

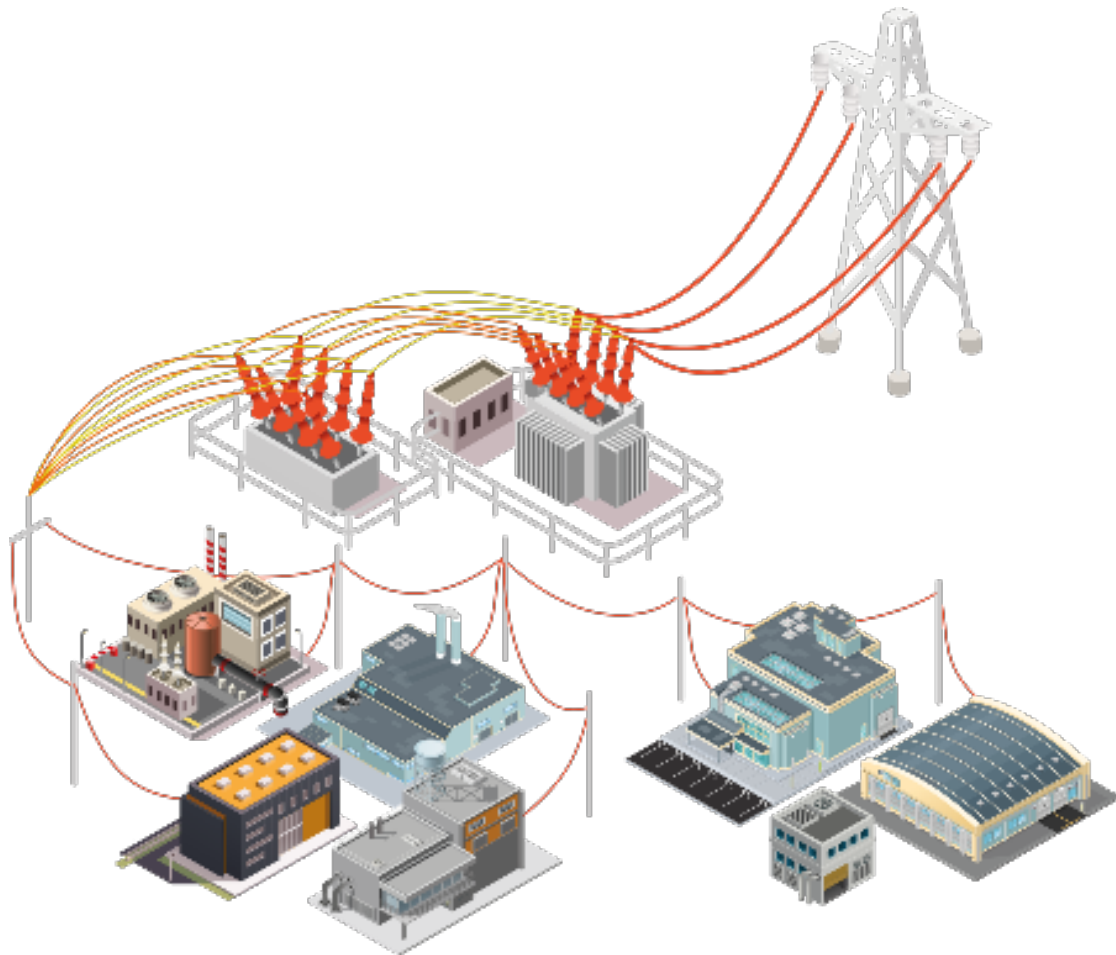
Energy market report

December 2023



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Energy market report



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The analysis

Electricity ends 2023 at 87.43 MWh, 58.3% cheaper than in 2022



Juan Antonio Martínez & Leo Gago
Grupo ASE Analysts

- » For the first time, renewables have generated more than half of the annual electricity (52.6% of the mix), and for the second consecutive year, Spanish electricity prices have been the most competitive in Europe.
- » The annual demand fell by 2.7% in 2023 and has accumulated a decrease of 10.2% since its peak in 2018.
- » Analysis: there is an increased risk of surplus renewable energy supply in 2024.

The electricity price closes December at €72.17/MWh, a 13.7% increase compared to November. The daily price of the Spanish wholesale market (POOL) for December closed at €72.17/MWh, rising by 13.7% compared to November, but it is 46.7% cheaper than in December last year, when it stood at €135.29/MWh. The difference between 2023 and 2022 is -58.3%.

Price of the Daily Electricity Market (OMIE)

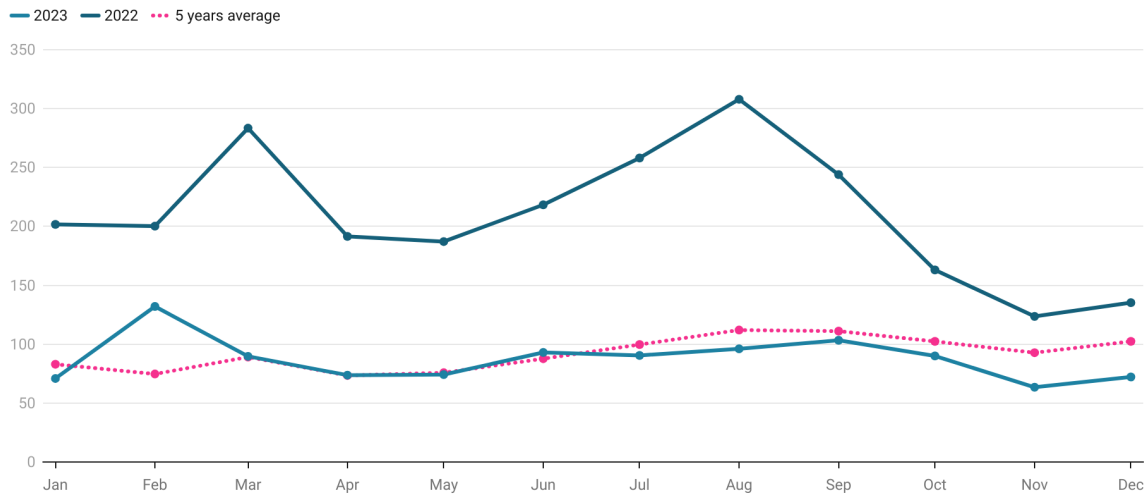


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The increase in the last month is due to a rise in electricity demand and a decrease in wind and photovoltaic production.

