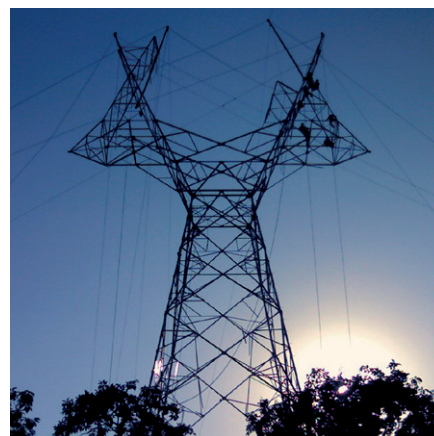# TRACTEBEL
engie

FORECASTING OF ELECTRICITY CAPACITY PRICES ON EU RESERVE MARKET

Shaping our world

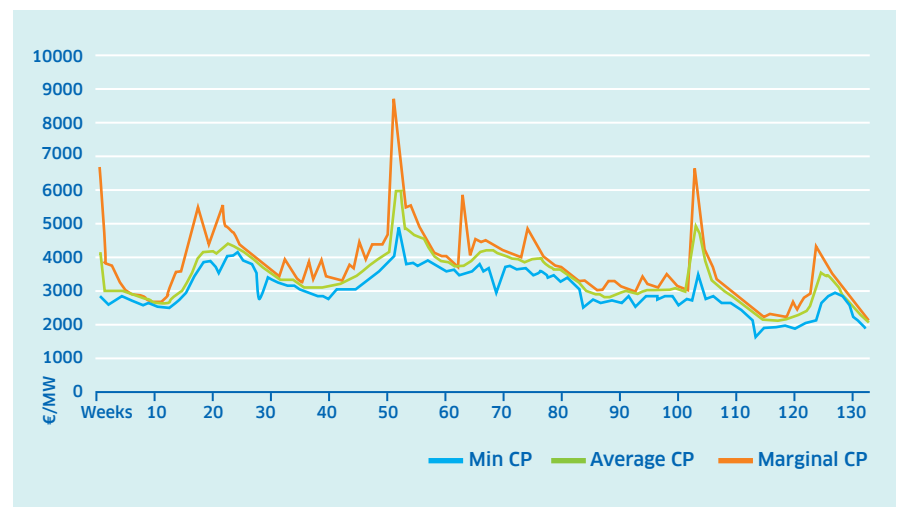# Capacity Prices on Primary Control Reserve Market

Forecasting of the electricity capacity prices (CP) on primary reserve control (PRC) market is very challenging as it is influenced by many factors including availability of power generation (renewable and conventional), weather, calendar effects (holidays etc.), power demand and behaviour of bidders.

An accurate forecasting of CP for market participants is essential. If the participant overbid the CP for given week, they do not participate on the market and lose a considerable amount of money.

On the other hand, if a bid is too low compared to the actual price the participant has a comparably high opportunity costs, missing the potential gain of higher prices for given week.

Therefore, it is very important to make the forecast as accurate as possible.

Complex, historical behavior of the primary control reserve capacity prices (CP)
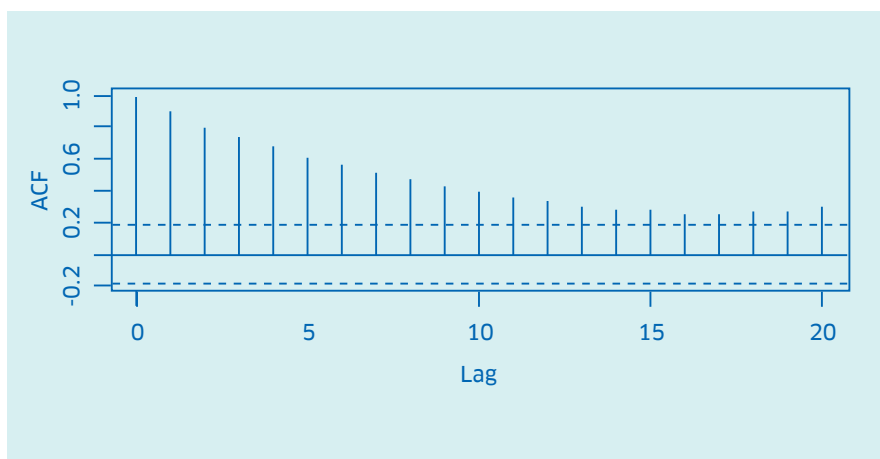
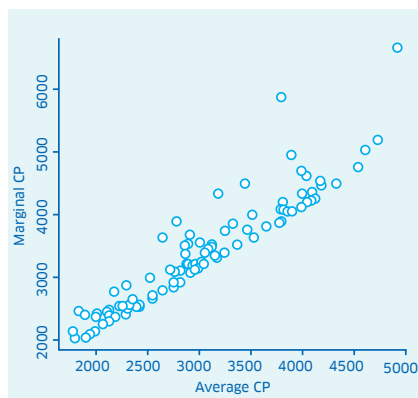# Methodology with Artificial Intelligence (AI) and Statistical Approaches

