

Decoupled: how Spain cut the link between gas and power prices using renewables

Spain has some of the lowest wholesale electricity prices in Europe, largely owing to the country's strong solar and wind growth which reduced the influence of expensive coal and gas power on the electricity market.

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About

This report analyses the influence of coal and gas generators on wholesale electricity prices in Spain compared to the four other major gas power countries in EU+UK (Germany, Italy, United Kingdom, Netherlands) in the first half of 2025 and 2019. The analysis discusses Spain's reliance on gas for grid stabilisation and the impact on renewable curtailment and costs.

Spain has some of the lowest power prices in Europe, largely thanks to solar and wind

The reduced influence of expensive fossil gas and coal power on the electricity market in Spain, driven by surging wind and solar, has turned the country into one of the cheapest power markets in Europe.

However, increased reliance on gas power post-blackout for grid stabilisation has been costly, highlighting the need for investment in clean forms of flexibility, such as batteries and interconnection.

- **Spain's wind and solar growth has reduced the influence of expensive fossil generators on the electricity price by 75% since 2019.** This decline in the hours where the electricity price was tied to gas power cost was faster than in other gas-reliant countries, such as Italy and Germany. As a result, Spain's wholesale electricity price was 32% lower than the EU average in the first half of 2025.
- **Spain remains reliant on gas for grid services, the costs of which doubled since the April 28th blackout.** These services accounted for 57% of the electricity price in May 2025, up from an average of 14% in the year before the blackout. As a result, curtailment of renewables has tripled since the blackout, from 1.8% in the last two years to 7.2% during May–July 2025.
- **Spain lags behind its European peers in grids and battery storage.** As Europe's fourth biggest power market, it only has the thirteenth largest battery storage fleet. However, post-blackout reforms aim to remedy this.

“Spain has broken the ruinous link between power prices and volatile fossil fuels, something its European neighbours are desperate to do.”

“Spain risks sliding back into costly gas reliance amid post-blackout fears. Boosting grids and batteries will help Spain break free from fossil dependency for good.”

Dr Chris Rosslowe

Senior Energy Analyst, Ember

Surging wind and solar helped make electricity in Spain cheaper than in most European countries

Spain has some of the lowest wholesale power prices in Europe, largely because rapid solar and wind growth has reduced the influence of costly fossil generators on the electricity market more quickly than in other countries.

