

Day ahead Markets for Electricity

Purpose of DAM for electricity

- Electricity is economically non-storable
- Power system stability requires a constant balance between production and consumption
- Electricity demand depends on weather, intensity of business activity and everyday activities. Hence prices exhibit seasonality on daily, weekly and annual levels and abrupt, short lived and unanticipated price spikes

Working of Electricity Markets

Unlike most other commodity or financial markets, the electricity spot market is typically a day-ahead market that does not allow for continuous trading. This is as system operators require advance notice in order to verify that the schedule is feasible and falls within transmission constraints.

In a day-ahead market, agents submit their bids and offers for delivery of electricity during each hour of the next day before a certain market closing time (see figure 1). Thus in most markets, prices for all contracts of the next day are determined at the same time using the same available information. The Market Operator (MO) uses a market clearing algorithm to clear the market, which results in a market clearing price (MCP) as well as the scheduled production and consumption for every hour of the market horizon.

The market clearing price forecasts for day d are required on day $d-1$, typically at hour h_b (around 10 AM). On the other hand, data concerning results for day $d-1$, including market-clearing prices and demands are available on day $d-2$ at hour h_c (around noon). Therefore, the actual forecasting of market-clearing prices for day d can take place between hour h_c of day $d-2$ and hour h_b of day $d-1$. Additionally, producers and retailers use this period to optimally self-schedule and to produce appropriate bids.

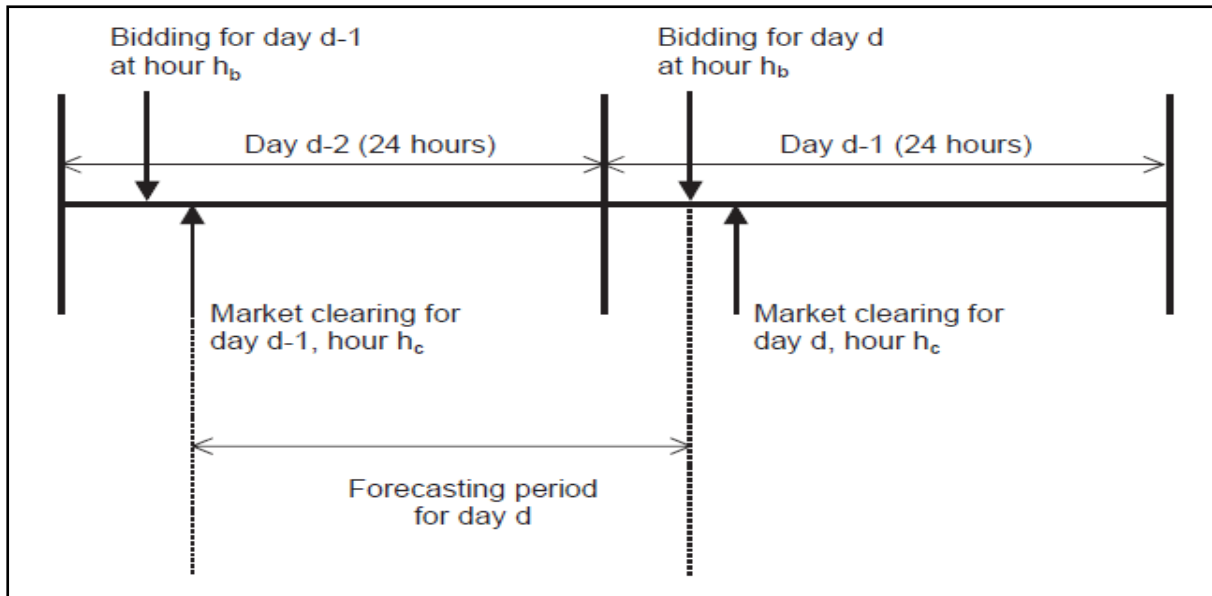


Figure 1: Framework for market-clearing prices of day d

The genuine role of an organized market for electricity is to match the supply and demand of electricity so as to determine the market clearing price (MCP). The MCP is established in an auction conducted once per day, as the intersection between the supply curve (aggregated) and demand curve (aggregated). In case of a once sided auction, on an aggregate demand curve is estimated (see figure).

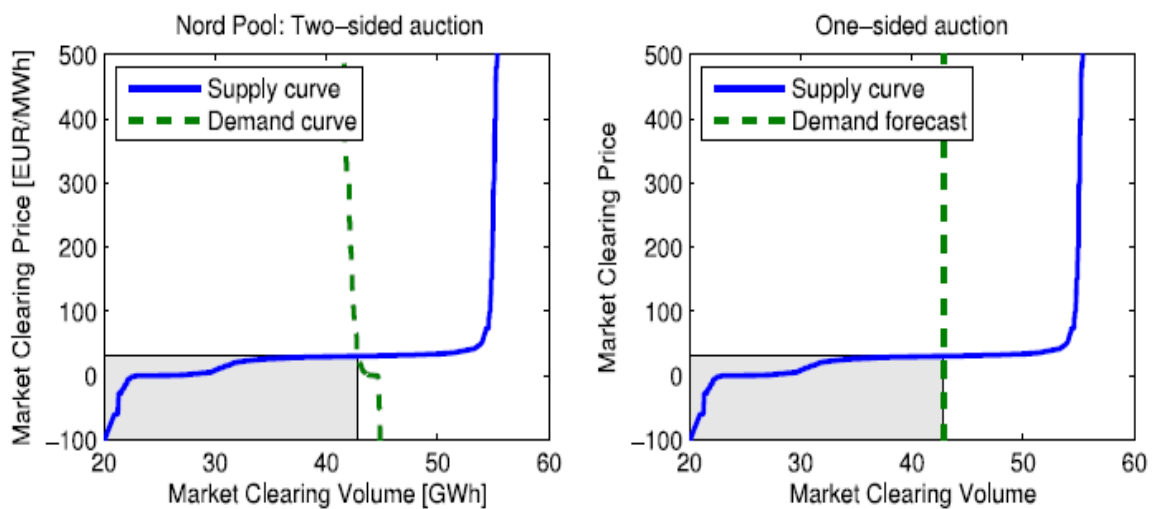


Figure 2: MCP for one-sided and two sided (hypothetical) auctions

An auction market can be uniform-price, in which buyers that bid above the MCP and suppliers which ask below the MCP are paid the same price, which is the MCP. In contrast, in a pay-as-bid (or discriminatory) auction, a supplier would be paid exactly the price he bid for the quantity transacted.

When there is no transmission congestion, the MCP is the only price for the entire system. However, when there is congestion, locational marginal prices (LMP) or zonal clearing prices differ from the system price and from each other.

The average of the 24 hourly (or 48 half-hourly) prices is called the daily price, the daily spot price or the baseload price. The average of prices for the on-peak hours (8 AM to 8 PM) is called the peakload price. These are conventions for the day-ahead prices.

Forecasting of Electricity Prices

Electricity Price forecasting models can be classified into one of three categories: Heuristics (naïve, moving average), simulations (game theoretical) and statistical models (time series and AI).