Our forecasting methodology consists of different phases and sub steps using various methods from artificial intelligence including neural network, evolutionary algorithm and statistical approaches.

Some exemplary results and methodological components are presented very briefly below.

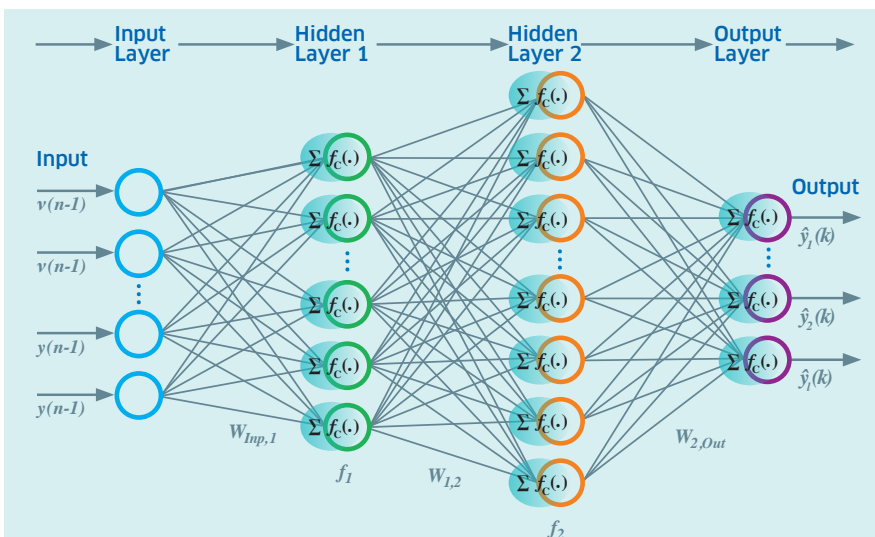## Autocorrelation of the marginal electricity price

Correlation analysis among marginal and average capacity prices

The marginal CP is highly correlated with the average CP. This informs us about the importance of the average CP as a explanatory variable for marginal CP.