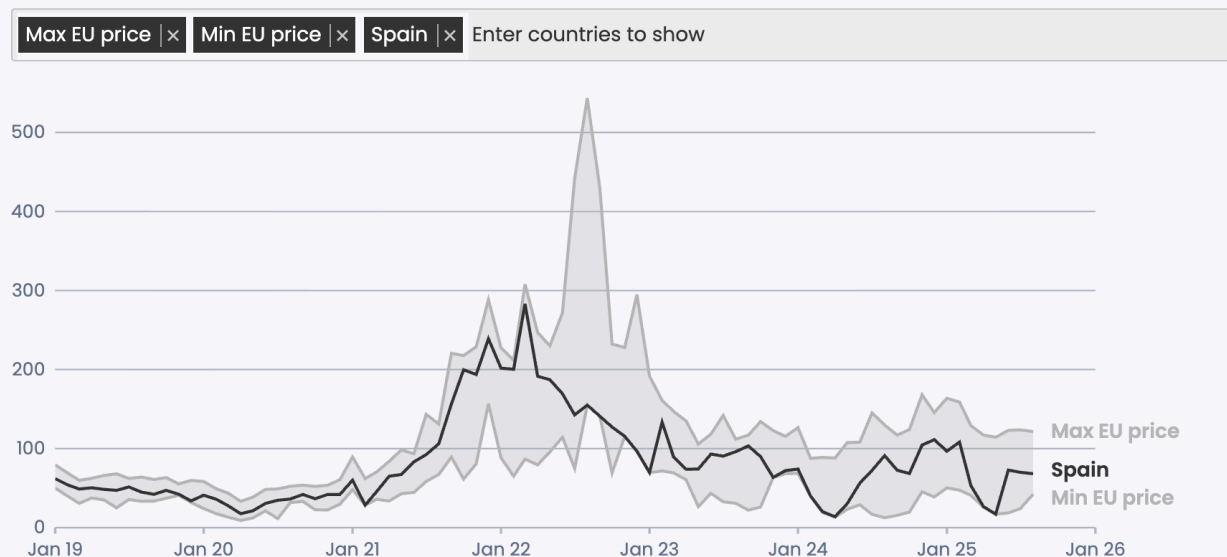


Spain's electricity is cheaper than in most European countries

In the first half of 2025, wholesale electricity prices in Spain were 32% lower than the EU average and at least 30% lower than in any European country with a large gas power fleet, such as Italy or Germany. In the first half of 2019, before the gas crisis and [widespread growth of wind and solar](#) across the EU, Spain had some of the most expensive electricity prices in Europe (EU+UK).

Electricity is cheaper in Spain than in most European countries

Wholesale electricity prices (€/MWh)



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Electricity prices decoupled from gas in Spain more quickly than in other countries

One reason for Spain's competitive power prices is that, despite having the third largest gas power fleet in the EU ([28 GW](#), second only to Italy and Germany), the country experiences the lowest impact of gas on electricity prices among these gas-heavy European countries.

In European power markets, the [most expensive](#) generator operating to meet demand – typically fossil gas or coal – sets the hourly wholesale electricity price. When the generation from [lower-cost technologies](#) like wind and solar grows

enough, it displaces gas and coal, and fossil power determines the price less often.

Thanks to strong solar and wind growth, this fossil displacement is already happening in Spain, typically in the central hours of the day when solar generation peaks or in windy night hours. In the first half of 2019, Spain's power prices reflected the cost of fossil generation in 75% of hours – this dropped to just 19% in the same period in 2025. As a result, Spain's average hourly electricity price in the first half of 2025 (62 €/MWh) was below the [cost of generating electricity with gas](#), which averaged 111 €/MWh during the same period, ranging between 87 and 148 €/MWh.

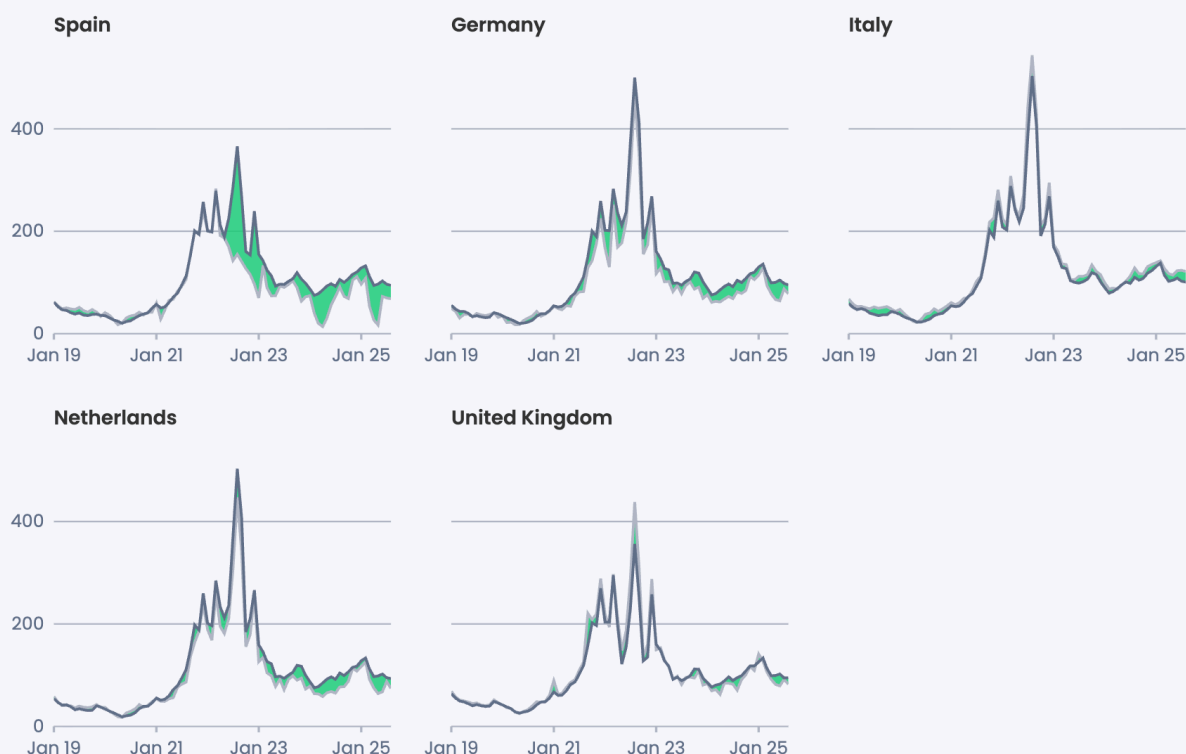
Electricity prices in Spain are no longer tied to gas power cost

