THE SPANISH ELECTRICITY SECTOR IN THE FACE OF RISING GAS PRICES AND THE GOVERNMENT MEASURES ROLLED OUT IN RESPONSE

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Abstract

The increase in electricity prices, which peaked in August 2022, has affected the various activities carried out in the Spanish electricity sector differently. This paper analyses the impact of this increase on the sector, distinguishing between electric power companies and electricity retailers, paying special attention to their operating profit and, particularly, to the influence of aspects such as (i) the incidence of forward contracts with a fixed price, (ii) asymmetric exposure to price increases in wholesale electricity markets, or (iii) belonging to vertically integrated groups, in the case of electricity retailers. The effect on the sector of the measures rolled out by the authorities to mitigate the impact of higher electricity costs on households and companies in Spain is also analysed. Of note among these measures are the Iberian Exception (a mechanism to cap the cost of the gas used in electricity generation) and the temporary deduction of the so-called excess remuneration arising from higher gas prices. Lastly, this paper studies the impact of the extraordinary temporary levy that energy companies must pay on net turnover for 2022 and 2023.

Keywords: energy, electricity markets, electricity prices, generation costs.

JEL classification: E31, Q41, Q43, L94.

Resumen

El incremento de los precios de la electricidad, que alcanzó su máximo en agosto de 2022, ha afectado de forma diversa a las distintas actividades que se desarrollan en el sector eléctrico español. Este artículo analiza el impacto de dicho incremento sobre el sector, distinguiendo entre empresas generadoras y empresas comercializadoras, con especial atención a los resultados de explotación. En particular, se analiza la influencia sobre dichos resultados de aspectos como i) la incidencia de los contratos a plazo con precio fijo; ii) la exposición asimétrica a los incrementos de precios en los mercados mayoristas, o iii) la pertenencia a grupos verticalmente integrados, en el caso de las empresas comercializadoras. Asimismo, se analiza el efecto sobre el sector de las medidas desplegadas por las autoridades con el propósito de mitigar el impacto del encarecimiento de la electricidad sobre los hogares y las empresas de nuestro país. Entre estas medidas destacan, por ejemplo, el mecanismo ibérico para limitar el coste del gas empleado en la producción eléctrica o la minoración del denominado «exceso de retribución» surgido como consecuencia del aumento del precio del gas. Adicionalmente, se analiza también el impacto del gravamen temporal que las empresas energéticas deben pagar sobre la cifra neta de negocios de los años 2022 y 2023.

Palabras clave: energía, mercado eléctrico, precios de la electricidad, costes de producción.

Códigos JEL: E31, Q41, Q43, L94.

Índice

1 Introduction

Starting in spring 2021, European wholesale electricity market prices began to rise sharply, reaching historical highs in August 2022, constituting one of the most significant manifestations of the energy crisis faced by the region in the last two years (Banco de España, 2023a). Similar price changes were seen in most European wholesale markets, although the increase in Spain was curbed by the application, in mid-June 2022, of the Iberian mechanism to cap the price of gas in electricity generation (see Chart 1.1).[1] Against this background, this paper analyses how these developments have affected the various firms that participate in the different segments of the electricity market.

In particular, the analysis reveals that electricity producers have seen their bottom line improve thanks to the rise in wholesale electricity prices. The marginal pricing arrangement of the wholesale electricity market[2] and the current electricity generating structure of most European markets means that fossil fuel-powered production (especially by combined cycle gas turbine plants) generally sets, either directly or indirectly, the final electricity wholesale market price for a high percentage of the hours of each day. This market price is the rate that is potentially paid to all the producers supplying the market at any given moment, such that operators not using fossil fuels for electricity generation have seen their revenues rise far faster than their costs.

However, there are several reasons why the increase in income at energy producers is smaller than would result from simply multiplying the increase in the wholesale price by the amount of electricity sold on this market each hour.

First, the generation costs of fossil fuel technologies, which mainly use natural gas and, to a lesser extent, coal, rose sharply owing to the increase in the price of these commodities on international markets (see Chart 1.2). In 2022 24.7% of electricity generation in Spain came from combined cycle technology, 6.4% from cogeneration facilities[3] and 2.8% used coal-based technology (vs 17.1%, 10% and 1.9%, respectively, in 2021). Since Spain (along with most European countries) does not produce natural gas, it must look overseas for its supply.[4] As such, a significant portion of the sector's income is transferred abroad. This loss is difficult to avoid, at least in the short term until such time as renewable generation is able to replace the need for fossil fuel-based technologies.

Second, in the face of rising electricity prices, households and firms may have responded by either cutting their demand or meeting it with alternative energy sources.

1 This mechanism primarily aims to constrain the price rises on the wholesale electricity market caused by wholesale natural gas price increases (see Section 4 for a detailed explanation).

2 The market has been designed with a marginal pricing structure, whereby the same price is paid to all producers. In general, the marginal production costs of the most expensive generating technology participating in the market determines this price. For more details, see Pacce Sánchez García and Suárez-Varela Maciá (2021).

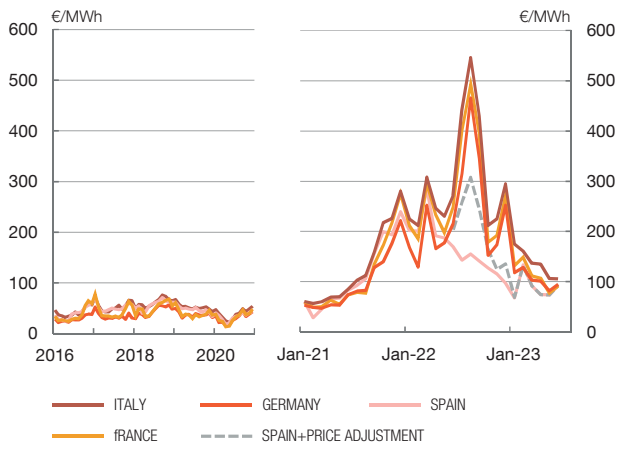
3 Cogenerative electricity production makes use of the residual heat of certain industrial processes. Gas is generally the main input for the thermal technologies used in cogeneration.

4 In 2022 the main exporters of natural gas and liquefied natural gas to Spain were the United States (28.8%), Algeria (23.8%), Nigeria (13.9%) and Russia (12.1%). It is worth noting that in that same year, electricity production accounted for 37.9% of Spain's demand for gas (Enagás, 2023).

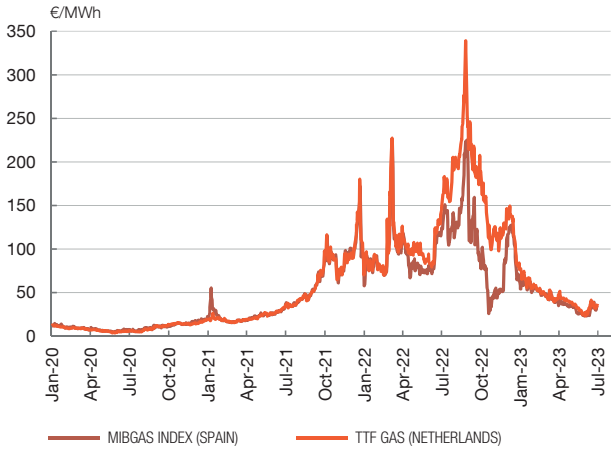
Chart 1

THE SURGE IN WHOLESALE ELECTRICITY PRICES PARTLY REFLECTS THE PRICE GROWTH OF FOSSIL FUELS USED IN ELECTRICITY GENERATION

1 THE PRICE OF ELECTRICITY ON VARIOUS EUROPEAN WHOLESALE MARKETS (a)



2 THE PRICE OF NATURAL GAS ON EUROPEAN WHOLESALE MARKETS (b)



SOURCE: OMIE, MIBGAS and Refinitiv.

a The Spanish wholesale market price is shown from June 2022 onwards along with the adjusted price of the Spanish system. The latter is the price that must be paid by buyers on the Spanish market who are not exempt from payment of the cost of the adjustment mechanism limiting the cost of gas used in electricity production (see Section 4). This measure approximates the cost of purchasing electricity at the spot price on the Spanish wholesale market.

b The MIBGAS index is the weighted average price of all the gas trades executed for the same day in all of Spain's trading sessions. The Dutch gas market price is the Endex Dutch TTF Natural Gas MMBtu.