The electricity price in 2023 has been 52% lower than what the market anticipated at the end of 2022

Although it is in a clearly higher range than its average over the last decade, the average electricity price of 2023 closes at €87.43/MWh, 58.3% lower than that of 2022 (€209.69/MWh).

Daily Gas Price TTF vs MIBGAS (€/MWh)

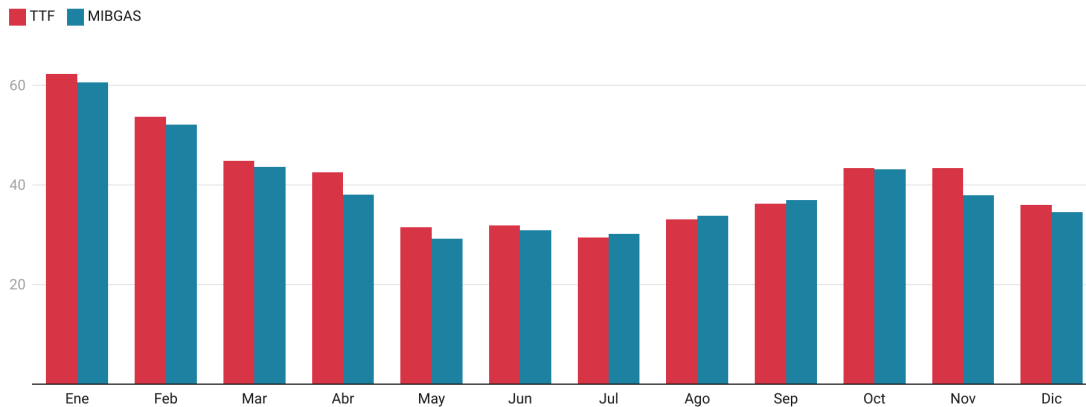


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In any case, it has been much more moderate than the forecasts at the end of 2022 indicated. At that time, the 2023 product (Yr-23) was closing on the Spanish electric futures market (OMIP) at €183/MWh, 58.3% above what the spot price finally marked (€87.43/MWh).

This has been the general rule in the countries around us. For example, in Germany, the average spot price of electricity for 2023 has been €95.17/MWh, when the forward market quotation at the end of 2022 set the price for 2023 (Yr-23) at €233.71/MWh.

As we explained in the December preview, the energy crisis that the European market anticipated in 2023, as a consequence of the Russian gas supply cut, has been contained due to the destruction of energy demand, which has exceeded all expectations and could have a structural character in some sectors. This issue will need to be considered in the forecasts for the coming years.

The price of electricity in Spain is the most competitive in Europe for the second consecutive year

In 2023, the average price of electricity in Spain (€87.43/MWh) was again the lowest among the major EU economies (Germany, France, Italy, Spain), whose average was €101.82/MWh.

In 2022, the competitive advantage of the Spanish market was mainly based on the Iberian mechanism of the gas cap. It was initially expected to remain in force until 31 May 2023, and was even extended to December 2023. However, it has not come into operation at all in 2023 due to the significant reduction in the daily gas price in Spain (MIBGAS). This better performance in 2023 is due to the 16% growth in renewable generation.

Evolution of Electricity Prices in Europe (€/MWh)

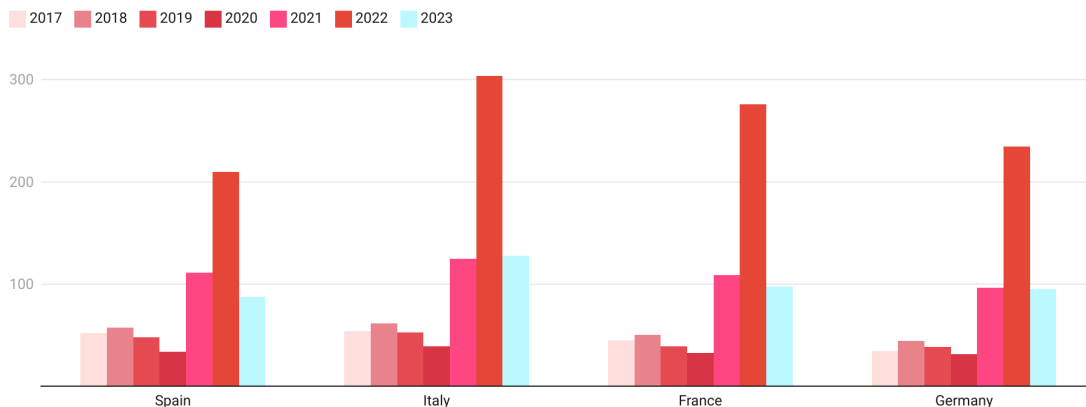


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Renewable generation reached 52.6% of the electricity mix in 2023

Electricity generation has decreased by 3.3% compared to last year due to the reduction in electricity demand (-2.7%) and the fall in the export balance (-28.6%). Wind power has led the electricity mix for the third consecutive year, accounting for 24.5% of total generation, followed by nuclear at 21.5%.

Electricity Generation Mix (2014-2023)

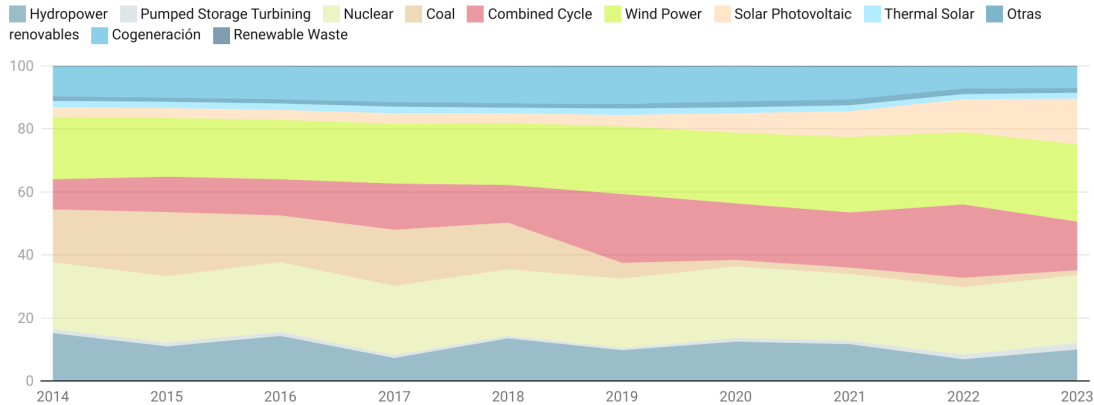


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Renewable Sources

In 2023, for the first time, more than half of Spain's annual electricity generation was from renewable sources. After growing by 15.7%, it reached 52.3% of the mix.

