

INTERVIEW OF EL PERIÓDICO DE LA ENERGÍA WITH ALEASOFT IN ITS 20TH ANNIVERSARY

AleaSoft, September 10, 2019. Interview of El Periódico de la Energía with Antonio Delgado Rigal, PhD. in Artificial Intelligence, Founder and CEO of AleaSoft, on the 20th anniversary of the company.

1.- Aleasoft about to turn 20, what does it feel like to be a leading company in energy market prices forecasting?

This year we are celebrating. In a few days, in October, we will celebrate 20 years of the foundation of the company. Being leaders in energy market price forecasting is a constant challenge and a great responsibility.

In these 20 years we have created a factory of forecasting models. We have created a set of tools that allow us to create and validate hundreds of models in the most efficient way possible.

During this period we have had the privilege of working for the most important companies in the energy sector in Spain and in Europe. It is a feeling of pride and satisfaction seeing how customers who started working with AleaSoft almost 20 years ago continue to trust us every day with our forecasts of demand, renewable energy production and prices of electricity markets across Europe with forecasting horizons of short, medium and long term.

2.- What has caught your attention the most of what is happening in the electricity markets during this 2019?

The year 2018 was a very atypical year. The prices rose throughout that year due to the increase in the price of CO₂ and fuels. The year 2019 is in general of stability in the prices of the electricity markets. The fuels have fallen in price and there has been an interesting situation: with the high prices of CO₂ emission rights and the decrease in natural gas prices, the production of electricity with coal has been almost completely cancelled.

Another important event is that little by little the renewable energy production increases and the plans to install more photovoltaic and wind energy are really ambitious. In general, this year we can say that efforts to reverse climate change are beginning to produce results with the reduction of CO₂ emissions and other polluting gases since we have less coal energy production and more clean renewable energy production.

3.- In Spain, there has been an important circumstance, the combined cycles have risen to the detriment of coal that produces virtually no energy. What happened?

Gas and coal compete to produce electricity when there is a thermal gap. The CO₂ emission factor of coal is almost double that of natural gas, for this reason the increase in the price of CO₂ emission rights affects coal competitiveness much more. In the matching of the electricity market, the offers to produce energy with coal, being more expensive, do not match while those of natural gas that cover practically all the thermal gap do.

Other aspect that has favoured the production with natural gas to the detriment of the electricity production with coal was the Royal Decree-Law 15/2018 of October 5, 2018, which eliminated the green centime for the energy production with natural gas but not for the coal energy production.

As we mentioned before, the reduction of electricity production with coal almost to zero has avoided emissions of CO₂ and other polluting gases.

4.- Without a doubt, photovoltaic is being another protagonist . Is it the new era of solar energy?

The photovoltaic has been reducing costs continuously and at the moment they have lowered the electricity market price barrier. This is causing a *Photovoltaic Revolution* with unexpected changes in economic and social matters.

More than 60 years ago, science and technology advanced in the study and development of semiconductors, mainly silicon. From these advances, on the one hand, there is microelectronics with integrated circuits and microprocessors that have caused an exponential development in all areas. Each year integrated circuits increase the amount and speed of the transistors inside. The other branch that emerges from silicon semiconductors is the photovoltaic cell or photoelectric cell. In these more than six decades of existence, these photovoltaic cells have evolved becoming more efficient. The solar panels that are composed of photoelectric cells generate more electricity and have a lower cost.

This photovoltaic revolution has coincided with a fight to reverse climate change caused by an excess of CO₂ emissions and other polluting gases. The CO₂ emissions cause a greenhouse effect that raises the planet's temperature with all the environmental disaster involved.

A photovoltaic energy production with lower price and more efficient, will gradually displace the production of electricity with fossil fuels. In addition to being clean, this energy is renewable and unlimited, since the source is sunlight.

In Europe, the southern regions, with more hours of sunlight, have an advantage with photovoltaic energy production and the introduction of this technology will be an important factor in regional development. In Spain it coincides that the southern regions of the country that have been economically disadvantaged now have a great opportunity that cannot be wasted.

We are in the presence of a new era of solar energy.

5.- What does Aleasoft foresee that will happen in the market as far as prices are concerned when as much photovoltaic as it seems is installed?

The installation of photovoltaic energy has two areas: production for self-consumption and production to sell by injecting energy to the electricity grid. In both ways, the tendency is for prices to fall since the demand for electricity that will be replaced by self-consumption will decrease and we will have more renewable electricity displacing coal and natural gas energy production, which are the most expensive.

The photovoltaic has a limitation and is that it produces proportionally to the intensity of sunlight. It has its maximum value in the day when the sun is at the highest and disappears with the sun. Also in winter, with fewer hours of sunlight, the production is lower than in summer.