A fragment of the considered artificial neural networks (ANN) architecture

Multiple layers and nodes of ANN are required to incorporate different influencing variables and their dynamic interactions.
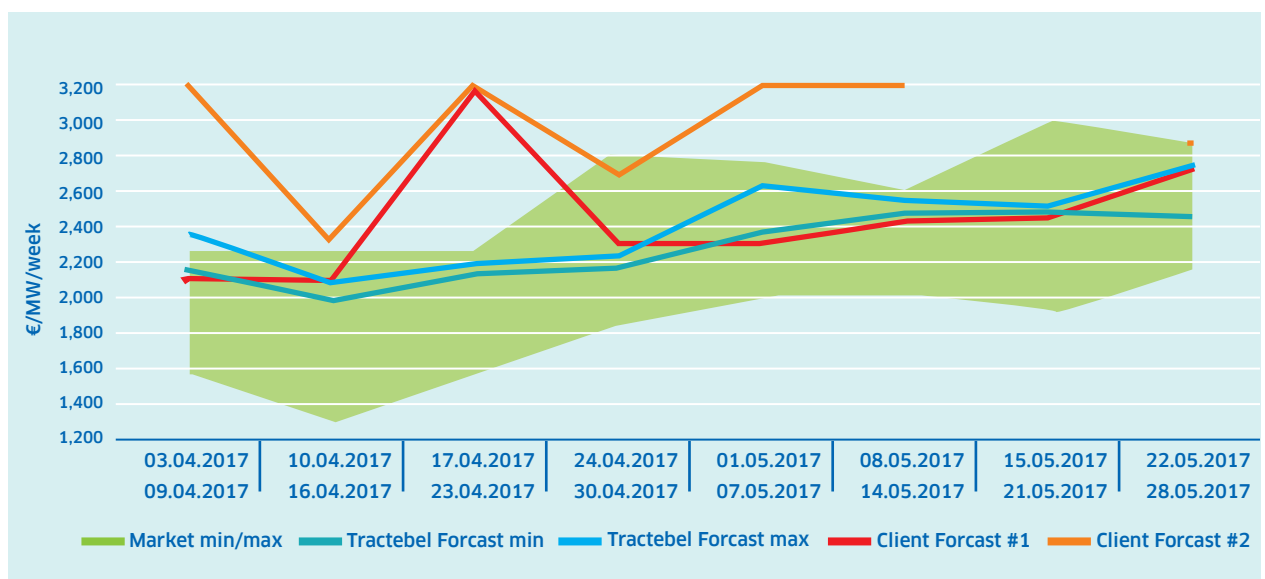
Field Study: Forecasting Support for an Energy Utility

Tractebel achieves more accurate forecasting results than traditional methods by combining different forecasting methods from artificial intelligence to statistical approaches.

Compared to the existing forecast methodology, Tractebel's forecasting models outperformed the forecasting performance of the client and resulted in an

16.7 % increase in revenue over the 8-week testing period. The figure below shows the forecasting results of the client and of Tractebel's models.

PRL price evolution and forecasting, a fragment

Legend: Market min/max | Tractebel Forcast min | Tractebel Forcast max | Client Forcast #1 | Client Forcast #2

The above figure shows that in some cases clients overbid the expected CP. Then they did not participate in the market and lost the revenue for those weeks. The forecasts of our models were usually close to the upper limit of the interval, but inside the interval, so that the customer can always participate in the market maximizing its revenue.

Other Implementation

Implementation of our approach is demonstrated for the electricity spot price forecasting. Please refer to the paper of Dr. Atom Mirakyan published in Energy Economics Volume 66 from August 2017.

Atom Mirakyan, Martin Meyer-Renschhausen & Andreas Koch (2017).
"Composite forecasting approach, application for next-day electricity price forecasting."
Energy Economics, 228-237,
https://doi.org/10.1016/j.eneco.2017.06.020

Our Services

We provide forecasting and data analytics for CP as well as other market variables such as spot market prices, weather or the energy demand. We offer:

- Forecasts on a regular basis updating the forecasts incrementally

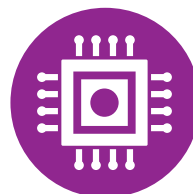- Easy to use models, which can be used by the client

Advantages

By co-operating with Tractebel in forecasting of electricity capacity prices on the EU reserve market, our clients will realize significant benefits. Our efficient algorithmic forecasts will:

Increase the understanding of clients about complex market dynamics

Increase the revenue of the market participant through acquiring higher CP prices

Automatize the forecasting process

Tractebel achieves more accurate results than traditional methods by combining different forecasting methods from artificial intelligence to statistical approaches.

We are Tractebel

Tractebel provides a full range of engineering and advisory services throughout the life cycle of its clients' projects, including design and project management. As one of the world's leading engineering and advisory companies and with more than 150 years of experience, it's our mission to actively shape the world of tomorrow. With about 5,000 experts and presence in more than 70 countries, we are able to offer our customers multidisciplinary solutions in energy, water and urban.

Since December 2014, Tractebel Engineering GmbH (former Lahmeyer International) belongs to Tractebel and thus is part of the international ENGIE group headquartered in Paris. Tractebel (Brussels, Belgium) and Tractebel Engineering GmbH (Bad Vilbel near Frankfurt, Germany) cooperate on numerous international projects as one company.

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- 50-100 projects
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