Wind power increased by 3.2%, but the technology that has experienced the most spectacular evolution has been photovoltaic (+33.9%), which now contributes 14.5% of the generation mix. In fact, during peak radiation hours (between 9:00 and 18:59), photovoltaic led the generation with 28.9% of the mix, ahead of wind (20.2%) and nuclear (19%).

Variable Generation Mix 2023

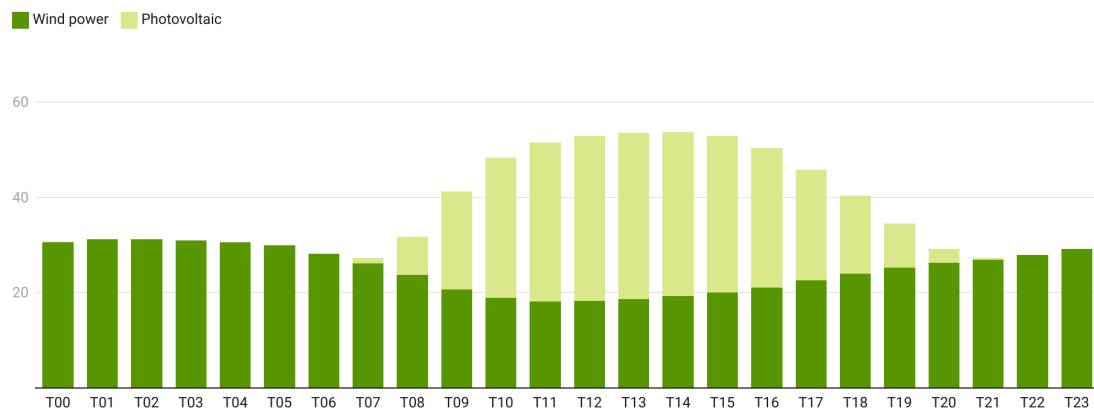


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Photovoltaic capacity increased by 29% in 2023 to 24,647 MW. Meanwhile, wind power capacity saw a modest increase of 3.3% to 30,718 MW. New wind and photovoltaic installations (in project and under construction) guarantee that in 2024 renewable generation will again record significant progress.

In the last five years, wind and photovoltaic have grown by 71.5%, representing a remarkable intensification of variable renewable generation, which depends on weather conditions and high seasonality. Integrating this greater intermittent renewable generation will pose a significant challenge for the electrical system, with declining electricity demand and limited interconnection and pumping capacity.

On the other hand, after an extremely dry 2022, hydropower has become the third renewable source with a contribution to the mix of 10%, after growing by 41.9% in 2023. However, its production was 11.1% lower than its average over the last ten years.

Thermal Gap

Generation from fossil sources (coal and combined cycle gas) reduced by 37.3% in 2023 compared to the previous year.

Coal now accounts for just 1.5% of the generation mix, with only five plants connected to the grid. In parallel with coal's decline, combined cycle gas plants (CCGs) have been gaining weight in recent years, thanks to their greater agility to integrate into the system and their lower CO2 emissions (almost three times less than coal).

While in 2022, CCGs reached 23.3% of the mix, driven by the gas cap mechanism and scarce hydro generation, the disappearance of these two phenomena in 2023 has led to less generation from CCGs (-35.6%).

In any case, CCGs remain the third source of generation, with 15.5% of the mix, even increasing their share to 20% during peak hours. In fact, in 2023, CCGs set the marginal matching price of the POOL in 70% of the hours (hydrothermal gap).

Hydrothermal Gap Generation Mix

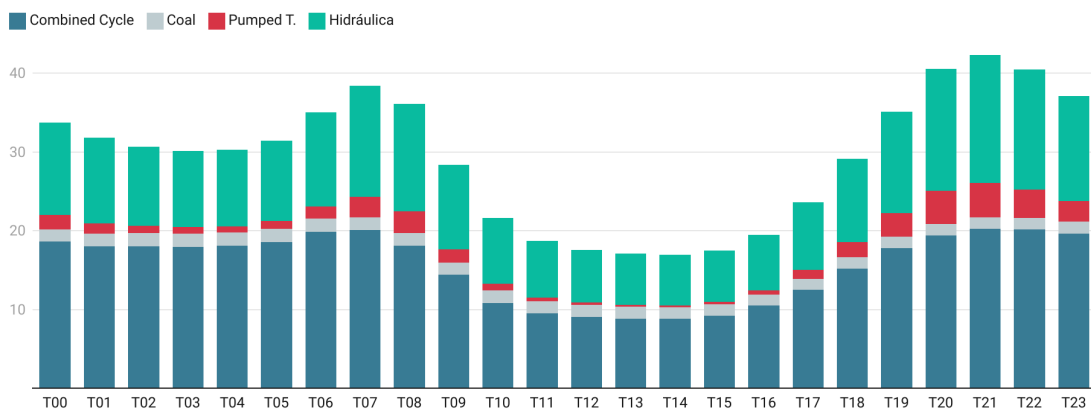


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It's very likely that combined cycle gas plants (CCGs) will continue to lose their share of the generation mix in 2024, as new renewable capacity is added and demand continues to contract. However, they will maintain a significant weight within the mix (especially during peak hours) and in setting the prices of the daily market, thanks to their high flexibility to integrate into the system when generation from variable renewable sources (wind + photovoltaic) decreases.

The annual demand decreases by 2.7% in 2023 and accumulates a decline of 10.2% since its peak in 2018

In 2023, demand again recorded a significant drop of 2.7% compared to last year and has accumulated a contraction of -10.2% since reaching its historical peak in 2018.

