

# Gas balancing market

---

## Mathematical models

In the short term, for natural gas there are other problems that can be considered. Here we discuss the newly designed balancing market in some Countries, i.e. natural gas markets where one typically wants to adjust its daily positions long or short. From an operational point of view we remark that, natural gas flows in the transmission system from one point to another on the network by virtue of the differential in pressure existing between those two points. Therefore also a short term balancing market must take into account the physical rules and cannot be a set of simple financial transactions. Moreover, by definition, it must include the gas TSO. In a daily balancing setting, for instance, at the end of each day (so called Gas Day), for any residual deviation between gas injections and withdrawals, shippers incur imbalance charges for the imbalanced volumes accumulated throughout the day in a given balancing zone, and not timely compensated. Because of this they may want to get closer to the balance, and this can be achieved by selling or buying some amount of gas with daily frequency. The gas balancing markets are typically built around the concept of uniform price as in the electric setting. However the clearing, and the consequent price, is typically unique in the day. Therefore the shippers are required to bid or offer a certain quantity at a certain price. The market is cleared accordingly with classic uniform price settings (i.e. intersecting the aggregated demand and the offer curve) and consequently the price is set and the transactions are cleared.

From the shipper point of view there are many possible alternatives of optimizing the bid/offer strategy, depending on the usage of the natural gas (e.g. residential, industrial or power production), the cost of imbalance, and the rest of the medium/long term alternatives of the portfolio they are managing. Therefore the balancing market can be views as another option to extract value in the gas value chain

## Modeling and algorithmic considerations:

From the modeling point of view, the optimal balancing market can be posed as a mixed integer optimization problems with uncertainty in the strategy of the competitor, and – as previously noted – other alternatives can be incorporated from existing contracts. Depending on the integration level with other contracts, and depending on the usage of the natural gas, the problem can be a small or medium size stochastic or robust MILP that can be solved with off the shelf tools.

### Contributor:

Dr Fabrizio Lacalandra, QuanTek