Furthermore, electricity demand also shifted as a result of the energy saving measures put in place by the European Commission.[5] All of the above has affected the total amounts of electricity sold by producers.

Third, against the backdrop of surging electricity prices, the Spanish Government introduced a range of regulatory changes that have had a direct impact on electric utilities' income. The most notable of these are the implementation of the mechanism to cap the price of gas used in electricity generation (see Section 4), the limiting of the "windfall remuneration" resulting from spiking gas prices and the temporary levy on utilities' net turnover in 2022 and 2023 (see Section 5). These regulatory actions have directly affected electric utilities' income statements.

Lastly, a sizeable proportion of electricity is not sold by producers at what is known as the wholesale market clearing price – that is, the price that achieves equilibrium of electricity supply and demand at any given time –, but is rather sold via the futures markets at a previously agreed price. According to the National Commission on Markets and Competition (CNMC, 2022b), the average price of forward contracts settled in 2021 (weighted by the

5 The aims of the energy saving measures rolled out by the European Commission included Member States reducing their electricity consumption by 5% at peak demand times between 1 December 2022 and 31 March 2023 and voluntarily cutting total electricity demand by 10% and gas demand by 15% between August 2022 and March 2023 (European Commission, 2022a and 2022b).

amount settled that year) was 44% lower than the weighted average settlement price on the spot market. Therefore, the ex post risk premium was negative in 2021, unlike 2019 and 2020.[6] In other words, it would be a mistake to estimate the revenues potentially earned by electricity producers without accounting for the percentage sold on the futures market and the corresponding selling prices.

Even so, electricity prices on wholesale futures markets have also risen steeply since mid-2021. In 2021, close to 80% of electricity futures sold in Spain had a maturity period less than or equal to one year. In 2020 this percentage stood at 90% (CNMC, 2022b). Thus, as 2021 and 2022 progressed and the low-price contracts signed in 2020 (for delivery in 2021 and 2022) gradually expired, renewals were agreed at significantly higher prices[7] in an environment in which, as noted above, generating costs for inframarginal technologies had not risen by the same amount.

In any case, electricity retail must not be left out of any analysis of the electricity sector. Utilities operating in this area initially suffered from rising wholesale prices (especially firms without sufficient hedging on the futures markets), since a sizeable share of the electricity sales made by these firms involve prices agreed with their clients over a specific time frame. Given that the selling prices agreed with customers may lag behind the revisions of the purchase prices agreed with producers, increases in costs in this segment can fast outpace increase in revenue during periods of rising wholesale market prices. As such, according to the CNMC (2023c), smaller retailers have recently struggled more than those coming under the umbrella of large corporations, and particularly more than those forming part of vertically integrated firms. In periods of relative price stability on wholesale markets, this may not be as significant, since non-vertically integrated retailers can easily hedge against price movements via the futures market. However, in a situation like that of 2021-22, rising futures market prices and, therefore, increases in fees and collateral requirements, put additional financial strain on smaller retailers. Similarly, since they do not engage in electricity generation, these smaller retailers lack the hedging inherent to vertically integrated firms, which can be seen in purchases of electricity by means of bilateral intragroup contracts.[8] However, as time has gone by, smaller retailers appear to have been able to update their sales prices with their clients as contracts have come up for renewal, adjusting to the forward hedging available at each time.

In order to better understand the implications of the recent environment of high prices on wholesale electricity markets, this paper first outlines the structure of the Spanish

6 A negative ex post risk premium implies that net purchasing positions are liquidated at a profit, while sell positions bear the losses.

7 Rising prices on the futures markets suggests that the intermediaries of these markets may also be receiving a not-insignificant proportion of the revenues generated by higher prices, given that collateral sums and transaction fees are linked to prices.

8 Conversely, if the forward hedging of smaller retailers stood at prices above those of larger operators, their selling prices were able to increase relatively more. The CNMC (2023c) suggests that offers appearing in the offer comparison published by the CNMC have dropped for large groups relative to other retailers since September 2021, which had not occurred prior to 2020.

electricity market. It also describes the potential effect of wholesale market price movements on each segment of the electricity market and analyses the dynamics of the Spanish electricity futures markets. Section 3 focuses on the impact of the latest rise in wholesale prices, which has been unusually large by historical standards, even following the recent easing. The next two sections look at the impact of the Iberian exception for gas pricing on the revenues of electricity producers and the measures put in place to limit the "windfall remuneration" received by electricity firms. The conclusions are set out in the final section.

2 The Spanish electricity sector

2.1 The structure of the electricity sector

The regulations on the electricity sector differentiate between electricity generation (production), transmission, distribution and retail.[9]

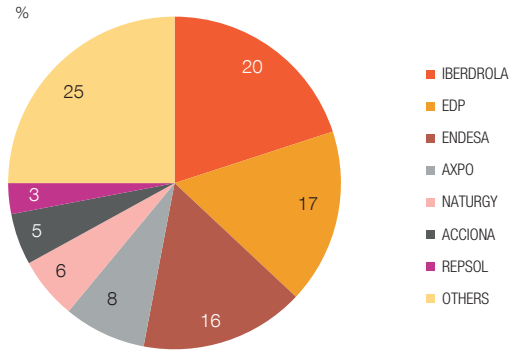
Owing to existing economies of scale, the law acknowledges the monopolistic nature of transmission and distribution, which are regulated accordingly, both in terms of the entry of new agents and the setting of prices. Generating and retailing electricity are deemed to be activities undertaken on the open market. In accordance with existing regulations,[10] any firm undertaking one of the regulated activities in the electricity sector is thereby prohibited from carrying out any unregulated sector activity.[11] However, a group of firms is allowed to perform otherwise incompatible activities, as long as the activities are carried out by different firms and they comply with certain independence criteria.[12]

In Spain, high-voltage transmission is carried out solely by Red Eléctrica de España (REE),[13] while most distribution is handled by four corporate groups: Iberdrola, Endesa,

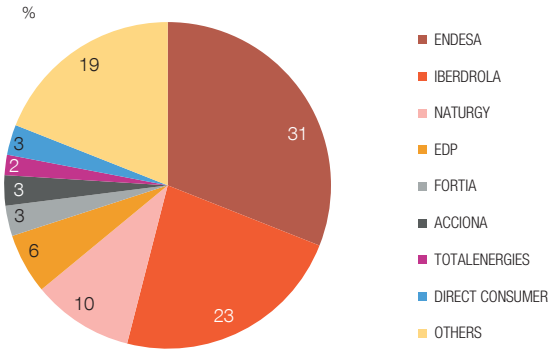
Chart 2

ELECTRICITY GENERATION AND RETAIL IS CONCENTRATED IN A HANDFUL OF UTILITIES IN SPAIN

1 SHARE OF ELECTRICITY GENERATION OF THE MAIN UTILITIES IN THE IBERIAN ELECTRICITY MARKET ("DAILY OPERATING SCHEDULE"). 2021



2 ENERGY SUPPLY SHARE BY GROUP IN THE SPANISH RETAIL MARKET. DATA AT 31 DECEMBER 2021



SOURCE: CNMC.

9 Transmission involves delivering the electricity from the sites at which it is generated to consumption centres (distribution substations). Distribution consists of delivering this electricity from the substations to individual consumers. Other parties involved in the electricity sector are the regulators, the electrical grid operator and the market operator.

10 See Article 12, on the separation of activities, in Law 24/2013 of 26 December 2013 on the electricity sector (link in Spanish).