Evolution of average hourly power demand in Spain (MW)

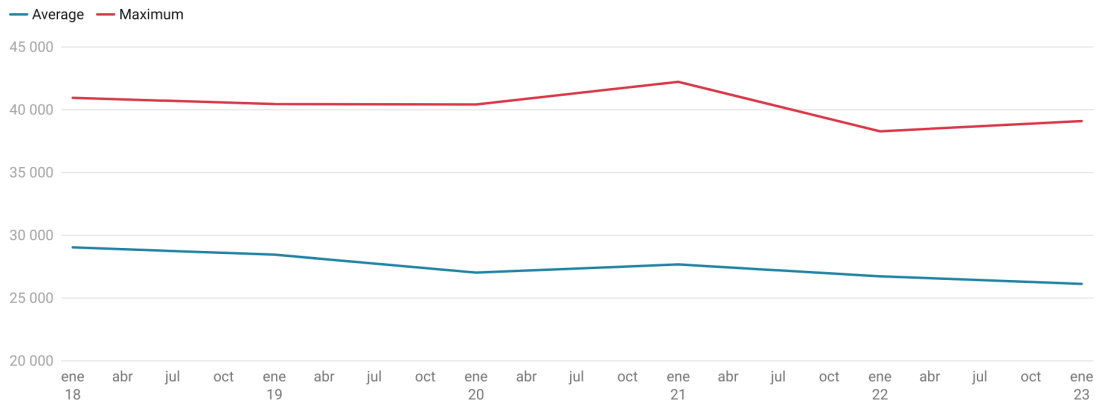


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Several factors explain this clearly downward trend of the last five years, aside from the 2020 pandemic:

- The rise of self-consumption in homes and businesses.
- An increase in energy efficiency.
- Milder winter temperatures.
- The high price signal of the last three years, which has motivated a change in habits in homes and businesses.

The factor that could alter this downward trend in the coming years is the expansion of the electrification of mobility and certain industrial sectors, replacing other fuels such as gas.

Undoubtedly, the main cause of the decline in demand is the unstoppable growth of self-consumption in businesses and households. More than 298,000 homes and over 54,000 businesses already have self-consumption installations.

In 2018, there were approximately 450 MW of self-consumption installed, while 2023 ends with about 8,000 MW (+1,678%). In the last two years, self-consumption has grown by about 2,500 MW/year. It is estimated that 47% of the installed capacity corresponds to the industrial sector, 32% to the residential sector, and 20% to the commercial sector.

Demand data indicate that, in 2023, the reduction during peak radiation hours (from 10:00 to 17:00) is between 12% and 15%, compared to 2018.

Average Hourly Demand Spain (MWh)

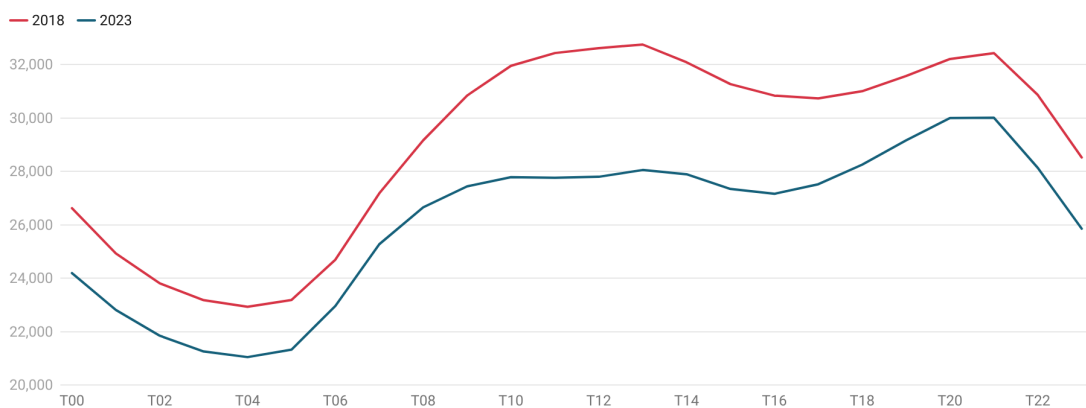


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As shown in the graph, the curve of electricity demand in 2023 is flattening compared to 2018, due to the greater drop during the central hours of the day.

Regarding industrial demand, where the impact of the increase in photovoltaic plants for self-consumption (47% of the total installed capacity) has been significant, the demand has accumulated a drop of 7.3% in 2023.

Other causes that have reduced industrial consumption include the high price signal, improved efficiency, and the relocation of certain sectors. The paper manufacturing (-21%) and metallurgy (-7%) sectors account for nearly 50% of the total reduction in industrial consumption in Spain during 2023.

MIBGAS falls 9% in December and consolidates its discount premium over the reference gas market in Europe

In December, high renewable production reduced the demand for gas for electricity generation by 28% and was the main factor driving the fall in wholesale gas prices in Spain. This decreased by 9% compared to the previous month, to an average of €34.55/MWh. Additionally, gas reserves in Spain are at 92% and liquefied natural gas (LNG) reserves at 62%.

Likewise, the daily reference price in Europe (TTF) also experienced a reduction in December, of 16.8% to €36.05/MWh, thanks to high reserves (82%) and low demand. Despite the weakness shown by the fundamentals, the spot and futures gas markets have shown significant price volatility for much of the month, with sharp rises that have been corrected in the last days of October.

Daily Gas Price TTF vs MIBGAS (€/MWh)

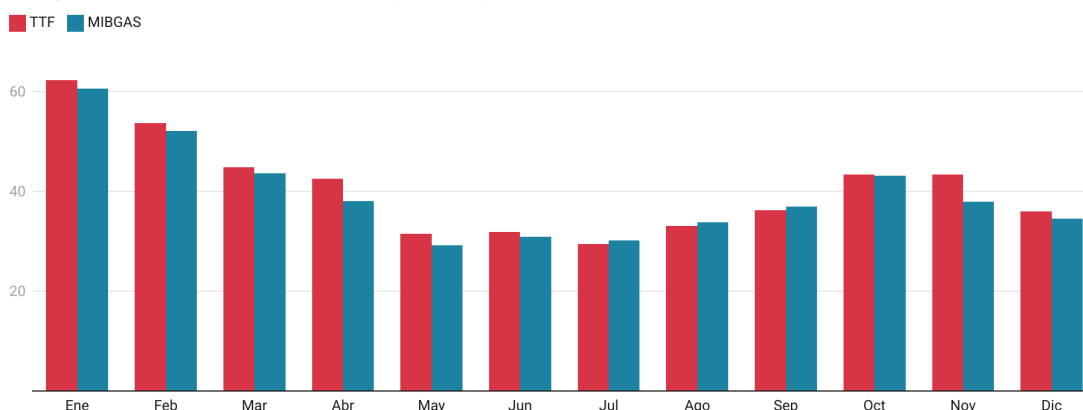


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The average daily price of the wholesale gas market in Spain closed 2023 at €39.27/MWh, with a 40% drop. The Spanish price consolidates among the most competitive in Europe, with a discount premium of €1.43/MWh over the Dutch TTF, the reference in Europe, which closes the year at €40.71/MWh.

