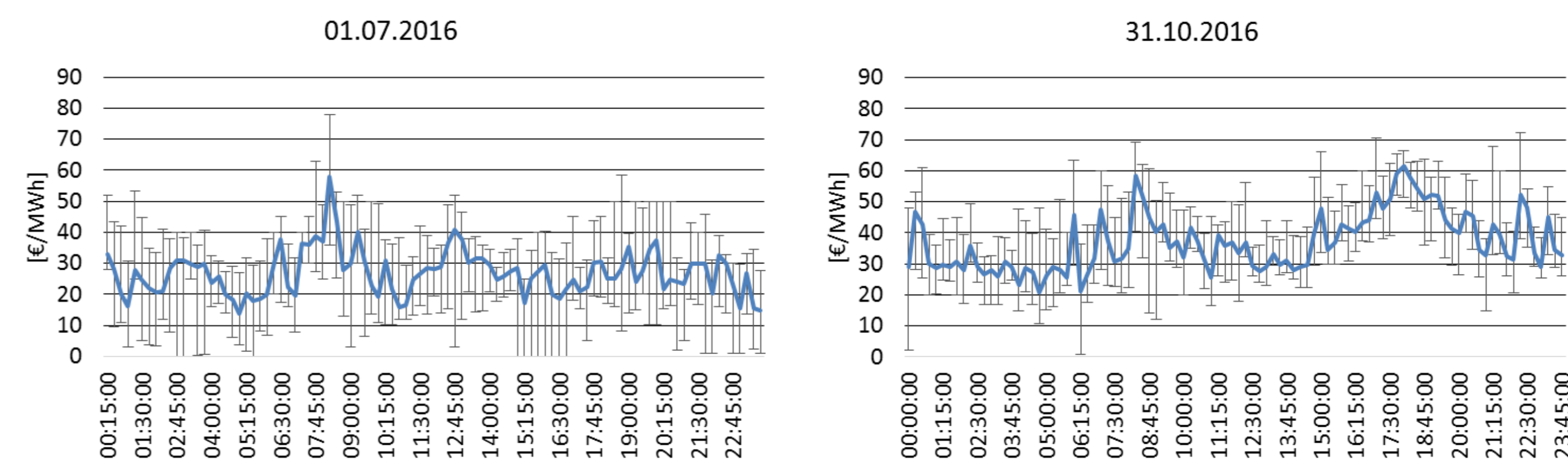


Figure 1: EPEX results for Day-Ahead (DA) and Intraday (ID) Auctions on 01.07.2016 and 31.10.2016 respectively. The blue line represents average prices, the whiskers represent the highest and lowest price for each hour and quarter hour respectively.²

Results

For power plant operators, it is possible to participate on several markets at the same time. This offers the possibility to combine advantages and decrease disadvantages of the different electricity markets. E.g. the lack of predictability of control reserve calls can be compensated by the participation on the spot market while the lower prices on those can be compensated by (punctual) high revenues on the control reserve market. This concept is shown in Figure 3.

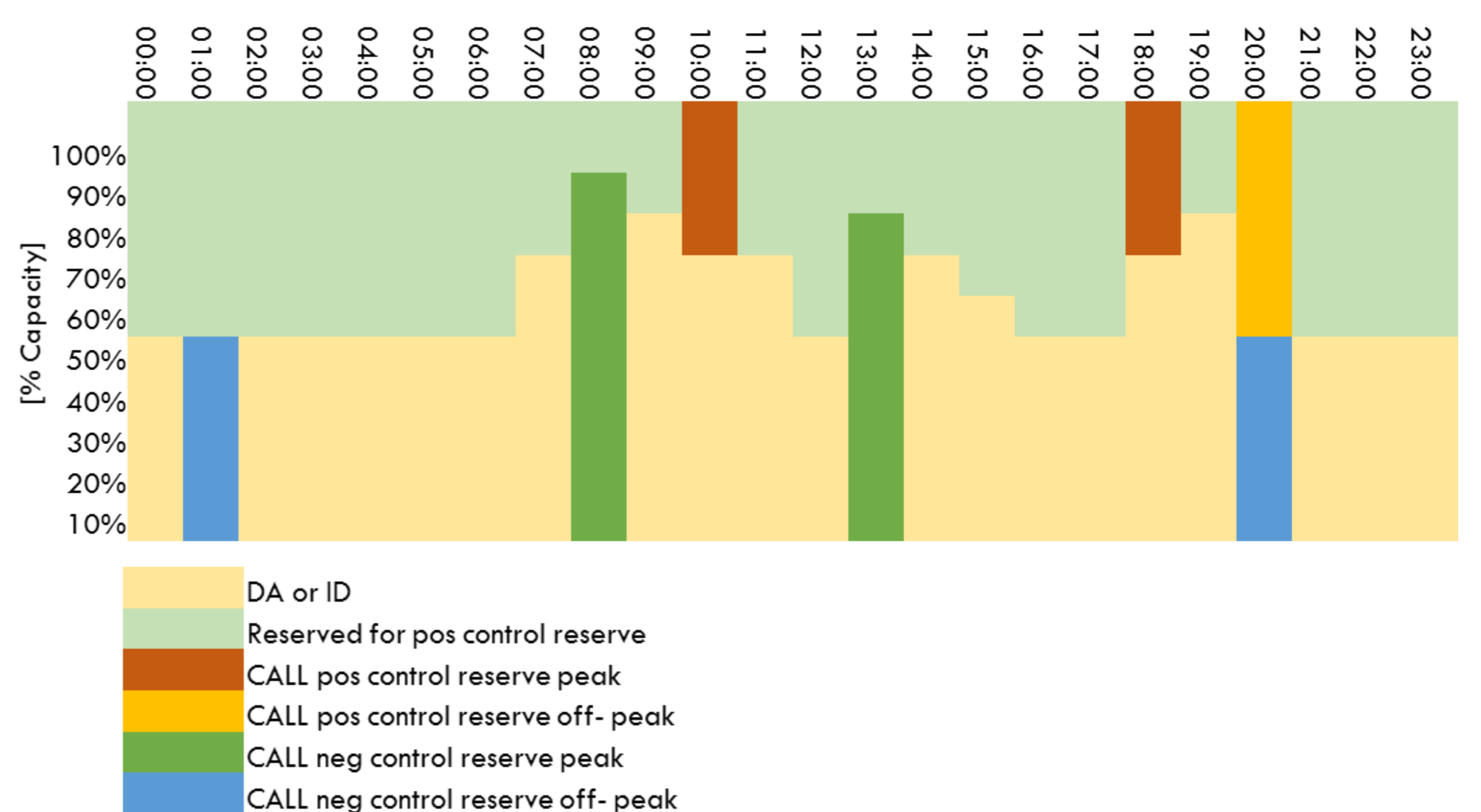


Figure 3: concept for both participation on the control reserve market (positive and negative) as well as on the spot market.