Wholesale electricity prices and short run marginal cost of gas power (€/MWh)

Top five countries in EU+UK by gas generation capacity

Shaded area = difference between power price and gas power cost

Power price Gas power cost



Source: Ember, ENTSO-E, LCCC

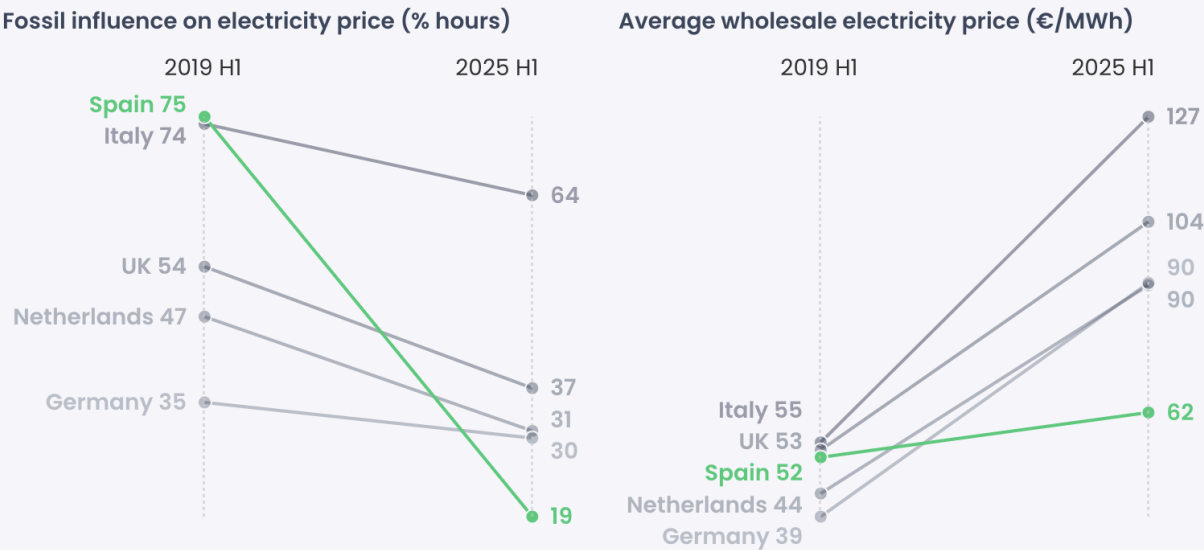
Between June 2022 and December 2023 prices in Spain were kept low by a state-mandated temporary price cap (Iberian mechanism).

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Spain has achieved the fastest reduction in fossil power influence among the top five countries in EU+UK by [installed gas power capacity](#). Spain has reduced the number of hours when electricity prices are above the cost of fossil power by 75% from 2019 to 2025 (from 75% to 19%), whereas other gas-reliant European countries have seen a more modest reduction, including the Netherlands (-34%), the United Kingdom (-32%), Italy (-13%) and Germany (-12%).

Spain went from having the highest influence of fossil generation on power prices in the first half of 2019 to the lowest among gas-reliant countries in the same period this year.

Spain curbed the influence of expensive gas and coal power, becoming one of the cheapest electricity markets in EU+UK



Source: [Ember](#), ENTSOE, LCCC, Montel, [BFF](#) • Fossil influence measured by % hours when electricity price is above the cost of gas power.
Top 5 countries in EU+UK by installed gas generation capacity.



Spain's fast-growing wind and solar displaced coal and gas power

The reduction in the influence of coal and gas generators on electricity prices was driven by Spain's solar and wind growth.

Between December 2019 and June 2025, Spain doubled its wind and solar capacity, adding over 40 GW, more than any EU country except Germany – a power market twice the size.

