METEOROLOGY DATA

- Translator analytics
- Data scientists
- Data managers
- Engineers specialized in data

52 Specialists in analytics

400 Professional collaborators

3 Million Gb

Machine Learning, Artificial Intelligence and algorithms that integrate meteorology to offer advice on energy efficiency to the clients

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Meteorology and big data for energy management

Weather information is becoming a key factor in big data processes. And with it, companies are generating predictive models for their business and planning practices. Repsol uses weather forecasts, for example, for managing renewable electricity facilities, to offer its customers advice on energy efficiency at home or to anticipate incidents on its trading business shipping routes.

«Weather factors affect our activity, climate change is an example of this», explains Julia Díaz, head of Data Science at Repsol's Data & Analytics & Artificial Intelligence Hub. «That's why at Repsol, we have to be open to the advancement of a science that is constantly innovating» and that increasingly provides greater precision in its forecasts on weather conditions, which are highly complex.

Meteorological data for decision making

The Data & Analytics & AI Hub works to extract value from 3 million gigabytes of data that Repsol handles daily

The energy company has a Data & Analytics & Artificial Intelligence Hub, in which 52 specialists in data analytics work with different profiles (translator analytics, engineers specialized in data, data scientists, and data managers). These specialists collaborate with 400 professionals from the different business units to extract value from the more than three million gigabytes of data that Repsol handles daily.

«We use weather data provided by specialized agencies which, in turn, we combine with data from our own activity» and from other external sources, such as geolocated information or sociodemographic studies from the National Institute of Statistics (INE). The challenge is to incorporate such diverse sources into mathematical models so that «they 'speak to us' in the simplest way possible terms and serve as support in decision-making», continues Díaz.

For these advanced analytical techniques to be successful, «it is essential that the data for the calculations is of high quality». That is why Repsol collaborates with the Spanish State Meteorological Agency (AEMET), «a reference in our country», that also markets the global forecasts of the European Center for Medium-Range Weather Forecasts (ECMWF). This body is made up of 34 European weather agencies and is internationally recognized for its forecast quality. On the technological side, Repsol has a strategic partnership with Microsoft that includes hosting its Data & Analytics platform on Azure, the American company's 'cloud'.

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Effects on consumption patterns

Weather is essential to optimize the integration of renewable energies in the electricity market

From the fashion sector to the banking sector, the use of weather data is becoming more widespread in all customer-focused operations, which have different consumption patterns depending on the season and the weather conditions. Using your car, buying heating fuels or mineral water at a service station are all decisions affected by temperature, wind or rainfall, factors «that are continuously applied in commercial practice to determine what the future demand or prices will be».

Repsol uses the 'Degree day' concept, based on the AEMET temperature forecast and business analysis, to «approximate trends that respond to our customers' needs». This tool helps to anticipate, for example, the consumption of LPG (butane and propane) to heat homes and prepare the logistics chain. Weather forecasts are also used to offer tailor-made products for adverse weather conditions such as anti-freeze systems for agriculture.

The Data & Analytics & AI Hub is working on a project to issue technical energy efficiency recommendations to its power and gas customers. They will include smart guidelines, «to adjust your refrigerator's energy consumption according to the temperature or use more or less light depending on how cloudy it is», Díaz assures, based on the results of algorithms that use meteorology.

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Management of renewable energies

The energy group, which also generates and markets low-emission electricity, aims to be a carbon-neutral company by 2050. It currently has different renewable projects — in operation and development — with a capacity of 6,100 MW. That is why using meteorology for managing wind and solar farms — from studying possible locations to making predictions about the facilities in operation — is a factor to take increasingly in to consideration.

To optimize the integration of renewable energies in the electricity market, it is essential to have a production forecast «as accurate as possible, which we cross reference with other price and demand forecast strategies to decide which of our generation's energy mixes we take to the auction». Added to the difficulty posed by the intermittence of renewable energy sources are the demands of a market «where the new Spanish regulation requires a supply update every 15 minutes, which means the meteorology offers more immediate and updated information», indicates Julia Díaz.

The specialized agencies have already fine-tuned factors such as surface wind components to adapt them to the wind energy production needs and now offer up to 100-meter forecasts that reach the height of the wind turbines. Progress is also being made in the indicators related to solar energy, such as predicting airborne dust that, when it settles, reduces the solar panels' performance.

Machine Learning techniques will provide greater precision in the calculations that meteorology needs

Machine Learning and computing needs

One line of ongoing work that will make meteorology evolve is the application of Machine Learning and Artificial Intelligence techniques «similar to those we are already using at Repsol for our business scenarios». These are cognitive technologies that train computers using past predictions and behaviors so that they learn automatically and provide more precise calculations.

Today, meteorological services provide a highly detailed 48-hour forecast and a reliable seven-day forecast, with more uncertainty the further removed in time. Meteorologists estimate that each day of improvement implies 10 years of research, and they also warn that 100% accurate predictions will never be possible because the atmosphere is, by nature, a chaotic system.

Hardware also poses a challenge due to the capacity requirements and computing costs for modeling these physical phenomena. In the next few years, the first quantum computers could arrive with a calculation speed 100 times greater than that of current supercomputers, «an emerging technology that responds to computing requirements and an ever-increasing data volume which will demand more precision, but also more speed», concludes Díaz.

Communication Executive
Managing Division
prensa@repsol.com

Campus Repsol ·
C/ Méndez Álvaro, 44. 28045. Madrid ·
Phone number: 917538787 - 917534471