After the Blackout: A Subtle Shift in Risk Management

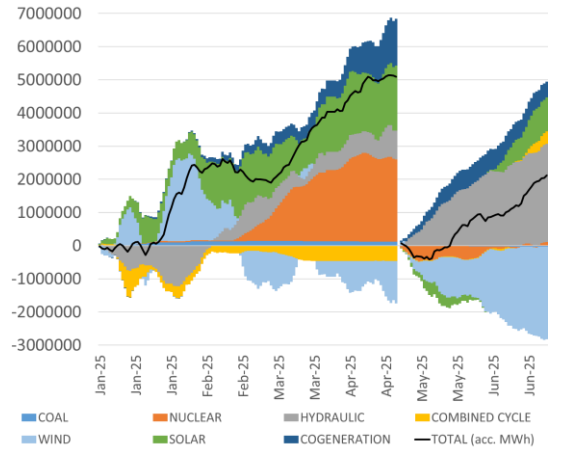
Following the blackout of April 2025, Spain's day-ahead electricity market continued to operate normally. However, an increase in security-related balancing actions by REE suggests a more cautious operational approach in May. This shift -likely aimed at reducing system risk- has translated into higher wholesale electricity market price, highlighting the trade-off between reliability and affordability.

Spain, renewable energy leader. Over the past two decades, Spain has emerged as a European leader in the deployment of renewable energy, particularly solar photovoltaic and wind power. Installed solar capacity grew from nearly zero in 2006 to over 34.9 GW by 2025, while wind capacity more than doubled over the same period, reaching nearly 32.5 GW (REE, 2025). So far in 2025, solar and wind have jointly covered an average of 45.4% of Spain's electricity demand, with certain days and hours reaching significantly higher shares (OMIE, 2025).

Blackout and the complex integration of an increasing share of renewables in the electricity grid. Despite the rapid roll-out and the numerous benefits of renewables, such as emission reductions and lower electricity prices, the integration of these sources into the grid continues to pose technical and operational challenges.[1] These challenges became particularly evident during the massive blackout on April 28, 2025. At 12:33 CET, a sudden and widespread grid failure triggered the automatic disconnection of the Iberian Peninsula from the continental European system, leaving over 50 million people without electricity for hours. While initial speculation pointed to cyberattacks or equipment failure, official investigations by Red Eléctrica and the Ministry for the Ecological Transition (MITECO) ruled these out, pointing instead, indirectly, to a deeper and increasingly relevant issue in a decarbonized economy: the growing complexity of balancing a grid that relies more and more on variable renewable sources. The Government's investigation identified a combination of excessive voltage levels, insufficient active synchronous generation, and limited capacity to absorb disturbances as the root causes. In other words, although it may ultimately have been a failure of system management, **the event highlighted the rising difficulty of operating a power system with declining inertia[2],** driven by the reduced participation of inherently inertia-contributing technologies, such as conventional thermal plants and rotating-mass hydro, and compounded by the underdevelopment of energy storage solutions in renewable systems.

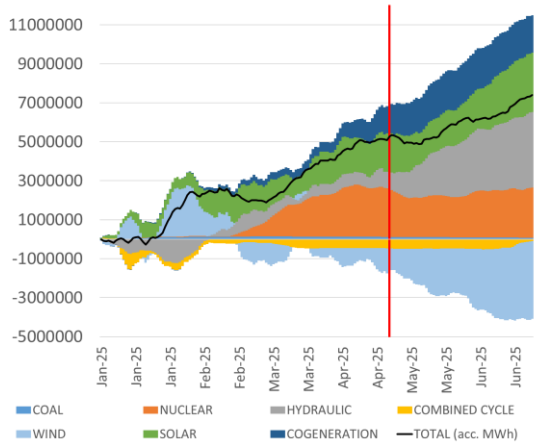
1: Some of them have been addressed in: i) Spain | Renewables: Wind north, solar south -strong growth yet falling short of targets | BBVA Research; ii) Spain | The Power Grid, the Overlooked Cornerstone of the Energy Transition | BBVA Research
2: Inertia refers to the ability of synchronous machines to resist sudden frequency changes, acting as a buffer against imbalances.