As a result, wind and solar generation alone equaled almost half (46%) of Spain's electricity demand in the first half of 2025, up from less than a third (27%) in the same period in 2019. This led to a stronger decline in fossil power than in other major gas-reliant countries, such as Italy and Germany. In the first half of 2025, fossil generation was only a fifth of electricity demand in Spain (20%), much lower than in Germany (41%), Italy (43%), the Netherlands (48%) and the United Kingdom (32%).

August 2025 was the first month in Spain's recent history with [no coal-fired power generation](#). That is a remarkable change: 10 years ago, in August 2015, coal accounted for a quarter of Spain's power. Gas power generation in Spain has been declining since 2022, accounting for 19% of the country's demand in the first half of 2025, down from 26% in the first half of 2019.

The rise of wind and solar has reduced Spain's fossil fuel import dependency. In the past five years (2020–2024), Spain [cut its power sector import bill](#) more than any other EU country. New solar and wind plants added in Spain in the past five years avoided 26 billion cubic metres of gas imports costing €13.5 billion, almost five times what Spain [invested in its transmission grid](#) in the same period.

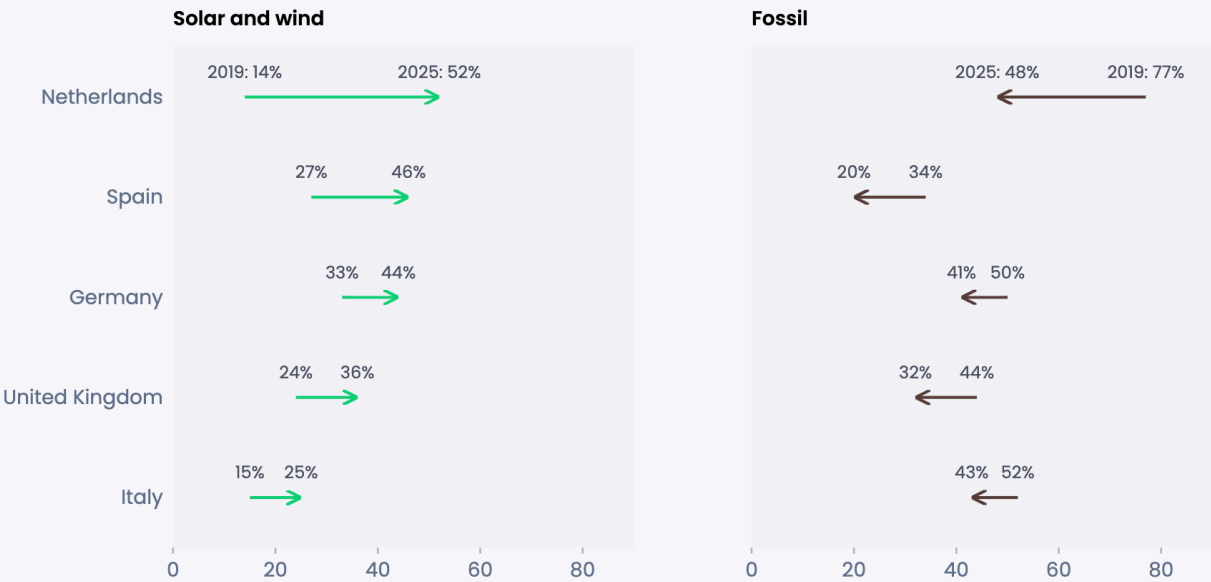
Moreover, fossil power displacement driven by wind and solar meant that the wholesale price of electricity in Spain has become less vulnerable to [gas price](#)

[volatility](#) than in other European countries. According to the Central Bank of Spain, the country's wholesale electricity prices [would have been 40% higher](#) in the first half of 2024 if wind and solar generation had remained at 2019 levels, requiring more fossil gas generation to meet demand and making the country more vulnerable to gas price hikes.

Rapid solar and wind growth strengthens Spain's position as a low-fossil power leader

Share of electricity demand in H1 2019 → H1 2025 (%)
Top five EU+UK countries by installed gas generation capacity

Generator ● Solar and wind ● Fossil



Source: Monthly electricity data, Ember

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Increased use of gas post-blackout is a costly warning, exposing slow investment in alternatives

While gas generation is in decline, Spain remains reliant on gas for grid stability, a situation that has led to rising costs, especially since the country has taken a more cautious approach since the Iberian blackout in April 2025. In contrast, investment in alternative, clean forms of flexibility has been slow.