11 According to the European Commission (2007), there is a "danger of discrimination and abuse when companies control energy networks as well as production or sales, protecting national markets and preventing competition. Such a situation also creates a disincentive... from investing... in their networks, since the more they increase network capacity, the greater the competition that exists on their "home market" and the lower the market price".

12 See Article 12, on the separation of activities, in Law 24/2013 of 26 December 2013 on the electricity sector (link in Spanish). Similarly, Directive (EU) 2019/944 of the European Parliament and of the Council requires legal, organisational and executive independence of distribution network managers when they form part of a vertically integrated company.

13 REE is also the technical manager (or operator) of the Spanish electrical grid.

Naturgy and EDP.[14] These same groups also lead in the generation and retail businesses, thereby qualifying as vertically integrated.[15] According to CNMC data (2023a and 2023c), in 2021 Iberdrola, Endesa, Naturgy and EDP generated 59% of the total energy on the Iberian Electricity Market (MIBEL, by its Spanish abbreviation) (see Chart 2.1)[16] and retailed 70% of the total electricity via their groups on the Spanish retail market in that same year (see Chart 2.2).

2.2 Price movements in the wholesale electricity market and their impact on different sectors of the industry

Transmission and distribution are, as noted previously, regulated activities, and service charges are set by the Government. This means that changes in wholesale electricity prices may only have a small impact on the accounts of firms operating in these areas.

The case of electricity generation and retail is different. Prices for electricity generation are set on the wholesale electricity market. The wholesale electricity market obeys a marginal pricing model, whereby all power producers receive the market clearing price, which is closely linked to the marginal generation costs of the most expensive technology supplying the market at any given moment. This means that, in general, upward (downward) price movements on the wholesale electricity market positively (negatively) affect producers' income statements. However, there are alternatives that allow electricity producers to contend with price risk, including energy futures or the trading of financial derivatives whose underlying is the wholesale electricity price, thereby making companies' income statements less dependent on price changes.

In terms of retailers, a distinction must be drawn between reference or regulated retailers, who operate on a regulated market and offer the Government-set "regulated rate for small consumers" (PVPC, by its Spanish abbreviation)[17] and retailers that participate in the open market (split between the household, SME and industry segments), where prices are set in a competitive environment.[18]

In the case of the former, the electricity production price paid by the consumer is directly linked to the hourly prices on the wholesale electricity market,[19] while the retail

14 More than 300 distributors are registered with the CNMC. However, in 2021 95% of the amount allocated for distribution was split (based on their number of supply points) between the aforementioned four corporate groups: Endesa (41%), Iberdrola (37%), Naturgy (13%) and EDP (4%) (CNMC, 2023c).

15 Directive (EU) 2019/944 of the European Parliament and of the Council defines a group of undertakings as vertically integrated when it performs at least one of the functions of transmission or distribution and at least one of the functions of generation or supply.

16 Two other noteworthy producers are AXPO and Acciona, which represented 8% and 5%, respectively, of MIBEL generating capacity in 2021. According to the CNMC (2023a), there were 115 producers on the MIBEL in 2021.

17 This type of tariff is only available to consumers contracting up to 10 kW of power.

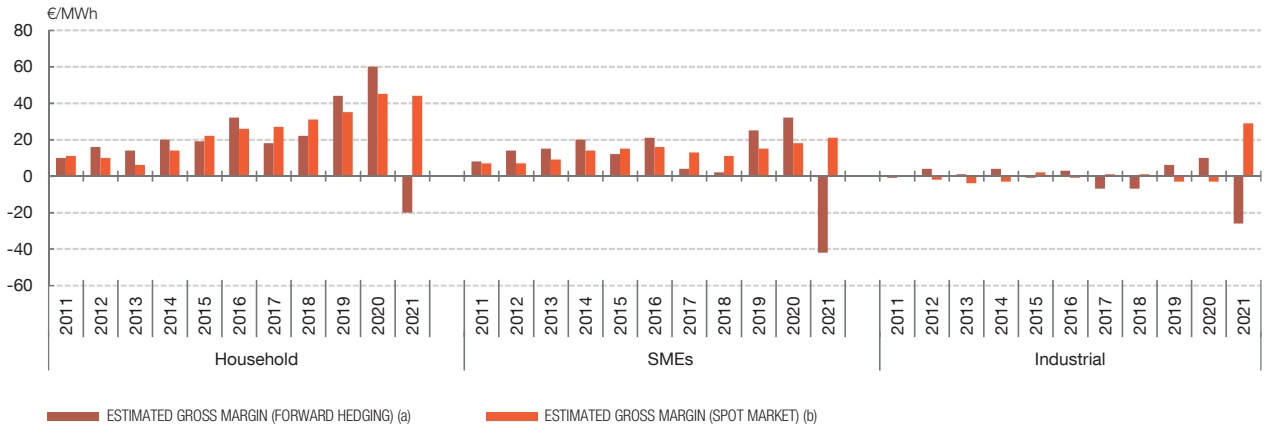
18 There are eight reference retailers authorised by the CNMC. According to the CNMC (2023c), there were 496 retailers authorised to participate in the open market in 2021, of which 397 sold electricity to the end consumer (378 in the household segment, 366 in the SME segment and 305 in the industrial segment).

19 The format of the regulated electricity rate varies across different European countries. In particular, the futures market plays a critical role in its determination in some countries, such as Portugal, France and the United Kingdom, while such a rate does not exist at all in others (e.g. Germany).

Chart 3

THE CNMC'S ESTIMATES OF GROSS MARGINS OF RETAILERS ON THE OPEN MARKET ARE SIGNIFICANTLY HIGHER IN THE CASE OF HOUSEHOLD CONSUMERS

1 ESTIMATED GROSS MARGINS FOR ALL RETAILERS, BY PROCUREMENT METHOD AND CONSUMER SEGMENT



SOURCE: CNMC.

a The gross margin is estimated by taking into account the approximate cost of procuring electricity on the forward market (to do so, the forward price is used as an ex post reference).
b The gross margin is estimated by taking into account the approximate cost of procuring electricity on the spot market (to do so, the spot price is used as an ex post reference).

margin is regulated by the Government[20] in such a way that the price risk is borne by the consumer. As a result, retailers who make use of this tariff model have little incentive to hedge against wholesale price swings. As such, these firms' revenues can be expected to remain relatively stable over time and not move with the wholesale market price.[21]

The case of open market retailers is different, given that they compete on price and tend to offer consumers stable generation prices over a fixed horizon. The risk of price swings on the wholesale market is borne by the retailer, which is therefore incentivised to hedge against them by purchasing energy on the futures market or trading financial derivatives in order to lock in the cost of the electricity when it comes to settling sales contracts with consumers. The CNMC's estimates of retailers' gross margins[22] when sourcing their electricity from either the spot market or the futures market is illustrative here. The latest estimate available (CNMC, 2023c) shows a gross retailer margin that grew up to 2020 and was largest in the household consumer segment, followed by the SME and industrial segments (see Chart 3). However, price developments on the wholesale electricity market

20 The supply margin (or cost) of the PVPC is currently equal to the power contracted by the consumer (in kW) x €3.113 per kW and year.

21 Although margins remain stable, revenue volume can be affected by fluctuations in volume of business: higher (lower) prices can reduce (increase) demand or encourage customers to switch to (from) other open market retailers. As such, regulated market supply points as a percentage of all supply points dropped by ten percentage points (pp) between 2021 Q2 and 2022 Q3 (from 32% to 22%), a fall much greater than that seen in the two previous years (-1.1 pp in 2019 and -0.5 pp in 2020. See CNMC (2022d and 2023c).

22 The CNMC (2023c) defines the gross supply margin as the difference between the price of energy included in the amounts invoiced by retailers and the estimated cost of supply.