We need a backup power when we have neither wind energy production nor solar energy production. Currently and in the coming years the production with combined cycle gas turbines is and will continue to be this backup energy.

Once the price of electricity tends to decrease in the hours of more light because we have more photovoltaic electricity, there will be a stimulation effect to consume more electricity, that is, increased demand. These hours of more sunlight coincide with the hours of more intensity of human activity. In this way, in Europe, interconnected continent, the market balance will be maintained with less and less volatile prices.

6.- Is the market prepared for so much change? Do you think it should be reformed?

We have heard many times about reforming the electricity market. The European electricity market is unique. It is a market that is increasingly integrated. In the short and medium term, the national electricity markets have an obligation to integrate more, with the same rules for all, which are of competition between all agents that sell and buy electricity in Europe.

In stable, transparent and balanced markets, a more competitive technology gradually displaces other less competitive ones.

Since 2002, when the San Roque combined cycle was launched, and until 2011, 67 cycles with a total capacity of more than 25 thousand MW were installed. In this same period of time, the wind energy production was growing to exceed 22 thousand MW of capacity in 2012. If other sources of electricity production such as cogeneration are counted, in 2012 we had more than 50 thousand MW of installed electrical capacity in Spain that were not in the year 2000.

The electricity demand in this period went from about 21 thousand MWh to about 30 thousand MWh of annual hourly average, which is still the annual hourly average ceiling.

The increase in production capacity was covering the increase in demand, but thanks to competition, energy with lower price was displacing more expensive and less efficient technologies.

The electricity market price during this period stabilized, with less fluctuation in the short and medium term. Despite this technological change in the generation mix, the electricity market worked and continues to work without any problem and the market balance is maintained and will continue to be maintained.

7.- What forecast do you do of the electricity market in the medium and long term? Will there be any surprises?

The price forecast depends on the model chosen and the scenarios corresponding to the explanatory variables in the medium and long term. If these scenarios are chosen properly and market balance is taken into account, there will be no surprise. The future market price, among other aspects, will depend on the price of natural gas and the price of CO₂ emissions, which are the factors that most influence the marginal price.

8.- In recent months there is much talk in the PPA market, the long-term contracts. How is this market developing in Spain? What is your experience about it? Is a good price forecast essential for contracts to move forward?

Since 2018 there has been an avalanche of PPA contracts in Spain. A PPA contract is essential for developers and manufacturers that develop a renewable infrastructure, for those who finance the projects and especially for those who buy electricity in the medium and long term. We are aware of this avalanche of PPA contracts for the tens of orders that we are receiving of price forecasting reports of electricity market for the medium and long term since 2018, both in Spain and in other countries in Europe.

There are some limitations. In the case of electricity buyers who want to access a PPA contract, they need endorsements to guarantee that they will buy the agreed electricity during the term of the contract. There is another limitation. Many large consumers look to the future with a horizon of one or two years without having sufficient risk management tools or a longer-term vision, for example, 10, 15 or 20 years that are the time horizons of a PPA. For the director of a company that consumes a lot of electricity, it is a great personal and business risk to sign a 20-year contract at a certain price and that the market price falls.

Since last year we have been in contact with the main companies that are large consumers of energy in the country, to provide our medium and long-term price forecasts as basic tools to have a vision of the future and to be able to make decisions in the most scientific possible way.

The first step in signing a PPA is having a good price forecast.

9.- Another actor that begins to have prominence in the sector is hydrogen. How far do you think this technology can break into the market? Isn't it too expensive?

Hydrogen will have more and more prominence because it is the fuel of the future. For months we talked about the photovoltaic revolution but we can start talking about the *Hydrogen Revolution*. Both technologies complement each other perfectly.

The hydrogen can be produced from water and the passage of an electric current in a process known as electrolysis and dating back to 1800. At this time, producing hydrogen by this procedure is expensive since it depends entirely on the price of electricity and it has the advantage of being non-polluting. There are other methods of hydrogen production with less cost per kg produced, but being based on the decomposition, for example of natural gas, emit CO₂.

A photovoltaic park connected to a hydrogen production plant can produce this fuel continuously without the need for external fuel, only from sunlight.

Once the hydrogen is produced, it can be used quite similarly to natural gas in engines, turbines or for heating. But the most important use in the future, and perhaps the most unknown, is producing electricity directly through a chemical process without combustion in a fuel cell or hydrogen cell. That is, the process contrary to electrolysis, since water and electricity are obtained from hydrogen and oxygen. This process was used for 50 years in the Apolo program to generate electricity and water in the ships that transported astronauts. As a coincidence in the use of hydrogen for five decades, in that same space program, hydrogen was the main fuel of the engines.

