

Case study 3

Wind strength variability in Italy and energy generation



Focus: During the first days of March 2016 there was a strong variability in the wind regime over Italy linked to particular synoptic systems over the Mediterranean Sea which had implications for supply-demand balance

Boosting decision making

- The main objective of this case study is to illustrate the benefits of designing adequate decision-support products to identify variability in the wind regime that impacts on the power system.
- How can ENEL effectively manage the risks associated with extreme climatic events?

The seasonal forecasting context

- This case study focuses on seasonal forecasts of strong wind events and their probability of occurrence. A challenge is the time sampling of such events that is usually shorter than a month. A suitable approach for temporal downscaling of seasonal forecasts will be investigated.

Sectoral challenges and opportunities

- Power price management and hedging of generation portfolio – when to hedge the power production?
- Managing variable wind power production in a multi-asset system to achieve supply-demand balance.

Weather conditions and the power system

Around 3rd March 2016 the presence of a cold pool over Central Europe favoured the formation of a deep depression centred over the Adriatic Sea. It created a strong pressure gradient over the Tyrrhenian Sea causing strong westerly winds over Southern Italy. The quasi-stationary nature of the synoptic pattern favoured the persistence of strong winds over the southern portion of Italy.

On 10th March there was a weak low between Sardinia and Algeria as part of a cyclonic pattern extended towards the Black Sea. The presence of a secondary low over Southern Balkans generated a saddle over Southern Italy. With an almost zero pressure gradient at the ground, there were very weak winds over the southern regions of Italy in this latter period.

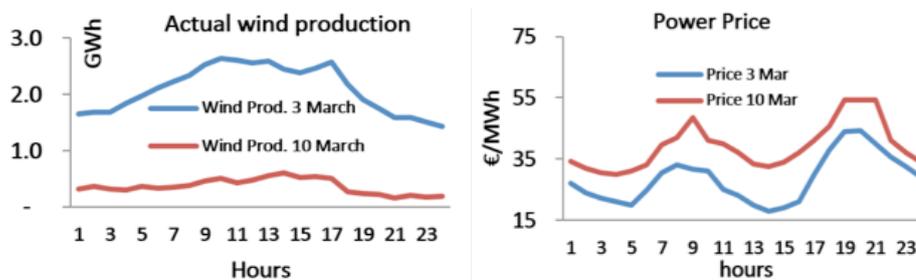


Figure 1: Hourly wind production and the effect on market prices

Figure 1 shows the hourly wind power production (left) and evolution of the market power prices (right) during March 2016 in Southern Italy. Coherently with the meteorological scenario on 3rd March, there was a high level of power production by wind farms, especially during the middle hours of the day. The effect was to lower market prices due to the strong offer of renewable energy. For a wind producer it was a good day because they sold a large volume of production, even if at low price, and as they do not pay for the wind there are no merchant costs involved.

Better strategy management

In this case, given the lower power price as a consequence of the strong wind output, the thermal producer was 'kicked out' of the market. For a producer with both thermal and wind production assets, it is not easy to quantify the combined effect of strong winds for its production strategy. However, it is critical to estimate such cross interactions in order to consistently plan the operations of the different assets and fuels. If the producer knows, by means of seasonal forecasts, the wind production and at which level it will be forced to turn off the thermal assets, they can optimise the fuel reserves and supplies to improve their final margins.

Climate event

Variable wind speeds in Southern Italy in the first two weeks of March 2016

Sector impact

Variations in wind power production and price and implications for thermal power production and price

Management strategy

Using seasonal climate data to forecast energy demand linked to weather conditions

Industrial and research partners

The SECLI-FIRM project aims to demonstrate how improving and using long-term seasonal climate forecasts can add practical and economic value to decision-making processes and outcomes, in the energy and water sectors. To maximise success, each of the nine SECLI-FIRM case studies is co-designed by industrial and research partners. For this case study, the industrial partner is utility company, ENEL, and the research partners are ENEA, KNMI and UEA.