Increased reliance on gas post-blackout has heightened existing problems in Spain's grid

While the influence of gas and coal on power prices has been weakened, Spain remains reliant on gas to solve grid constraints. As renewables have rapidly grown, investment in grids and [clean flexibility solutions](#) has not kept pace. As a result, renewables curtailment and grid costs had been rising steadily, before spiking since the April 28th blackout.

Curtailment of renewables has tripled since the blackout

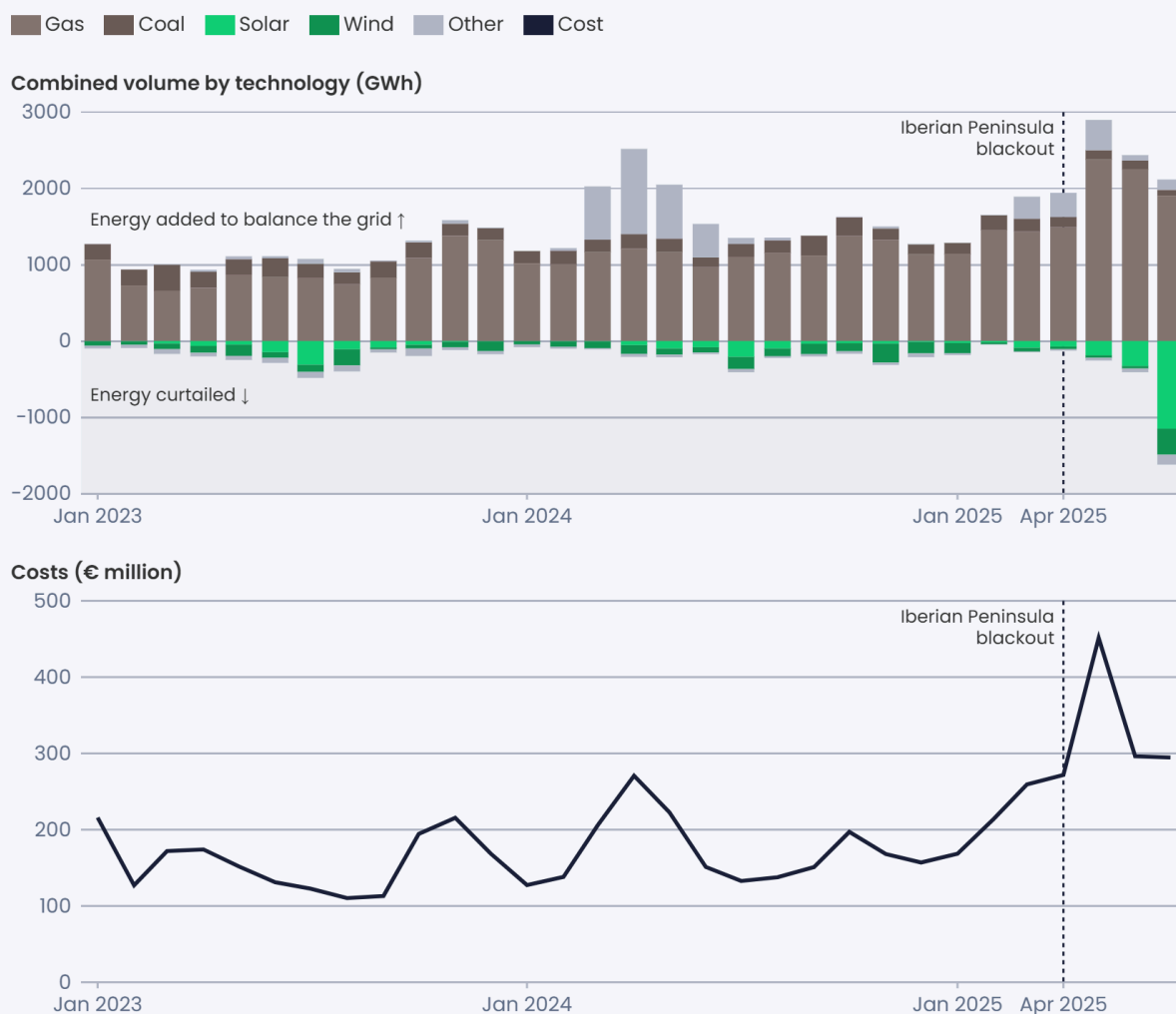
Curtailment of renewables in Spain is mainly used to resolve voltage control issues or physical constraints in the grid. As wind and solar are turned down, gas power plants are typically turned up in their place. These actions are

coordinated through the so-called technical restrictions markets, which dominate the cost of ancillary services in Spain.