Spain's lesser dependence on pipeline supply from Northern Europe, along with our enormous regasification and LNG storage capacity (the largest in Europe), has allowed us to better overcome the crisis caused by the Russian gas supply cut.

Gas futures (TTF) fall more than 30%, bringing Cal 24 down to €33/MWh

The gas futures markets maintain their downward trend. The Cal-24 products end the year with a quote close to €33/MWh, with a drop of more than 30% since the end of October. Contributing to the downward pressure is a combination of a mild start to winter, weak demand, and a supply that remains high thanks to increased LNG arrivals and imports from Norway.

TTF Futures Curve (€/MWh)

In yellow, price on 31/10/2023; in red, price on 30/11/2023; in blue, price on 15/12/2023.

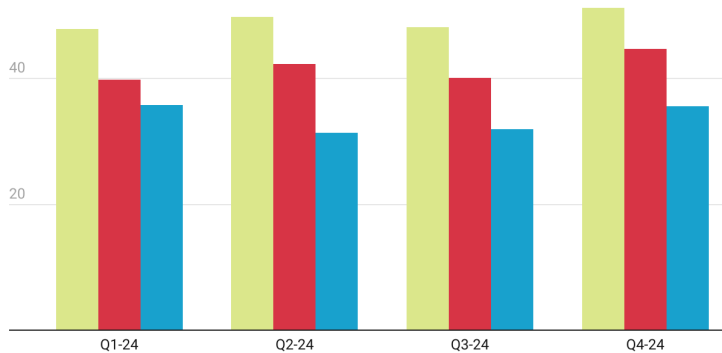


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Despite the threat of transit risk in the Red Sea and the possibility of colder weather for the next quarter, the high level of gas stored in Europe is reducing the risk premium for the 2024 curve. The cushion of reserves alleviates concerns that prices might experience aggressive increases to incentivize further destruction of demand.

The prospect of maintaining high Norwegian imports and the arrival of LNG cargoes during the remainder of winter suggests that European storage will be over 50% at the start of spring, even in a cold winter scenario.

Level of gas reserves in Europe (%)

— 2022 — 2023 — 5 years average — 2024

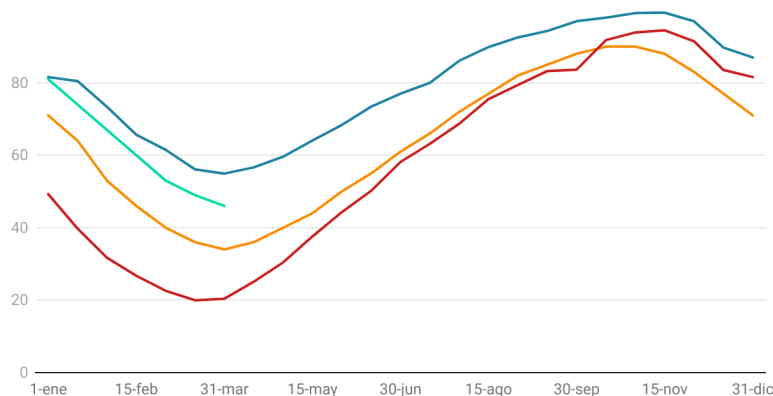


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CO2 emission prices (EUA) rebound by 15% and could again raise gas and electricity prices

Throughout 2023, CO2 emission prices (EUA) had maintained a downward trend, from €100/t at the beginning of April, due to a weaker economic context in Europe, combined with lower industrial and energy sector emissions.

This fall accelerated in the first half of December, when they reached their annual low at €66/t. This decrease has a key impact on the levels of energy switching in European gas and is a significant factor behind the recent falls in the prices of gas hubs like the TTF. The impact also directly translates to the fall in electricity market prices (spot and forward), as the variable cost that sets the marginal prices of gas plants decreases.

However, in the second half of December, the trend has reversed, and CO2 emission prices (EUA) have experienced a sharp rise of 16%, from €66/tCO2 to €78/tCO2. This has once again strengthened the energy switching signal (switching from coal to gas), which raises the anchor that sets the price of gas.

Generation electricity costs (MWh) coal-fired power plants vs. gas-fired power plants (M+1)



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At present, the price signal for January for a gas-fired plant with 50% efficiency is more competitive than that for a coal-fired plant operating at 40% efficiency. The TTF M+1 product is currently moving around €32-35/MWh, below the fuel switching prices which are at €35-38/MWh.

Therefore, if emission prices stabilize between €75-80/tCO₂, it is highly likely that the demand for gas for energy generation in Northwest Europe will be boosted compared to coal (as CCGs are more competitive), leading to a slight recovery in gas prices (TTF).

The LNG Market

For the sixth consecutive week, spot prices of liquefied natural gas (LNG) in Asia have experienced a decline, falling to \$13.3/MMBtu, influenced by full inventories and a solid LNG supply.

GNL Price

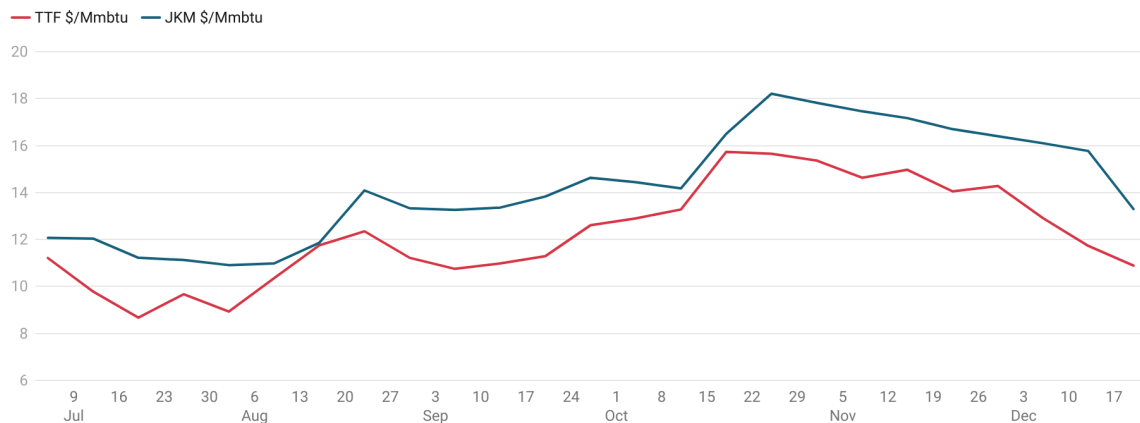


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On the other hand, LNG exports from the United States decreased in the third week of December, with only 22 vessels departing from its liquefaction plants. However, the average delivery of natural gas to LNG export plants remained at 14.6 Bcf/d, suggesting that the departure of new vessels is likely to increase again in the coming weeks.

