

# Energy Price Forecasting

Artificial Intelligence applied  
in the Energy Sector

Alejandro Delgado Fornaguera  
Technical Project Manager  
[alejandro.delgado@aleasoft.com](mailto:alejandro.delgado@aleasoft.com)

**Webinar: What artificial intelligence (AI)  
means for the power generation industry**

October 16, 2018

 **AleaSoft**  
ENERGY FORECASTING

# AleaSoft Energy Forecasting

**AleaSoft** offers solutions for forecasting in the energy sector

**AleaSoft** is a precursor of the fourth industrial revolution with the use of innovative techniques **Artificial Intelligence** and **Machine Learning** applied uninterruptedly in the electricity sector since 1999

## NUESTROS CLIENTES

- Utilities
- TSOs
- Distributors
- Traders
- Retailers
- Large Consumers
- Generators
- Banks
- Investment Funds



**At present, 3/4 of the electricity that is traded in the Spanish electricity markets uses AleaSoft forecasts as a reference.**

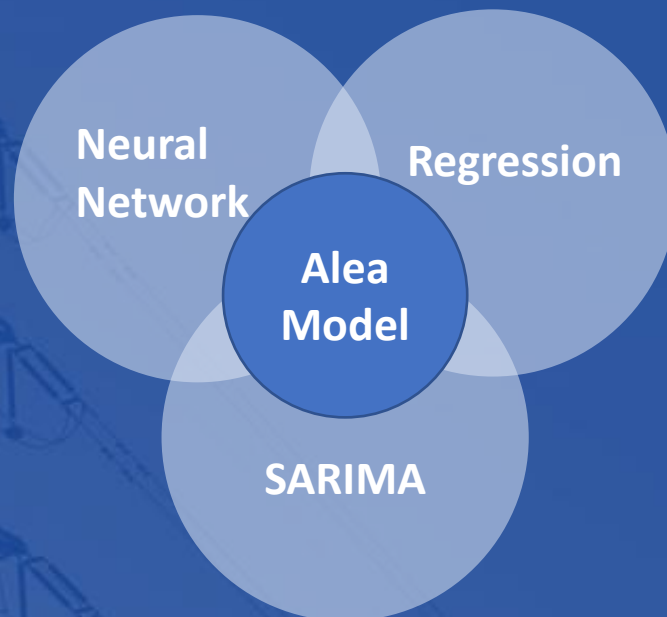


# Alea Methodology

**AleaModel** is a unique type of forecasting model, developed by AleaSoft specifically for energy forecasting, that outperforms classic forecasting models.

**AleaModel** takes advantage of the latest developments in statistics and **Artificial Intelligence** in the field of forecasting. It's a hybrid model approach that combines the power of the **Artificial Neural Networks** and the efficiency of the Box-Jenkins SARIMA-type model and the multiple non-linear regression.

The outcome of this hybridization is an **Artificial Neural Network** with a SARIMA model structure capable of capturing the seasonal dynamics and evolution of the series that provides the capability to rapidly adapt to changes in the tendency of the time series and the variables' influence. Through **Machine Learning** techniques, the model looks for dynamic relations on the data to project them into the future as a function of the explanatory variables.

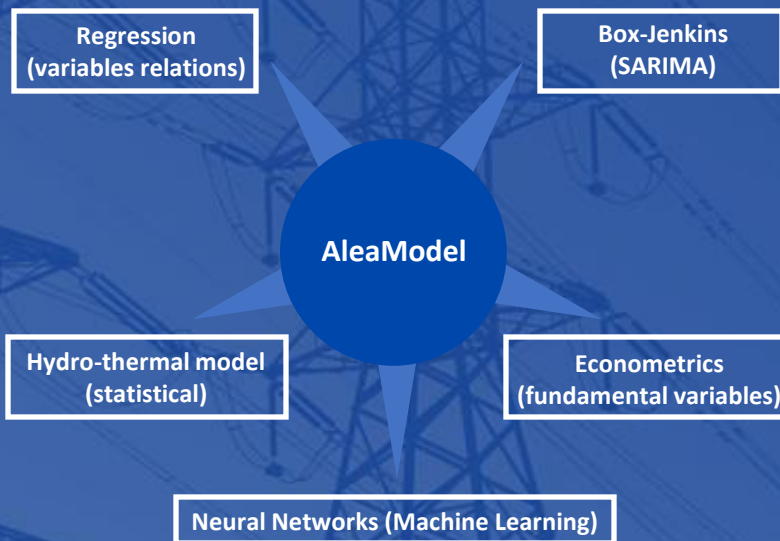


# Alea Methodology

**Regression** analysis to estimate the cause-effect relations between the explanatory variables and the main variable, and also among the explanatory variables themselves.

**Box-Jenkins** method that makes use of SARIMA models to analyze time series and apply differential transformations to make them stationary.

**Hydro-thermal model** for price forecasting that statistically fills the demand gap left by the renewable energy sources and nuclear production.



**Econometrics.** Use of socio-economic variables, such as GDP and Industrial Production for demand and price forecasting.