FIGURE 1. DAY-AHEAD MARKET ENERGY MIX: 2025 VS. 2024 (ACCUMULATED MWH, PRE-AND POST-BLACKOUT)



Source: BBVA Research with data from OMIE

FIGURE 2. DAY-AHEAD MARKET ENERGY MIX: 2025 VS. 2024 (CUMULATIVE MWH, FULL PERIOD)



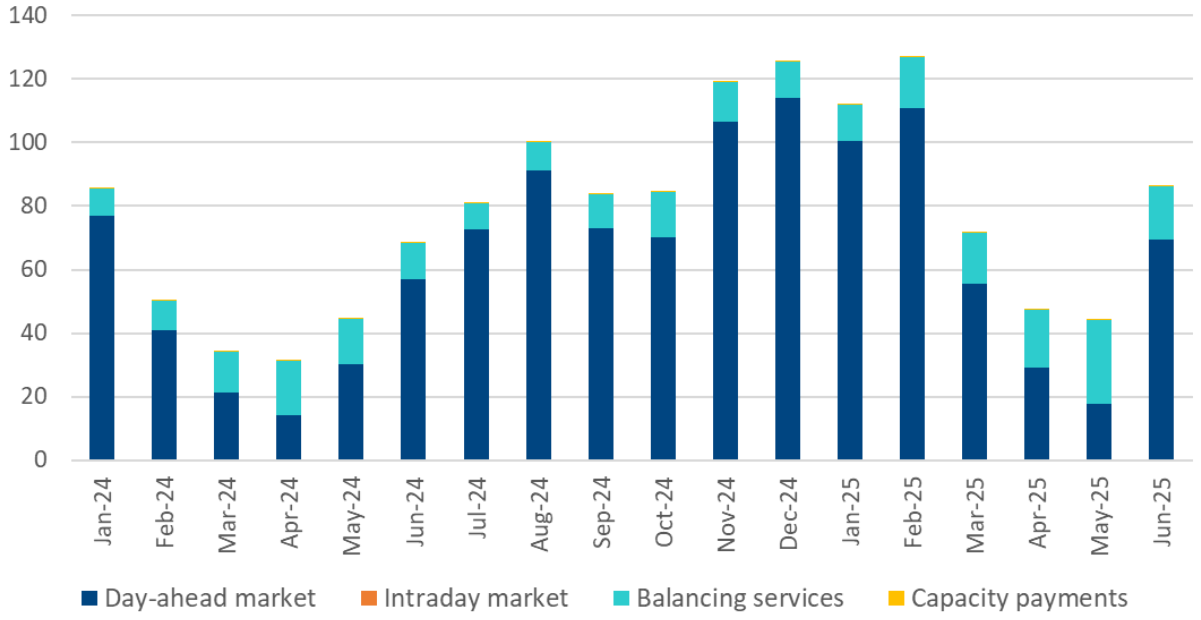
Source: BBVA Research with data from OMIE

Does the blackout indicate significant differences in the behavior of the energy mix and prices in the electricity market?[3]

There is no evidence of a managerial shift in the day-ahead electricity mix. **Figures 1 and 2** show changes in the Iberian day-ahead market generation mix between 2024 and 2025, enabling a quick assessment of whether the post-blackout shifts reflect new developments or merely a continuation of existing trends.[4] The charts show that electricity demand in 2025 has been higher than in 2024, as indicated by the black line, prompting most generation sources to scale up their output accordingly. Wind power, however, stands out as an exception: its output has fallen sharply, a decline that began after a strong January and has persisted since. Combined cycle gas, which had been running below 2024 levels earlier in the year, has since stabilized and even turned positive in recent days, particularly following the blackout. By contrast, hydro power has significantly ramped up its production, supported by higher demand, weak wind generation, and heavy rainfall earlier in the year. Other sources -including solar (driven by greater installed capacity), nuclear, and cogeneration- have also contributed more to meet the growing electricity demand.[5] **Overall, there is no evidence of a structural shift or management decision in the day-ahead market following the blackout. This is not unexpected, given that the regulator cannot intervene directly in the merit order** or modify the marginal pricing logic that underpins the day-ahead electricity market.

3: The following lines aim to shed light on whether the April blackout has altered the functioning of the Spanish electricity market by examining recent developments in a clear and accessible way, while acknowledging that deeper, more technical analysis will be needed going forward.
4: To show the difference, we calculate the daily MWh generated by each technology in 2025, subtract the corresponding 2024 values, and then accumulate the differences day by day up to June 24. The distinction between Figures 1 and 2 lies in how the accumulation is done. In Figure 1, we split the timeline: one cumulative line up to the day of the blackout, and a separate one starting the day after, giving us two trajectories, pre- and post-blackout. In contrast, Figure 2 shows a single cumulative curve across the full period, with the blackout day marked by a red line.
5: Solar, despite posting a net increase both year-to-date and over the past month, has slightly underperformed in the immediate aftermath of the blackout, similar to nuclear generation.