Table 1

ELECTRICITY UNDER FIXED OR VARIABLE PRICE CONTRACTS AS AT 31.10.2021

			Electricity (%)	
Market type	Segment	Retailer type	Fixed price	Variable price
Regulated market retailers (a)	Household and SME	Regulated retailer	1	99
Open market retailers	Household	Retailers - large groups	99	1
		Retailers - others	74	26
	Total household		92	8
	SMEs	Retailers - large groups	92	8
		Retailers - others	48	52
	Total SMEs		74	26
	Industry	Retailers - large groups	66	34
		Retailers - others	23	77
	Total industry		52	48
Total open market retailers			66	34
Overall total (open and regulated markets)			59	41

SOURCE: CNMC (2022a).

a The PVPC is applied by retailers operating on the regulated market.

in 2021 had a negative impact on the gross margins of utilities who sourced most of their electricity on the spot market. The same cannot be said of retailers with more hedging of their electricity purchases, whose gross margins remained stable in the household and SME segments and rose sharply in the industrial segment. According to the CNMC (2023c), the latter is related to the fact that a significant volume of industrial consumers are referenced to the spot market price.

It should be noted that the household segment represented 34% of total electricity demand in 2021, while SMEs and industry accounted for 15% and 52%, respectively. As at 31 December 2021, around 10 million household consumers had opted for the PVPC (10% of total electricity demand). These consumers see price changes on their invoice based on regulatory calculations.

From the retail perspective, while retailers on the open market sell a portion of their electricity at a fixed rate, a certain percentage is also tied to changing prices. In its report on the retail electricity market in 2020 (CNMC, 2022a), the CNMC estimated that the percentage of electricity sold at a variable price represented 34% of the total amount sold by retailers on the open market (see Table 1) as at 31 October 2021. However, this varied significantly by retail segment and type of retailer (large groups or otherwise). In the case of household consumers or SMEs on the open market, large groups sell nearly all of their electricity at a fixed rate. Fixed-price sales represent a smaller share for other retailers. Conversely, as has been mentioned previously, in the industrial sector (which represents 52% of all electricity consumed), a not-insignificant percentage of

its electricity is retailed at a variable price and is, therefore, directly affected by daily dynamics in wholesale electricity pricing.

2.3 Futures markets and bilateral intragroup contracts as a form of hedging against price changes

As noted previously, both producers and retailers can hedge against market risk, whether via trading electricity futures or via financial hedges (derivatives based on the wholesale electricity price) that can be settled by offset.[23] Both methods allow producers to lock in the price at which they sell electricity, while also allowing retailers to lock in the purchase price.

Electricity derivatives, much like financial derivatives, can be traded as bilateral contracts (also known as an over-the-counter (OTC) contract) or on the open market (the Iberian market comprises of the MIBEL derivatives market, managed by Operador del Mercado Ibérico – Polo Portugués (OMIP, by its Spanish abbreviation) and the German electricity derivatives trading platform, the European Energy Exchange (EEX)).[24] These markets involve more than just electric utilities, whose main aim is to hedge against market risk. Independent investors also participate, taking positions with a view to making a profit by correctly anticipating future price movements.

The volume traded on the Spanish futures market shows less liquidity than that seen on other European markets.[25] In 2021, for example, it stood at around 233.8 TWh, representing 96% of the electricity demand on the Iberian Peninsula, while in Germany and France this figure was as high as 1180% and 146.8%, respectively, of domestic demand.[26] Most electricity derivatives in Spain are traded on the OTC market (which handled 91.7% of the total in 2021) and most of the contracts traded had a maturity period of one year at most (accounting for 72.2% of the volume traded in 2021).[27]

As an alternative (or in addition) to futures markets, vertically integrated groups also enjoy inherent price risk hedging via the use of bilateral intragroup contracts. This type of hedging is available to producers and retailers that belong to the same corporate group and is, in general, cheaper and faces fewer restrictions on maturity periods than the futures market. For example, Endesa and Iberdrola sold around 60% of their production using this type of contract between 2017 and 2020. This electricity was, therefore, not sold on the

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23 Purchase power agreements are worth mentioning in this context. These are bilateral contracts to trade energy at a certain price over an agreed time horizon. This type of contract may be physical (as in settled by the physical supply of electricity) or financial (the cash difference is settled, such that the amount payable is equal to the difference between the price agreed in the contract and the price on the wholesale market).

24 According to the CNMC (2021a), there are also three central counterparty clearing houses (CCPs) that register derivatives (for clearing and settlement) whose underlying is the Spanish electricity price on organised markets or in OTC trades. These are OMIClear, European Commodities Clearing and BME Clearing.

25 The CNMC (2021a) carried out a thorough investigation into the potential reasons for the lower liquidity of the Spanish futures market relative to other European countries.

26 See CNMC (2022b).

27 In 2021 47.2% of contracts were agreed with annual maturity (that is, a maturity period of one, two, three or more years), 36.2% with quarterly maturity, 13.9% with monthly maturity and 2.8% with a shorter maturity. Of the annual contracts, 57.3% were agreed with a maturity of one year, while those with a two or three-year term represented 21.4% and 8.3%, respectively.

spot market (CNMC, 2021a). According to the CNMC (2021a), this type of trading makes the futures markets less attractive to vertically integrated groups and is one of the causes identified for the lack of liquidity.[28]

28 According to the CNMC (2021a), this inherent price risk hedging is not a problem in itself, the issue is that when it arises "in vertically integrated groups with sufficient market power and with a high degree of correlation between the needs of the generation and retail businesses, they can erect barriers to entry to the retail market thanks to their bypassing of the wholesale futures market". It is worth noting that when the CNMC consulted vertically integrated groups on this issue, they stated that bilateral intragroup contracts do not remove liquidity from the future market, because they still make use of this market to cover their net positions. Furthermore, these groups point out that this type of trading occurs in Germany and France and those markets have no liquidity concerns.

3 The potential impact of price increases in 2021 and 2022 on the wholesale electricity market

The sharp spike in prices on the wholesale electricity market seen from spring 2021 onwards, and which has only eased slightly since the end of summer 2022, has had differing impacts on firms in the electricity sector. The direction, scale and persistence of the impact appear to depend largely on the activities pursued by the different firms and the extent of their vertical integration. Meanwhile, the regulatory measures put in place by the Spanish Government to address the surge in electricity prices also appear to have had varying impacts on the operating income of electric utilities (see Sections 4 and 5).

From the perspective of producers, the direct impact of the rise in wholesale electricity market prices came from the share of electricity production that operators were able to sell on the spot market. As noted above, the wholesale market clearing price largely reflects the marginal generation costs of gas-powered plants and, as a result, revenues of facilities using other technologies rose significantly, since their costs had risen less than wholesale market prices.[29]

However, the existence of price risk hedges means that a sizeable portion of the electricity sold since prices began to climb did not lead to direct and immediate rises in producers' operating incomes. In other words, increasing spot market prices did not, at least when prices initially began to grow, have an impact on electricity sold on a forward basis at a set price. However, as mentioned in the previous section, most electricity sold on a forward basis in Spain has a maturity of, at most, one year. As a result, successive renewals of electricity forwards from spring 2021 onwards appear to have resulted in higher operating income for producers to the extent to which the price of electricity forwards in updated contracts reflected rising prices on the spot market.