Curtailment of renewables has been rising steadily, from 0.4% of generation in 2021 to 1.8% in 2023 and 2024, but accelerated steeply after the blackout, reaching 7.2% across May–July 2025. The reason for the sharp increase since April is the system operator’s decision to operate the grid in a [‘safe’ mode](#), running a greater number of gas power plants than usual to provide voltage control. This forcing of gas generation onto the grid has left less space for renewables.

The volume and cost of grid balancing actions have increased in Spain, especially since the blackout

Monthly volume and cost of grid balancing actions



Source: Red Eléctrica market data • Costs and volumes are shown for day-ahead and real-time technical restrictions markets combined.

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The use of gas for grid services doubled in May, increasing costs

Rising renewables curtailment wastes cheap electricity, but it is the increase in gas power that plays a more significant role in driving up costs. The use of combined cycle gas turbines (CCGT) for grid services increased from 7.8 TWh in

2021 to 13.7 TWh in 2024. Spain's CCGT fleet plays a far more important role in grid balancing than in power generation. Between 2021 and 2024, CCGTs provided only 25% of Spain's power generation but 75% of its balancing needs.

The Spanish grid's heavy reliance on gas for grid stability is even more apparent since the blackout. In May, the use of gas in technical restrictions markets soared to 2400 GWh, double the amount in May 2024. In the year preceding the blackout, the price of these markets averaged €5/MWh and made up 14% of the final electricity price. However in May 2025, the average price climbed to €24/MWh, making up 57% of the final electricity price, as wholesale power prices averaged only €17/MWh. These increases in volumes and prices caused the cost of grid balancing actions to double in May 2025 compared to the same month a year earlier.

Slow investments in grids and clean flexibility have proven costly

Clean alternatives to gas power are available to address the issues in Spain's grid while helping to integrate renewables. Investment in these can reduce the influence of expensive gas on grid costs, just as growth in wind and solar has reduced its influence on wholesale power prices. However, investment in these solutions has been notably slow in Spain.

Slow investment in grids and grid-enhancing technologies

Spain has been slow to invest in the grid capacity and network upgrades required for integrating a high share of renewables. During the five years from 2019–2024, Spain had the lowest grid spending in Europe, investing 30 cents on grids for every €1 on renewables, compared to a European average of 70 cents, according to [Bloomberg](#).


Development of grid-enhancing technologies – quick-to-deploy solutions that enhance the capacity of the existing grid – has been slow too. The Spanish peninsular grid has no operational synchronous compensators – devices that can provide dynamic voltage control and inertia without fossil fuels. By contrast, the British grid operates [at least 12](#) such devices, despite having a lower share of wind and solar in the generation mix (35% compared to Spain’s 43% in 2024). Another key solution – [dynamic line rating](#) – also remains in an early, exploratory phase in Spain, despite its high degree of readiness and widespread use across Europe.

Missing battery storage

Spain has one of Europe’s largest gas fleets and one of its smallest battery storage fleets. Spain’s battery storage fleet of 120 MW is only the 13th [largest](#) in Europe; notably small considering Spain is the fourth largest power market with the fifth highest penetration of wind and solar, and is also one of the continent’s [least well-connected](#) systems. [Many factors](#) are behind this lack of battery storage development, including the lack of a clear regulatory framework and Spain’s relatively large pumped hydropower fleet. However, the need for flexibility is clearly growing, as demonstrated by the arrival of negative power prices in 2024.

Spain's post-blackout policy reforms show the way forward for Europe

Reforms recognise renewables' role in security and clean flexibility as the future-proof solution for grid stability.