Weekly LNG exports from the United States in the number of shipments

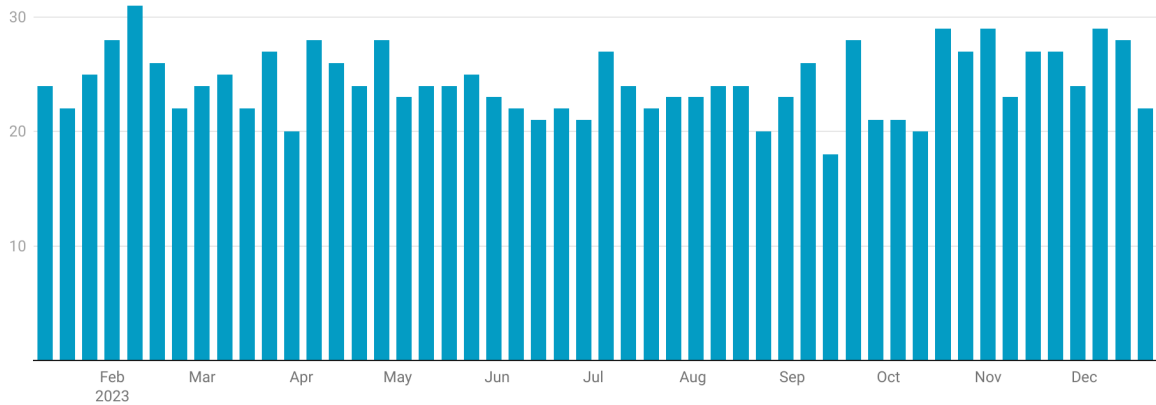


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The Spanish Yr-24 closes at €80.23/MWh, 44% lower than a year ago and with a €10/MWh premium over Germany

The price of Yr-24 closed at €80.23/MWh on its last trading day, December 28. This represents a reduction of 44.3% compared to a year ago, when it was at €144.13/MWh.

This significant decline has been generalized across European markets due to a relaxation of gas prices in Europe and CO2 emissions (EUA), along with bearish fundamentals: weak demand, improved French nuclear production, mild temperatures, and an increase in renewable generation.

Moreover, Yr-24 closed with a significant discount premium (€10.5/MWh) over the German Yr-24, the benchmark in Europe, at €90.72/MWh.

Evolution of Yr-24 price (€/MWh) Spain vs Germany

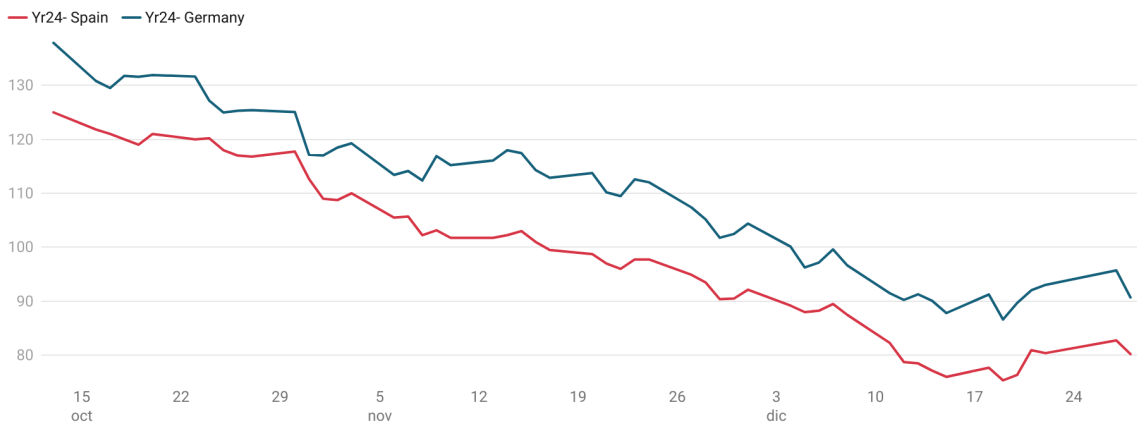


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Grupo ASE analysis

Increased Risk of Intermittent Renewable Energy Surpluses in 2024

Spain closes 2023 as the year with the highest installation of new solar and wind capacity. With a total of 6.5GW, it has surpassed the 6.2 GW of 2022 and 6.4 GW of 2019. During 2023, 5.5 GW of new solar parks and 1 GWh of wind parks were commissioned, meaning Spain now has 55.4 GW of variable renewable generation capacity (24.7 GW solar and 30.7 GW wind).

Annual growth of installed wind and photovoltaic power (MW)

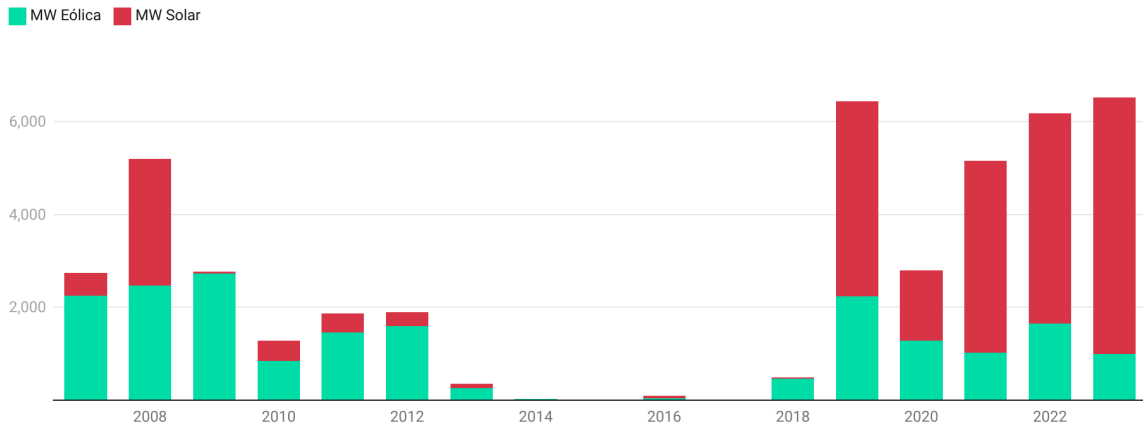


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In 2023, variable renewable generation accounted for 39% of the mix. Together, wind and photovoltaic exceeded 50% in the annual average during solar radiation hours. In those same hours, the hydrothermal gap technologies (gas, hydro, pumping, and coal), which set the high prices, have reduced their contribution to below 20%.