Chart 4.1 shows the change in electricity prices one month ahead, one quarter ahead and one year ahead, as tracked by OMIP. As can be seen, following the fall in prices caused by the pandemic, electricity futures rose significantly, exceeding €150/MWh in both one-year-ahead and shorter contracts.[30] This change in futures market prices suggests that, up until mid-2021, producers could have charged lower prices for electricity as a result of contracts made during 2020 (when electricity futures hit their lowest points owing to the drastic slowdown in economic activity caused by pandemic restrictions). However, the renewal of forwards from summer 2021 onwards, when electricity future prices were already rising sharply, led to a rise in operating income for producers not using fossil fuels for generation, thanks to persistently high gas prices. One consequence of higher prices on the spot markets is the increase in the euro amount of the underlying's value and in the

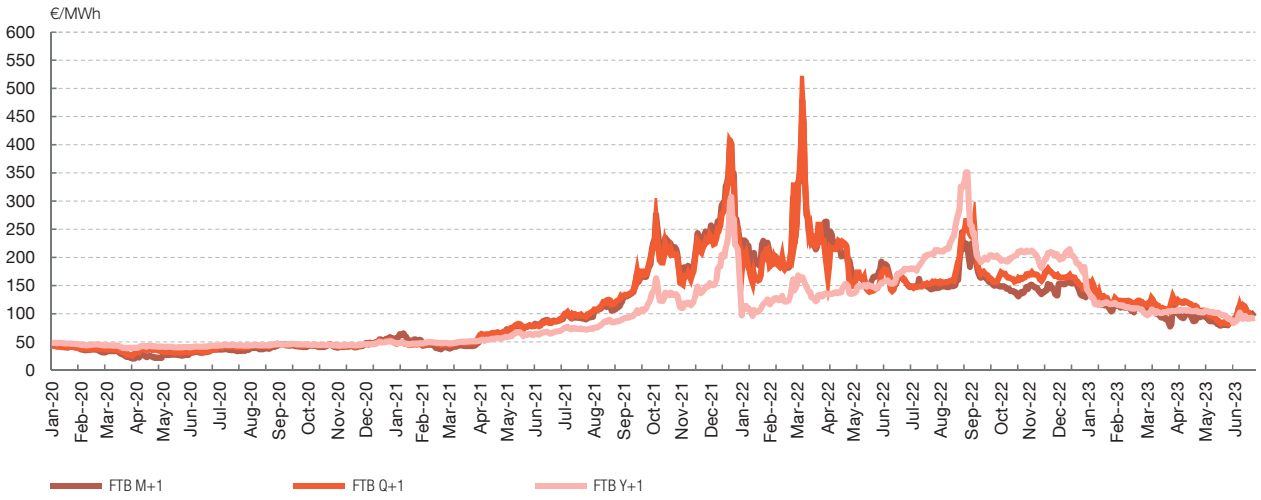
29 It cannot be ruled out that many electricity producers who use gas as their main input had long-term contracts in place for its supply at a set rate over a certain period of time, which allowed them to, albeit temporarily, avoid generating costs surging as gas prices climbed.

30 Prices for one month ahead and one quarter ahead agreements fell following the announcement of the implementation of the Iberian mechanism in April 2022.

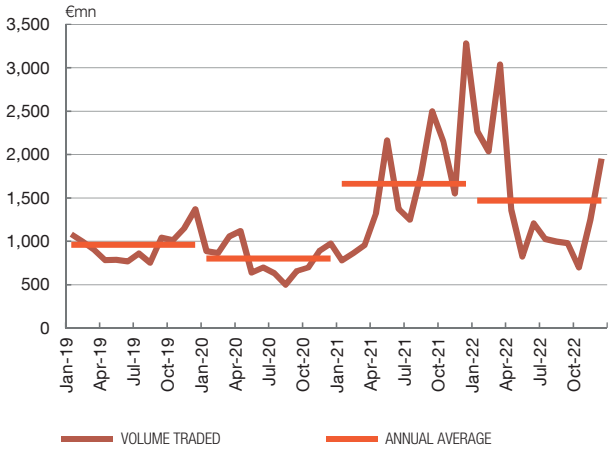
Chart 4

THE PRICES ON ELECTRICITY FUTURES MARKETS HAVE ALSO RISEN STEEPLY. AS A RESULT, THE VALUE OF THE UNDERLYING AND THE SETTLEMENTS PAYABLE HAVE INCREASED

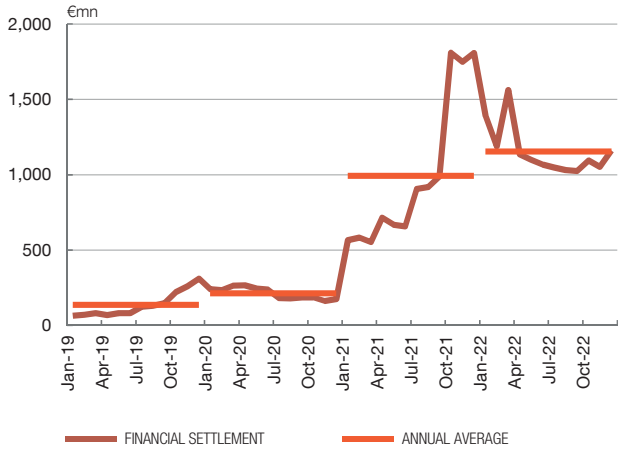
1 PRICES OF ELECTRICITY FUTURES ON OMIP (a)



2 ECONOMIC VALUE OF THE VOLUME TRADED ON THE FUTURES MARKETS (b)



3 FINANCIAL SETTLEMENT OF FUTURES CONTRACTS WITH UNDERLYING AT SPOT PRICE, TRADED ON THE FUTURES MARKETS BY SETTLEMENT MONTH (b)



SOURCES: OMIE, OMIP and CNMC.

a FTB M+1, FTB Q+1 and FTB Y+1 refer to the list price at one month, one quarter and one year after the day on which the transaction is performed.
b Calculation performed by the CNMC using data from intermediary agencies (OMIP-OMIClear and EEX-ECC).

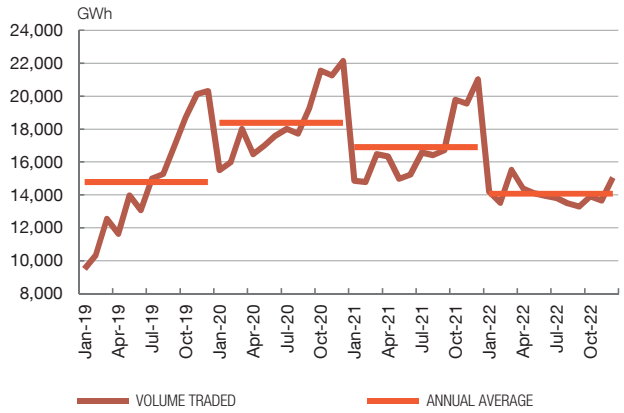
settlements to be cleared by clearing houses as a result of using forward agreements (see Charts 4.2 and 4.3).

This context of rising electricity prices has not led electric utilities to increase their hedging of market risk. Indeed, both the number of derivatives contracts and the volume of electricity used as the underlying in such contracts have fallen (see Chart 5). Specifically, the volume traded in 2022 was 50% down on the figure for 2021 (CNMC, 2023c). One possible explanation for the decline in the use of such hedging in the current context might be found

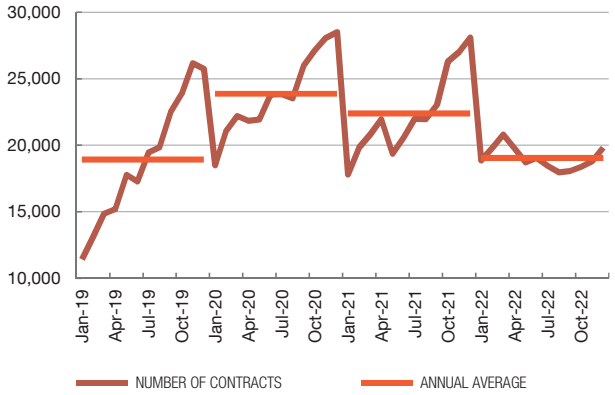
Chart 5

DESPITE THE INCREASE IN PRICES ON WHOLESALE MARKETS, THE VOLUME OF ENERGY AND NUMBER OF CONTRACTS TRADED HAVE NOT INCREASED