FIGURE 3. BREAKDOWN OF ENERGY CLOSING PRICE COMPONENTS (€/MWH) – NATIONAL POWER SYSTEM | JUN 2024 – JUN 2025



Source: BBVA Research with data from REE

Prices: higher weight of balancing services in May suggests a more cautious operational stance of the electricity system, paying a risk premium. The generation mix analyzed above primarily influences prices in the day-ahead market, which are linked to the marginal technology -i.e., the last unit dispatched to meet demand. As previously discussed[6], this marginal unit is frequently a gas-fired or hydro plant, making gas prices a key determinant of day-ahead electricity prices. Nonetheless, when we look beyond the day-ahead market and examine the remaining elements that shape the total wholesale electricity price -specifically, the intraday market, balancing services (also referred to as system adjustment services), and capacity payments- some noteworthy deviations emerge. In particular, balancing services appear to have behaved atypically during the month of May. Figure 3 above presents the monthly breakdown of the total wholesale electricity price over the period analyzed. While the day-ahead market remains the primary driver of wholesale electricity prices, **balancing services have played a notably significant role -accounting for an average of 22% of the total price during the period under analysis, with certain months, such as May 2025, reaching as high as 60% of the total wholesale price.** This observation may suggest a more cautious operational stance by the Spanish system operator (REE) with respect to renewable integration -or more generally, a shift toward a lower-risk approach motivated by heightened concerns over grid security following the blackout. In this context, the increase in balancing costs may be interpreted as the system effectively paying a “risk premium” to mitigate the probability of another major outage.

6: Spain | Reaping the Benefits of Renewable Energy in the Spanish Economy | BBVA Research. February 14, 2025.

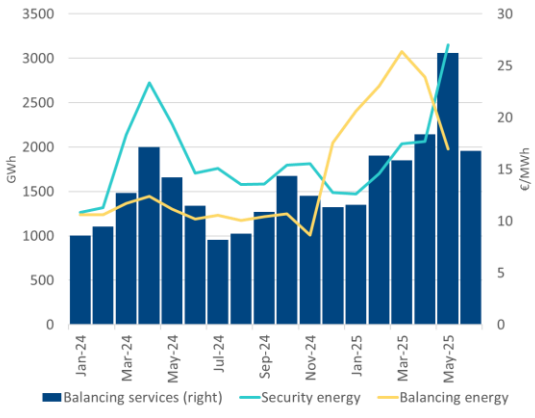
The rising cost of balancing services, mainly driven by preventive security measures.

The influence of balancing services on the overall wholesale electricity price can be understood through two main channels:

- **Volume of electricity managed through the balancing market**: A more conservative estimate of the maximum share of non-dispatchable renewable energy that can be safely integrated into the grid may lead to higher volumes of electricity being subject to real-time adjustments and balancing costs. These adjustments typically involve dispatching more flexible and controllable generation technologies - often fossil-fuel-based- to ensure system reliability. This volume tends to increase when renewables represent a larger share of the generation mix, due to their variability and limited controllability. However, it may rise even further if the system operator adopts a more risk-averse operational posture -effectively introducing a "risk premium" in the form of additional reserve or redispatch requirements.

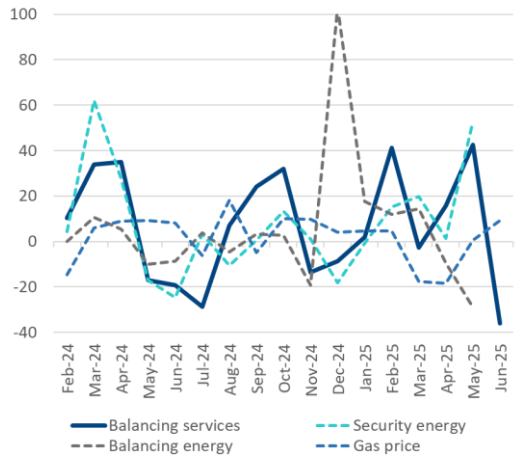
- **Price differential between the day-ahead and balancing markets:** Because the balancing market primarily relies on dispatchable technologies -excluding most intermittent sources such as wind and solar -it generally clears at higher prices than the day-ahead market. A higher share of renewables in the day-ahead market (which tend to suppress prices due to their low marginal costs), combined with rising gas prices (which increase the cost of balancing actions), can widen this price differential.