Variable Generation Mix 2023

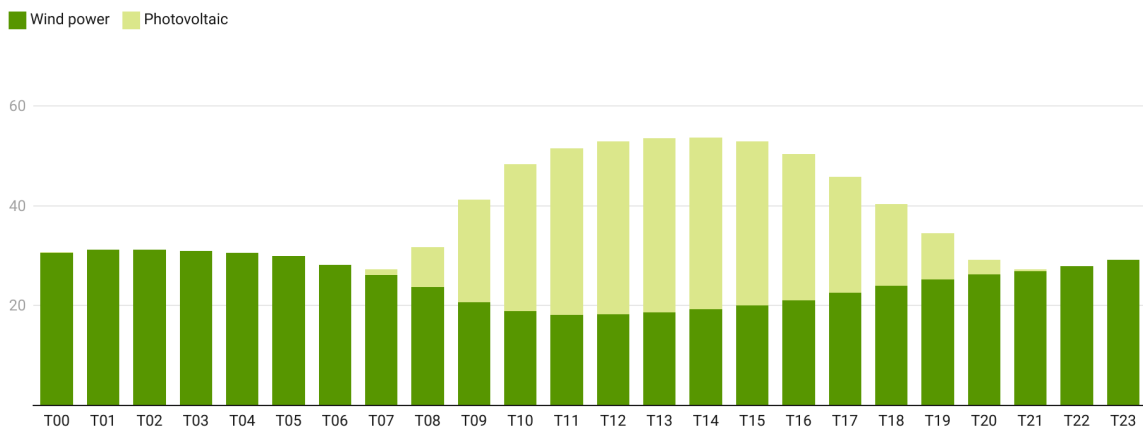


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Mix of Hydroturbine Generation

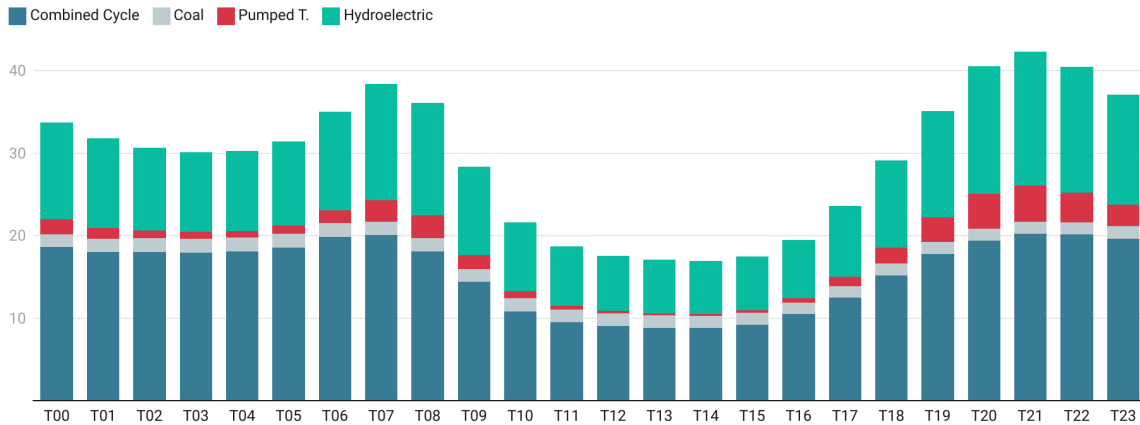


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This decline in hydrothermal gap technologies has led to a very significant reduction in electricity prices during central radiation hours. The difference in some hours reaches 50% compared to the peak hours at the end of the day.

Average Half-Hourly Price 2023 (€/MWh)

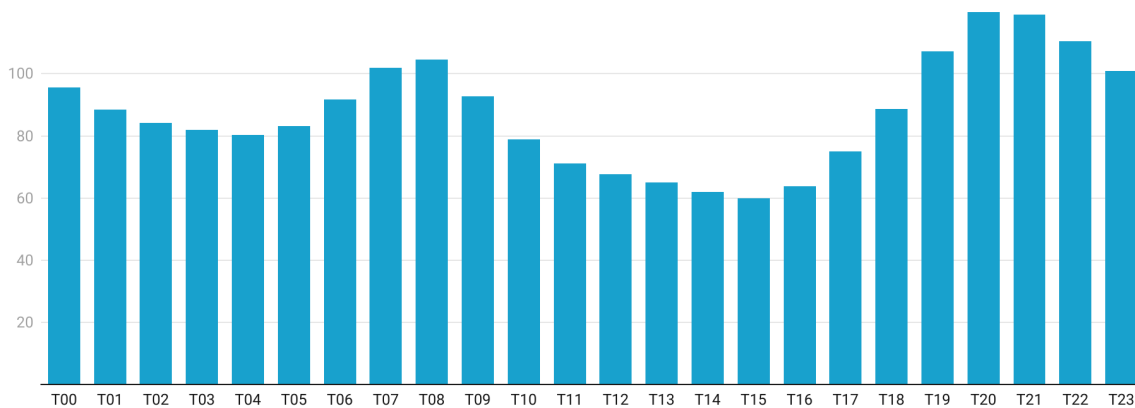


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During the spring of 2023, we observed that, for several weeks continuously, the combined offer of wind and solar energy, along with that from nuclear plants (which cannot flexibilize their production), couldn't be absorbed by the system (demand + interconnections + pumping consumption) and led to 'zero' prices.

At certain central times of the day, wind and solar plants had to limit their production for system stability reasons (technical spillage, also called curtailment). Additionally, we noticed that certain solar and wind plants didn't set prices due to low profitability, known as economic spillage.

What effects will the growth of renewables have in 2024?

During 2024, there is likely to be an acceleration of new installed solar and wind capacity, as many of the projects that received favourable environmental impact statements in January 2023 will connect during 2024 and 2025.

This increase in installed capacity guarantees in 2024 an increase in technical and economic spillages compared to last year, with a significant risk of price collapses during radiation hours and more prolonged periods.

According to the Ministry, 12 GW of photovoltaic solar energy projects have been processed for construction in Spain in 2024. If all these projects are approved and built, the installed solar energy capacity in Spain in 2024 could reach 41 GW, which is an extraordinary growth of 48%. Regarding new wind parks, at least 2.5-3 GW should be built, which could translate to a generation growth of between 3% and 5%.