1 VOLUME TRADED ON THE OTC, OMIP AND EEX MARKETS (a)



2 NUMBER OF CONTRACTS TRADED ON THE OTC, OMIP AND EEX MARKETS (b)



SOURCE: CNMC.

a According to the CNMC, "as in the other months analysed, December includes all of the contracts fully or partially settled in December 2022: monthly (December 2022), quarterly (2022 Q4) and annual (2022), as well as the balancing contract for the month and the other short-term (daily, weekend, weekly balancing and weekly) contracts settled in December 2022, recognising the energy (GWh) settled in that month in the case of quarterly and annual contracts".

b According to the CNMC, "the number of monthly, quarterly and annual contracts settled at any hour of the relevant month. The underlying asset of each contract is the notional supply/receipt of electricity at a constant 1 MW at all hours of the settlement period".

in agents' economic expectations. In periods of high, volatile spot prices, with the possibility of bigger price increases ahead (meaning that the expected distribution of such increases is positively asymmetric), producers will tend to prefer greater exposure to positive price shocks, and will therefore demand a high risk premium in exchange for renouncing future earnings.[31] Meanwhile, consumers will be willing to pay high risk premia in exchange for reducing their exposure to price changes on the spot market.[32] This is consistent with the above rise in the observed cost of electricity hedging. However, for some consumers, the higher risk premia required in this new environment could entail financial restrictions that limit their access to hedging.

From the standpoint of retailers operating on the open market,[33] the extent to which wholesale electricity prices affect their operating income will largely depend on the degree of hedging they have arranged. As already noted, the lion's share of electricity is retailed on the open market (around 90% of the total energy consumed in 2021) and, given the concentration of retail supply, a high percentage of such energy is sold by the sector's four main groups (accounting for 65% of the total electricity retailed on the open market in 2021). In a context of sharply rising

31 As noted in the Introduction, the ex-post risk premium has recently been negative, meaning that producers are more likely to demand a higher risk premium in the future.

32 For a detailed explanation of the expected trend in forward prices from an economic theory standpoint in the context of electricity markets, see Villaplana and Cartea (2011).

33 As already noted, the retailers in the regulated market are, in principle, unlikely to suffer the impact of higher wholesale market prices, since the price risk is borne entirely by the consumer.

wholesale market prices, this fact is of crucial importance since, as also noted in the preceding section, these groups can count on bilateral intragroup contracts as a natural hedge against price risk. For example, according to the CNMC (2023c), in 2021, as in previous years, the retailers of the main groups earned a higher gross margin than the other retailers in the household segment,[34] while such differences were smaller in the SME and industrial segments.

Compared with their vertically integrated counterparts, non-vertically integrated retailers have found it harder to renew their forward electricity purchase contracts, owing to both higher prices on the spot market and to what those prices mean in terms of the additional collateral required[35] to operate on such markets, making it harder for them to hedge against price risks.

In any event, since spring 2021, the negative impacts of higher wholesale prices on their operating income are likely to have been softened to the extent that retailers have been gradually adjusting their selling prices as and when they renew contracts with their customers and, as such, prices have adjusted in line with the forward hedging they have been able to arrange at each point in time. The recent fall in spot and forward electricity prices has generally eased the pressure on retailers' operating income. Meanwhile, retailers that were covered by long-term purchase contracts at low prices and that were able to upwardly adjust the sales contracts renewed with their customers have also avoided taking a hit to their operating income.

In the recent context of rising wholesale market prices, retailers that opted not to hedge a significant portion of their electricity purchase portfolio (i.e. making purchases on the spot market) have faced greater economic difficulties than those that chose otherwise, given that purchase prices on the daily market have far exceeded the selling prices agreed on with their customers (see Chart 3). Nonetheless, even where the unhedged portion of the electricity purchased is small, the collateral required to purchase electricity on the wholesale market is updated in line with the spot prices, thus entailing an additional financial burden for smaller retailers.[36] The list of electricity retailers published by the CNMC shows that 35 retailers deregistered in 2022 (the second highest figure since 2016, when 38 retailers deregistered), compared with the 13 that did so in 2020, with a further 12 following suit between January and April 2023, the third worst Q1 figure after 2012 and 2022 in terms of deregistrations recorded on the list (which first recorded the deregistration of a retailer in 2004).[37]

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34 According to the CNMC (2023c), from July 2013 onwards, the gap between the gross margins earned in the household segment by the two types of retailers narrowed as the main groups offered lower prices than the retailers.

35 The collateral is used to cover the risk that the parties might default on their financial obligations and, in general, may be arranged in the form of cash, guarantees or insurance. Default risk is positively correlated with electricity futures prices, and additional collateral is required when such futures prices rise. By way of example, based on the 2021 Annual Report and Accounts of OMIClear (OMIClear, 2022), the counterparty risk measured by the initial margins required of clearing members stood at an average of €219.8 million in 2021, versus an average of €79.7 million in 2020.

36 In view of these issues, in December 2021 the CNMC approved modifications regarding the collateral to be put up by retailers (CNMC, 2021c).

37 When a retailer is no longer able to operate, its customers are transferred to a retailer in the regulated market (see Article 47 of Electricity Sector Law 24/2013 of 26 December 2013).

All of which could lead to greater concentration in retailer activity, whether due to the relative advantage enjoyed by vertically integrated retailers when competing for customers thanks to their bilateral intragroup contracts, or to the fact that a significant number of retailers abandon the market for the reasons detailed above. This trend is reflected by the CNMC's latest report on the retail electricity market, which notes that, since 2021 H2, electricity sales have been increasingly concentrated in the larger retailers (CNMC, 2023c).

4 The Iberian mechanism and its impact on the revenues of electric utilities

Following the sharp price rises seen on the Iberian electricity market, the governments of Spain and Portugal agreed, with the prior approval of the European Commission, to set in place a mechanism to cap the cost of the gas used in electricity generation between 15 June 2022 and 31 December 2023 (the "mechanism").[38] This mechanism stipulates that fossil fuel-fired power plants[39] receive a transfer – the "adjustment unit amount" – for each MWh of electricity generated whenever the gas price exceeds a pre-established reference price. Specifically, the adjustment unit amount (Yi) received by each facility "i", in euro per MWh generated, is equal to:

$$Y_i = \frac{(P_{NG} - P_{NGR})}{0.55}$$

where (P_{NG}) is the price of natural gas on the Iberian gas market (MIBGAS) and (P_{NGR}) is the reference price of natural gas.[40] This transfer must then be deducted from the prices offered on the wholesale electricity market by the plants in question. In other words, if the pre-adjustment offer price of producer "i" is P_i^* per MWh of electricity, it should offer $P_i^* - Y_i$. This therefore lowers the price on the wholesale market, which is (directly or indirectly) set by these plants at most hours of the day (Pacce and Sánchez, 2022). Thus, while the mechanism is in place and whenever gas prices exceed the established reference prices,[41] its impact on wholesale market prices should be about equal, at any given hour, to the adjustment unit amount. Nonetheless, this is still a rough estimate of the mechanism's impact on final wholesale market prices, since there are other key factors that are hard to isolate:

— First, by guaranteeing remuneration for fossil fuel-fired plants thanks to the mechanism, there is a chance that the composition of the energy mix may have been affected, as compared with a counterfactual scenario in which no such mechanism applied. For example, a sizeable number of cogeneration facilities were initially excluded from the adjustment mechanism, leading a significant number to bring a halt to their operations during the first months of implementation, since the price of electricity on the wholesale market fell

38 While the measure was initially set to remain in place until 31 May 2023, it was extended up to the end of 2023 under Royal Decree-Law 3/2023 of 28 March 2023.

39 I.e. combined cycle, cogeneration and coal-fired power plants. To begin with, only cogeneration plants that did not fall under the specific remuneration framework were included (Royal Decree-Law 10/2022 of 13 May 2022). From 1 October 2022 onwards, any cogeneration facilities that waive the specific remuneration framework for which they qualify are also eligible for the mechanism, a decision that can be reversed (Royal Decree-Law 17/2022 of 20 September 2022). Under the specific framework, the remuneration paid to facilities comprises the market selling price plus remuneration for operating costs and remuneration for investment, the last two of which are regulated.