FIGURE 4. EVOLUTION OF BALANCING COSTS AND ACTIVATED ENERGY VOLUMES IN THE SPANISH POWER SYSTEM
(JAN 2024 – JUN 2025)



Source: BBVA Research with data from REE

FIGURE 5. MONTHLY PERCENTAGE CHANGES IN BALANCING SERVICES, ACTIVATED ENERGY, AND GAS PRICES



Source: BBVA Research with data from REE

Figure 4 and 5 presents the monthly change of three key balancing-related components in the Spanish electricity system between January 2024 and June 2025. **Security energy and balancing energy represent the physical volumes (in MWh) activated by the system operator**. The former is used preventively, for example, for voltage control or network congestion management, while the latter is used to correct real-time imbalances between

forecasted and actual generation. **Balancing services represent the total economic cost (in €/MWh) associated with these activities, potentially further influenced by other factors too, such as gas prices.**

May 2025 clearly stands out as the month in which security energy reached its highest level across the entire period, pointing to a possible deliberate increase in preventive activations by REE. In fact, the cost rose by nearly €8/MWh -an increase of approximately 43% compared to the previous month- marking a sharp contrast with the €3/MWh decrease observed during the same period in the previous year. Moreover, as shown in **Figure 5**, gas prices remained essentially stable in May (+0.5%), and the combined share of solar and wind in the generation mix actually declined by 0.7%, which makes the spike in security-related costs all the more exceptional. In contrast, the cost of balancing services, which had peaked in March, declined in both April and May, reversing the steady upward trend that had begun in late 2024.

From a basic statistical standpoint, when assessing which of the three variables, security energy, balancing energy, or gas price, has the greatest influence on the cost movements (m/m %) of balancing services, one factor stands out clearly: **security energy.** It is the only variable that is statistically significant in a linear regression model (at both the 10% and 5% significance levels), with a coefficient of 0.7, indicating that each percentage change in the volume of energy security is associated with a 0.7 percentage increase in the balancing service costs. Moreover, it is also the only variable with a high positive correlation with the dependent variable (0.71), **reinforcing the intuition that, over the analyzed period, fluctuations in the cost of balancing services have been primarily driven by changes in the volume of energy activated for system security purposes.**

In summary, the wholesale electricity market functioned largely as expected in the aftermath of the April 2025 blackout, with no clear disruptions observed in the day-ahead segment, unsurprising, given that the system operator does not directly intervene in the merit-order dispatch. **However, in the post-market adjustment layers -particularly in security-related interventions- REE appears to have adopted a more cautious, risk-averse operational stance. This shift was reflected in a notable increase in the volume of security energy activated, effectively placing a higher premium on system reliability, albeit at an increased cost to consumers.** While recent data suggests that this protective posture may have moderated in June, continued monitoring will be essential to assess whether this marks a temporary adjustment or a longer-term strategic change in grid management under high-renewables conditions. In parallel, Royal Decree-Law 7/2025 has just been approved, introducing urgent measures to reinforce the power system. This new regulation stems directly from the recommendations issued by the committee tasked with investigating the circumstances that led to the blackout, and may lay the groundwork for structural adaptations in the regulatory and operational framework.

Highlights of the Week

Global	**Indicators of Global Climate Change 2024: annual update of key indicators of the state of the climate system and human influence.** June 19, 2025.
Global	**COP30 host Brazil warns against over-reliance on carbon credits | Reuters**
OECD	**Global Drought Outlook | OECD.** June 17, 2025. It assesses how countries can strengthen drought management to adapt to a changing climate.
OECD	**Fast-tracking Net Zero by Building Climate and Economic Resilience | OECD.** May 27, 2025. This report provides governments with policy insights to help close the ambition and implementation gaps to reach net zero.
Europe	**EU eases state aid rules to boost green projects, cut carbon footprint | Reuters.** June 25, 2025.
Europe	**EU countries demand stricter controls on new CO2 price | Reuters**
Spain	**Policies to Achieve Spain's Climate Objectives.** IMF June 13, 2025. The IMF staff stress that large-scale subsidies would be "very costly" and urge carbon pricing to take the lead given tight fiscal space.

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