According to our projections for 2024, wind and solar could cover an average of 43.5% of the generation mix and reach peaks of up to 65% during central hours of solar radiation. In spring, as well as on days with strong wind generation, the ratio will skyrocket, generating an excess of variable renewable generation offer.

Simulation of Hourly Profile of Variable Generation Mix 2024

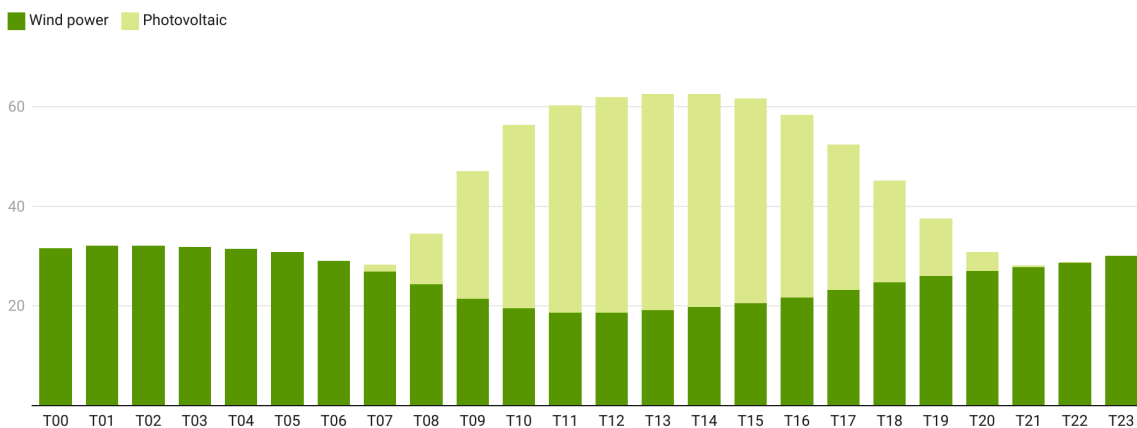


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Projection of Hydrothermal Gap Generation 2024

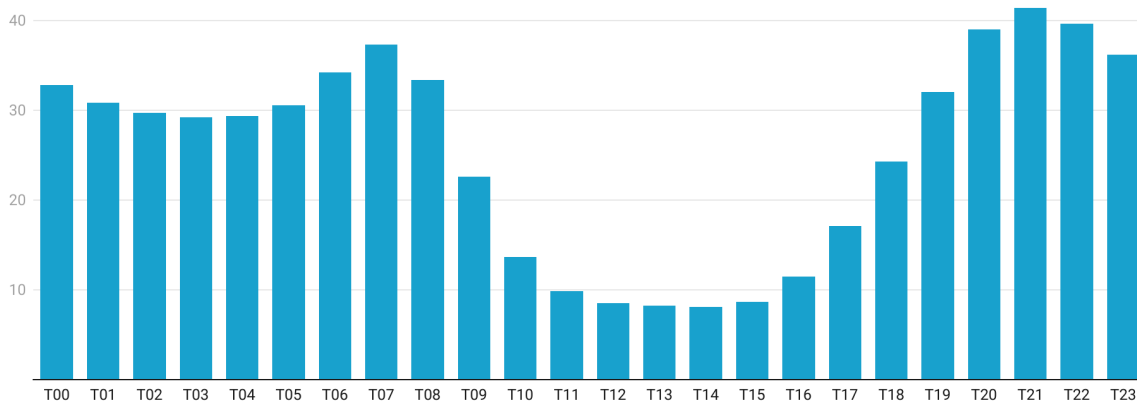


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The problem is that electricity demand is not only not increasing at the same rate as the installed capacity of solar energy, but it is contracting, particularly during radiation hours, due to the increase in self-consumption, which further raises the likelihood of large surpluses in the coming years.

For 2024 and 2025, a relaxation of gas prices is anticipated compared to the last two years. Moreover, from 2026, a new wave of LNG supply is expected with the start-up of new projects in the United States and Qatar. This could raise doubts among investors, given a potential risk of profitability loss for photovoltaic investors and consumers (self-consumption).

For this reason, it is necessary to accelerate the development of new storage models such as pumping, the electrification of certain industrial sectors, the improvement of the electrical grid, interconnections between countries, or the production of green hydrogen to accommodate the intermittent generation of new solar and wind projects that will come online over the next two years.

In our view, Spain will continue to have the cheapest energy in the EU in the coming years, in a critical moment, thanks to the new wave of solar and wind generation that is projected and under execution.

The risk of price collapse for 2024 and 2025 could occur at specific moments with a longer duration than what we have seen in 2023. But we understand it will be temporary, as the market reacts to the signal with investments in storage, greater electrical system capacity, and the industry adapts to the new price curve. It is a time when the sector needs to continue investing in a decentralized energy model shift, and Spain can consolidate a competitive advantage it never had before.

In this new electrical context, full of great uncertainty and volatility, the risks of operations and investments in assets have increased, and traditional price models have become obsolete. At Grupo ASE, we have been developing price forecasting models based on advanced analytics (Artificial Intelligence).

In 2024, we will make available to our clients a new intelligent system, capable of modelling prices, transforming thousands of data and complex processes into flexible and agile operations, which will enhance decision-making in the face of new challenges in the energy market.



Your energy protected by the group

We are the electricity sector company that champions the economic interests and rights of industrial consumers. We declare our independence, in basing our efforts on knowledge and technology.



Grupo ASE (Sede central)

Gran Vía 81, piso 6º,
departamento 2
48011 Bilbao (Bizkaia)
Tel: 944 18 02 71
ase@grupoase.net

Comunitat Valenciana

Avenida de Benidorm, 1 En-37
03550 San Juan (Alicante)
Tel: 966 593 464 · 606 393 077
marcelino.gilabert@grupoase.net

Región de Murcia

C/ Trapería 30, 5º B
30001 – Murcia
Tel: 618 212 774
ruben.hernandez@grupoase.net

Comunidad de Madrid

Avenida de América, 32
28922 Alcorcón (Madrid)
Tel: 912 262 209 · 610 29 96 27
grupoase.madrid@grupoase.net

Andalucía

Calle Pago del Lunes, 9
18195 Cúllar Vega (Granada)
Tel: 858 952 918
marcelino.gilabert@grupoase.net

Cataluña

C/ Comte Urgell, 286 · Pral. D
08036 · Barcelona
Tel: 934 186 424
ase@grupoase.net

www.grupoase.net