40 Specifically, the price of gas refers to the "average weighted price of all natural gas trades in daily products with delivery on the following day at the virtual balancing point" on the MIBGAS, while the mechanism's reference price was set at €40/MWh until December 2022, before rising incrementally to €65/MWh in December 2023. The difference between the two prices is divided by 0.55 (i.e. the reference value to estimate the thermal efficiency of combined cycle power plants, meaning that 1.8 MWh of gas is needed to generate 1 MWh of electricity).

41 Between 26 February 2023 and the date of this paper, the reference price has been higher than the observed gas price, and the mechanism has not therefore been operational over this period.

below the prices they were able to offer.[42] Combined cycle plants stepped in to generate much of this electricity, which may have skewed the wholesale market clearing prices.

— Second, a lower market price spurs foreign demand for electricity, which may also affect the final price. Yet even that impact is limited, since external demand for electricity cannot exceed the export capacity.[43] France is the most important of the Iberian Peninsula's border markets and this interconnection may have affected the final wholesale market price. Assuming that the Spanish wholesale price in the absence of the mechanism would have been equal to the wholesale price plus the adjustment unit amount, in practice, this impact also appears to have been small. Chart 6.1 shows the difference between the French and Spanish wholesale market prices, net of the adjustment unit amount, at any given hour between 15 June 2022 and end-2022. As can be seen, the difference in the prices on the two markets was greater than the amount of the adjustment at most hours (around 70%). One way of looking at this is that, even in the absence of the mechanism, electricity exports to France would in all likelihood have been running at maximum capacity for most of the time, since the Spanish wholesale price would still have fallen below the French equivalent for a high percentage of hours. There are essentially two reasons for this: one, prices on the MIBGAS gas market have been lower than those on the TFF market (see Chart 1.2), which, all other things being equal, should yield lower electricity prices on the Iberian Peninsula, and; two, the energy mix in France was affected by the surprise stoppage to much of its nuclear power production, leaving the country with no choice but to increase its demand for foreign electricity. This interpretation should nonetheless be approached with caution, since it depends on the assumptions used to estimate the counterfactual scenario.[44]

The mechanism is partly financed with a charge (or "adjustment cost") paid by the Spanish and Portuguese consumers (households, SMEs and industries) potentially benefiting from the measure. In Spain such consumers are identified as those with contracts indexed to the wholesale electricity price (including those with the regulated rate for small consumers)

42 The bulk of cogeneration falls under the specific remuneration framework. As noted by Rodríguez (2022), the specific remuneration for cogeneration is designed much like that for renewable facilities, except that, in the case of cogeneration, the cost of the fuel used is factored in. The reference value for the cost of fuel is updated by the government from time to time.

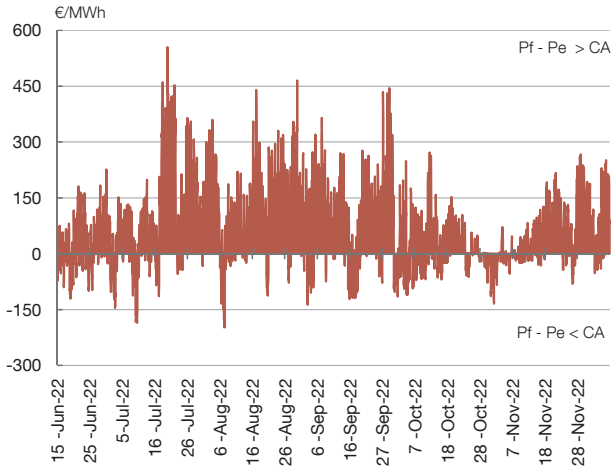
43 According to the International Energy Agency (2023), such issues had limited impact due to the low level of interconnection between Spain and the rest of Europe.

44 Hidalgo Pérez, Collado Van-Baumberghen, Galindo and Mateo Escobar (2023) estimate the prices for Spain in the counterfactual scenario based on the gas prices on the TTF market. According to their findings, the Spanish wholesale market price in the absence of a mechanism would have been higher than the French price between mid-September and early December, whereas the opposite would have been true (or the prices would have been similar) on a great many days in the other months in which the mechanism was in place. This would mean that the mechanism had a bigger impact on the rise in exports to France than that suggested in the main body of this paper. Nonetheless, it is worth bearing in mind that the mechanism was not operational between 26 February and 24 May, when the Spanish wholesale price was either lower than or equal to the French wholesale price for 90% of the time.

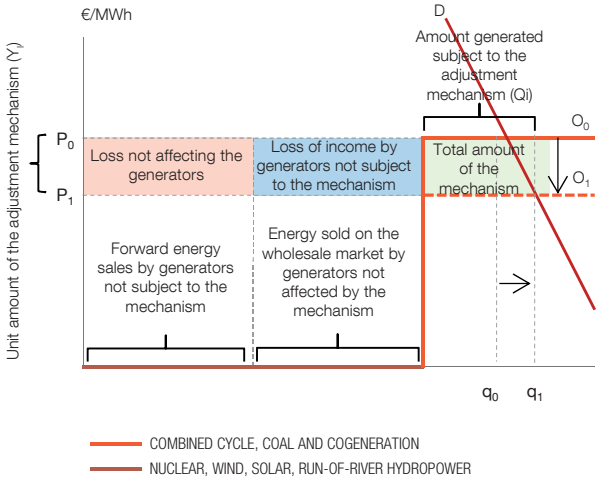
Chart 6

DIFFERENCE IN PRICES BETWEEN THE SPANISH AND FRENCH MARKETS NET OF THE ADJUSTMENT UNIT AMOUNT AND IMPACT OF THE ADJUSTMENT MECHANSIM ON THE REVENUE OF ELECTRICITY GENERATORS

1 DIFFERENCE IN PRICES BETWEEN THE SPANISH AND FRENCH MARKETS MINUS THE UNIT AMOUNT OF THE MECHANISM AT EACH HOUR (a)



2 EXAMPLE OF THE REDUCTION TO THE BID PRICE AND OF THE TOTAL AMOUNT OF THE ADJUSTMENT MECHANSIM DUE TO THE CAP ON THE COST OF GAS FOR GENERATION (b)



SOURCES: OMIE, ESIOS and Banco de España.

a Pf and Pe refer to the prices on the French and Spanish wholesale markets, respectively. CA refers to the adjustment unit amount. A positive value indicates that the difference in price between the French and Spanish wholesale markets exceeded the adjustment unit amount at the relevant hour and on the relevant day. A negative value means that the difference in prices between the two markets was smaller than the amount of the adjustment, or that the price on the French market was lower than the Spanish price.

b The chart is a simplified overview depicting the potential losses of generators not subject to the mechanism and should not be taken as an accurate.

and those with fixed-price contracts (or with fixed-price forward hedging arrangements), whose contracts have been renewed since the end of April 2022.[45] According to OMIE (the Iberian energy market operator), when the mechanism was launched in June 2022 the cost of the adjustment was financed by 52.6% of the energy purchased on the Iberian market, a percentage that was higher in Spain (55.5%[46]) than in Portugal (37.3%). In December 2022 these percentages had risen to 63.4% in the Iberian market and 69.4% in Spain, remaining unchanged at 37.3% in Portugal.

The mechanism is also financed with the additional revenue (attributable to the implementation of the mechanism) generated by the increase in congestion income (electricity import and export-related income)[47] from the electricity traded with France.

45 In March 2023, when the term of the mechanism was extended until December 2023, it was decided that electricity purchases under fixed-price hedging agreements signed before 7 March 2023 and for delivery between 1 June and 31 December 2023 would be exempt from financing the mechanism (Royal Decree-Law 3/2023 of 28 March 2023).