The industry context

In Italy there is an open market system for power, where price is determined by the balance between offer and demand. The Italian power market is divided into six geographical zones that, in some situations, behave as insulated systems. In terms of the power market, electricity price correlates positively with demand and negatively with renewable production because, in the bidding curve, renewable power plants are offered at zero price. Therefore, a measure of tightness could be defined as the demand net of renewable production.

The business process

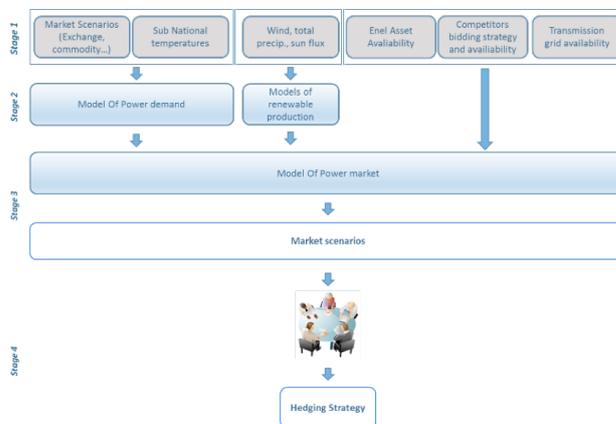


Figure 2: Flowchart for ENEL business process

Figure 2 shows the general framework of the decision process to manage the business within ENEL. A control group and a test group will be established by ENEL (see Figure 3 overleaf). In terms of climate conditions, the control group will only be able to access widely known climatological conditions (currently the most common approach) while the test group will also be given current tailored seasonal climate forecasts.

Co-designers

ENEL
ENEA
KNMI
UEA

Industry context

Utility
Power generation

Business process

Data gathering
(market and meteo)
Simulations of the
power market
Hedging committee

Value assessment of seasonal forecasting

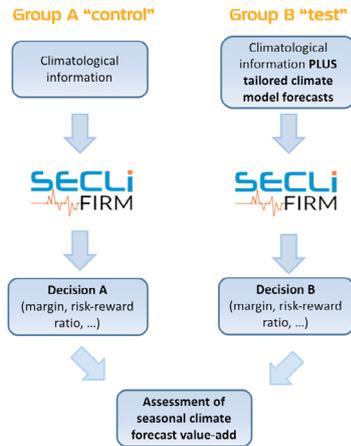
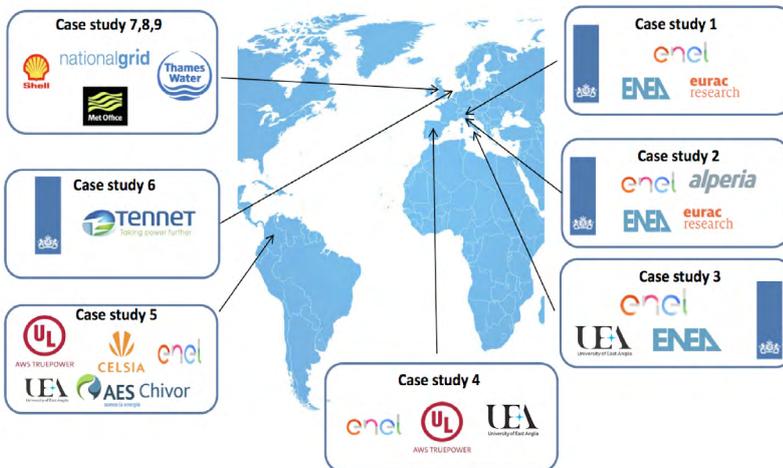


Figure 3: Flowchart for the evaluation process

The nine SECLI-FIRM case studies



The Added Value of Seasonal Climate Forecasting for Integrated Risk Management (SECLI-FIRM)

For more information visit:

www.secli-firm.eu

or contact the SECLI-FIRM team at:

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Value assessment

How will the value of seasonal forecasting be assessed?

Find out more

For more about this and other SECLI-FIRM case studies, visit www.secli-firm.eu

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