**Recurrent Artificial Neural Networks** that using **Machine Learning** algorithms and **Artificial Intelligence** incorporate auto-regressive and moving average terms in the neurons transfer function in both regular and seasonal terms. They incorporate non-linearity into the transfer functions to accommodate non-linear dependencies with the variables.

# AleaSoft Energy Forecasting

## Forecasting Services

**Demand and price**  
gas and electricity  
markets

**Demand**  
client portfolio

**Other variables**  
worldwide weather, socio-economic  
indexes, fuel prices, CO2 emission prices

**Renewable energy**  
(wind, photovoltaic, thermosolar, hydro) at  
national and single-plant level

**Other markets** (intraday, reserve,  
imbalances, technical constraints...)

### Short-term

(19 days ahead, hourly)

### Mid-term

(3 years ahead, hourly)

### Long-term

(30 years ahead, monthly)

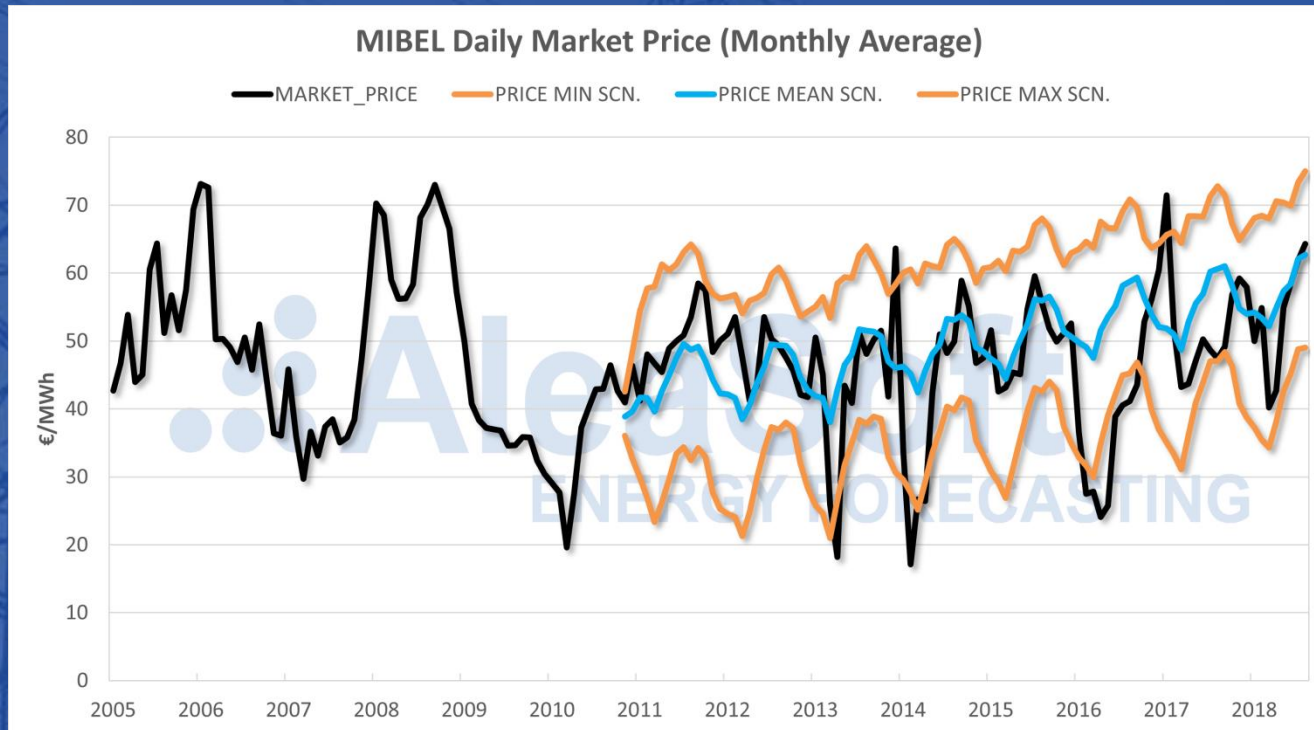
**Mean forecasting:** using a scenario that  
can contain mean or specific conditions.

**Stochastic forecasting:** forecasts with  
their associated probability distributions.

With the increase of **PPAs**, AleaSoft supplies long-term forecasting reports to developers and managers of generation infrastructures, as well as investors, banks, retailers and large consumers in **all European markets**.

# AleaSoft Energy Forecasting

This is how a long-term Spanish price forecast made in 2010 looks like:



This price forecast was generated in November 2010. After eight years, we can see how the model captured the market evolution and keeps being valid. **AleaSoft** models effectively detected the time dynamics and the influence of the variables on the price.



# Contact



## **AleaSoft - Madrid**

P. de la Castellana 79, 6ª CP 28046  
(+34) 900 10 21 61

## **AleaSoft - Barcelona**

C/ Viladomat 1, 1ª CP 08015  
(+34) 932 89 20 29

**[info@aleasoft.com](mailto:info@aleasoft.com)**  
**[www.aleasoft.com](http://www.aleasoft.com)**