As in the case of photovoltaic, the massive irruption in the market will depend on the production cost barrier being broken. Hydrogen technology advances on two fronts, in increasingly efficient production and in increasing efficiency of conversion to electricity. The photovoltaic-hydrogen binomial will displace the fossil fuels and the nuclear production.

10.- And for mobility?

The fuel of the future for almost all transportation will be hydrogen produced from clean renewable technologies, mainly photovoltaic. This will be evident when the cost of filling a fuel tank of a car, a truck, a ship or an airplane is lower with hydrogen produced in a clean and renewable way than with another fuel derived from petroleum or natural gas.

11.- Do you think there will be as much electric car as they say? How can this affect the electricity market? Price increase?

The introduction of the electric car is moving very fast. All depends on the price of this type of car, which is decreasing, and the amount of recharging points. Battery efficiency and recharge time have been improving. The electric car with battery will replace the conventional car and later that battery will be in many cases a hydrogen cell that recharges much faster filling the tank with liquid hydrogen.

The massive use of electric cars will increase the electricity demand and compensate for the demand lost in the system due to self-consumption and will help offset the greater supply of photovoltaic electricity. When the market price drops, less electricity will be poured into the grid and more hydrogen will be produced. As we have always said, the market balance will be maintained.

Future transport based on hydrogen or conventional batteries will allow, in addition to environmental cleaning, a decrease in the noise levels of cities and roads, that is, acoustic cleaning.

In the distant future, non-electric means of transport will be in museums.

12.- Another very important factor in the future of energy markets is digitization. Up to what point?

Digitization is essential for all companies in the energy sector, especially those that participate in the electricity or gas markets.

Digitization could be interpreted as the automation of all processes of information gathering, data analysis, validation, visualization of results, forecasts and decision making optimized with mathematical or statistical models. Any process that is done manually must be analyzed to be able to automate it to the fullest.

In AleaSoft we have developed several tools that are an example of digitalization in the electricity market. One of them is AleaPlanning, an application that allows the planning and optimization of the operations of a combined cycle gas turbine with the objective of maximizing profit. AleaPlanning's data collection and filtering processes feed the database with market data, price data of fuels and CO₂ emission rights, plant-specific data, such as the condition of the tanks, the ships arrival plan, the maintenance plan, the manufacturer's data, among others. With the use of AleaSoft models, AleaPlanning allows to obtain electricity market price forecasting up to medium term, with the associated probabilities, and using these forecasts and the rest of the input data, and also a set of risk management tools, optimizes the plant performance to determine the optimal operating regime for a period of time, including the programming of electricity generation, gas consumption, gas sales planning, etc. The AleaPlanning application allows you to visualize and analyze the data, both the input data and the optimization result.

13.- You already work with Artificial Intelligence. How can this help the energy sector?

In the course of these 20 years we have always worked with Artificial Intelligence, from day one. Our models combine different forecasting methods: classical statistics, fundamental models, time series and recurrent neural networks.

The energy sector generates an unlimited amount of information at European level every hour. Without advanced statistical and artificial intelligence techniques it is impossible to analyze and model all this volume of information.

With the use of our methodology, which we have called Alea, we guarantee the optimal combination of the most advanced scientific methods in the field of modelling and forecasts in the energy sector. It must be remembered that a large part of the decisions taken in this sector in the short, medium and long term depend on the quality of these forecasts.

14.- Do you take energy efficiency into account in your market forecasts? How can a greater efficiency affect prices?

Energy efficiency is included in the models of electricity price forecasts mainly through demand. In our medium and long-term electricity demand forecasting models, the energy efficiency is taken into account, so the price forecasts are not affected.

There are factors that affect demand in one way or another. Self-consumption and efficiency decrease the demand while the electric car, new uses of electricity and hydrogen production increase it.

15.- The storage. Do you think it will be necessary in Spain?

Electrical storage is a fundamental tool in the electrical system. Historically the electrical system has made the storage from the hydraulic pumping and little by little the batteries are being introduced.

As the cost of conventional batteries decreases, storage will be consolidated as a complement to renewable energy that is not controllable, that is, the electricity is stored when the price is lower and it is poured into the grid when the price is higher.

As I mentioned before, hydrogen production works just like a battery with the advantage that the hydrogen produced can also be sold as a secondary product.

In AleaSoft we also offer our clients a service for the profitability of storage systems by analyzing strategies aimed at participating in ancillary services and analysing the possibility of using the storage system to buy electricity in the hours of low prices and sell it in the hours of higher prices.