As an immediate response to the blackout, the Spanish government announced a [package of reforms](#) aiming to increase the role of renewables and a range of clean flexibility solutions. While the package was initially rejected in parliament for [political reasons](#), the same reforms are being pursued by [other means](#). Furthermore, long-awaited rule changes were approved within days of the blackout, allowing renewables to participate in voltage control. The speed and contents of this response show that renewables – backed by clean flexibility – remain the strategic choice for Spain.

Clean solutions on the horizon will help tackle Spain's grid problems

Many of the grid services provided by gas in Spain's power system can equally be provided by clean alternatives. These clean alternatives often come with the added benefit of improving renewables integration.

The Spanish government recently [approved](#) an amendment to Spain's grid development plan to add eight synchronous compensators to the mainland grid, where the original plan proposed zero. The additional investment cost is estimated at €750 million, delivering annual savings of €200 million, suggesting

high cost-effectiveness. This should reduce reliance on gas for voltage control and inertia.

Spain's battery storage pipeline is also growing, now the [fifth largest](#) in Europe, with 2600 MW announced and 340 MW permitted. Once installed, these will help limit renewable curtailments and associated costs by storing excess energy and easing grid constraints.

Interconnection is also progressing, albeit from a very low base. The European Investment Bank has [backed](#) the Bay of Biscay interconnection project, after the governments of Spain and Portugal appealed to the EU for more support, recognising the critical role interconnectors play in [stabilising the grid](#).

The rest of Europe can learn from Spain's experience

Spain's success in growing renewables and its challenges with integrating them offer lessons for the rest of Europe.

- Growing wind and solar to reduce the influence of gas in power markets can significantly lower wholesale power prices.
- It is vital that grid investments keep pace with renewables, including new grid capacity as well as enhancements.
- Failure to develop grids and clean flexibility can increase both grid and electricity costs if they remain reliant on expensive gas or coal.
- As some other European countries seek to expand gas power fleets, Spain is pushing in the opposite direction. For example, Spain is consulting on a capacity mechanism, a tool [typically](#) used to subsidise gas power, but the [proposed rules](#) would limit support for gas in favour of clean alternatives.

Supporting information

Methodology

Fossil power's influence on the electricity price

The influence of fossil power generators on the power price is estimated by the share of hours in a specified period when power prices are equal to or exceed the average cost of generating electricity with fossil gas. The methodology aligns with the latest [ACER market monitoring report](#).

The cost of producing electricity using fossil gas is represented by the Short Run Marginal Costs (SRMC) of gas power generation. This cost is the sum of fuel costs, carbon costs and variable operating and maintenance costs, assuming a gas power plant efficiency rate of 50%. For more detailed information, refer to [Ember's European electricity prices and costs tool](#).

When the SRMC of gas exceeds the SRMC of hard coal—an occurrence that was prevalent in the majority of hours during the first half of 2025 across the EU—this metric indicates the share of hours when fossil gas generation influences the power price.

Wholesale electricity prices

Wholesale electricity prices are the prices generators receive for selling electricity on the day-ahead market (for full details, see [Ember's European Wholesale Electricity Price Data](#)). For an explanation of how prices are set on the day-ahead market according to the marginal pricing (or “merit order” mechanism), see [here](#).

Wholesale and retail electricity prices

Wholesale electricity prices are different from the prices paid by electricity consumers (retail electricity prices). The latter can also include taxes, levies, network charges, system costs, subsidies and supplier profits.

However, wholesale electricity prices do impact the retail price – either immediately for the [minority](#) of Spanish consumers that are on dynamic tariffs, or over a slightly longer term for those on fixed-price contracts.

Specifically, the so-called “energy component” is the largest single contributor to the electricity retail prices in Spain (roughly [50%](#) of the total retail electricity price in 2024 and 2025). This component usually reflects wholesale market conditions, because it represents the cost that suppliers incur when procuring electricity in advance from the wholesale market to supply their customers.

Investment in Spain's transmission grid

Spain invested €2.9 billion in the country's transmission grid over the past five years (2020–2024), according to Red Eléctrica's annual reports for [2020](#), [2021](#), [2022](#), [2023](#), [2024](#).

Acknowledgements

Contributors

Elisabeth Cremona, Pawel Czyzak, Hannah Broadbent, Lauren Orso, Harriet Fox, Claire Kaelin.