46 Including energy sold at a variable price and energy sold at a fixed price under contracts renewed between late April and June 2022. Note that this percentage is higher than that estimated by the CNMC on information up to October 2021 (CNMC, 2022a), which suggested that 40% of energy was being sold at a variable price (see Table 1).

47 "Congestion income" is paid when the interconnections between two countries are operating at maximum capacity, and is calculated by multiplying the electricity exported (or imported) in each hour of system saturation by the price difference between the two markets. This income is split equally between the two countries. See CNMC Resolution of 6 May 2021 (only available in Spanish).

The Decree implementing the mechanism details how such additional congestion income should be calculated by the system operator.[48] According to OMIE, this income amounted to €592.2 million in 2022, while the total amount transferred to the fossil fuel-fired plants on the MIBEL thanks to the mechanism stood at €7,255.2 million. In other words, the additional congestion income accounted for 8.2% of such total transfers.[49] In any event, as an alternative to the additional congestion income calculation method described in Royal Decree-Law 10/2022 of 13 May 2022, it is possible to estimate how much the congestion income is likely to have increased as a result of the bigger price differences between Spain and France that may be attributed to the implementation of the adjustment mechanism. Specifically, again assuming that, in the absence of the mechanism, the Spanish wholesale price would have been equal to the wholesale price observed plus the adjustment unit amount, the total additional congestion income can be approximated by multiplying the adjustment unit amount in each of the hours in which the capacity to export electricity to France was saturated by the amounts exported in such hours. Given that the congestion income is split equally between the two countries, the resulting amount must be halved to obtain the portion attributable to Spain.[50] Using this method, between 15 June and 31 December 2022 the additional congestion income would have amounted to around €620 million (not far off the amount used to finance the mechanism). The flip side of this is that the implementation of the mechanism appears to have led to a wealth transfer of around €620 million from consumers in the Iberian Peninsula to their French counterparts, who do not finance the mechanism but do benefit from lower prices on the Spanish wholesale market. It is nonetheless worth noting that this amount is approximate and depends on the assumptions used to estimate the counterfactual scenario.

The lower prices seen on the wholesale electricity market due to the implementation of the mechanism meant less income for those facilities that were not paid the adjustment unit amount. Chart 6.2 shows, in simplified form, how the mechanism appears to have affected such income. The price reduction generated by the mechanism – from P0 to P1, a reduction equal to the adjustment unit amount – generates an amount payable to producers using fossil fuels (green area). The electricity sold by other technologies does not qualify for this compensation, leading to a decrease in the economic volume of the energy traded[51] (pink and blue areas combined), which, between 15 June 2022 and 31 December 2022, appears to have stood at around €5.5 billion on the Spanish wholesale market, although this last figure is a provisional estimate, since the indirect effects of the mechanism are not factored in. However, a significant portion of the energy that does not qualify for the

48 Royal Decree-Law 10/2022 of 13 May 2022 provides that additional income comprises the "value of the net income from the monthly auctions allocating cross-border capacity with France in each month with respect to the same month of the preceding year".

49 The difference was paid per unit of acquisition by Spain (€5,968.2 million) and Portugal (€695.2 million). Spain's bigger contribution can essentially be attributed to its higher electricity consumption. Nonetheless, Spain made a higher proportional payment for the mechanism since it has a higher percentage of consumers with contracts indexed to the wholesale market.

50 This approximation is similar to that proposed in Rodríguez (2022).

51 The economic volume of energy traded on the wholesale market at a particular hour is obtained by multiplying the market price (€/MWh) by the amount traded (MWh) at that hour. The sum total of the volumes traded hourly is used to obtain the daily, monthly and annual volumes traded.

adjustment unit amount is sold on a forward basis (for a price arranged beforehand) and is not therefore significantly affected by the decline in the wholesale price (pink area).[52] Thus, only the portion of the electricity sold on the wholesale spot market by technologies not qualifying for the compensation appears to have been affected by the lower wholesale market prices associated with the implementation of the mechanism. In other words, the loss of income can be approximated by the amount of energy generated by technologies not qualifying for the adjustment, minus the amount of electricity sold on a forward basis,[53] multiplied by the adjustment unit amount in each hour. Based on this calculation, the income lost by the electricity producers that did not qualify for the adjustment appears to have amounted to around €3.1 billion on the Spanish wholesale market between 15 June and 31 December 2022,[54] representing around 15% of the volume traded on the market (factoring in the adjustment mechanism paid to the producers affected) over the same period.

52 As can be seen in Chart 4.1, the mechanism essentially affected the renewal prices under forward contracts with a delivery date falling within less than one year.

53 It is assumed that the energy sold on a forward basis accounts for 52%, the midway point between the 59% estimated by the CMNC in October 2021 (see Table 1) and the 45% that can be approximated based on the proportion of electricity that did not finance the proportional part of the amount of the adjustment in the first month of implementation in Spain. This last figure is a conservative estimate, since in its first month of implementation the adjustment mechanism was paid for by all of the fixed-price contracts renewed in late April, May and over the course of June. OMIE's daily operating schedule, which includes the energy traded on the wholesale market and the energy sold under bilateral contracts (which bypasses the wholesale market), is used to subtract the energy sold on a forward basis from the total energy generated.

54 This figure may vary between €1.8 billion and €4.4 billion depending on whether the percentage of energy sold on a forward basis in Spain is 59% or 45%, respectively, of the total (see footnote 53).

5 Reduction to the "windfall remuneration" resulting from higher gas prices, and the temporary levy on energy firms

In Europe, many governments have proposed or approved measures seeking to soften the impact of higher wholesale electricity prices on household income and the costs structures of the different branches of the economy (see Table 2).[55] Against this backdrop, since June 2021 various measures have been approved in Spain in addition to the Iberian mechanism.[56] These measures include one that, to begin with, had a significant direct impact on the operating income of Spain's top electric utilities: the measure to reduce the "windfall remuneration" of non-CO2-emitting power plants as a result of higher natural gas prices.[57] This measure primarily affected hydroelectric and nuclear technologies,[58] reducing their income between 16 September and 31 March 2022.[59] On its publication, the Ministry for the Ecological Transition and the Demographic Challenge estimated that the measure would raise around €2.6 billion,[60] to be used to finance the reduction to one of the items on retail consumers' electricity bills.[61]

While most of the electricity sold on a forward basis, which was not directly affected by price movements on the spot market,[62] was initially included in the measure to reduce windfall remuneration, the rules were amended under Royal Decree-Law 23/2021 of 26 October 2021. Thereafter, the measure to reduce windfall remuneration excluded electricity covered by any form of fixed-price forward arrangement, for contracts signed both before and after the entry into force of Royal Decree-Law 17/2021 of 14 September 2021,

55 The European Commission has also published a series of recommendations on the measures that governments could take to combat higher electricity prices. See European Commission (2021).

56 They essentially focused on directly lowering the cost of consumers' electricity bills. Thus, in June 2021 the VAT on retail consumption was cut from 21% to 10%, while the tax on electricity generation levied directly on the wholesale market price was suspended. In September that same year the excise duty on electricity was reduced from 5.11% to 0.5%. VAT was further reduced from 10% to 5% in July 2022. For more details of the measures implemented, their cost and their effect on activity and prices, see Banco de España (2023b).

57 See Royal Decree-Law 17/2021 of 14 September 2021.

58 Initially, this measure did not apply to the facilities of electricity systems in non-mainland regions, power plants qualifying for a specific remuneration framework (renewables, cogeneration and waste) or small facilities (less than 10 MW). Nonetheless, certain photovoltaic and wind power facilities do not meet these criteria and are not exempt from payment of the reduction mechanism. See Rodríguez (2021) for a more detailed look at the implications of the measure and how it is applied.

59 The Royal Decree-Law sets out the formula for calculating the windfall remuneration to be reimbursed by producers and, among other matters, provides that the profit adjustment will apply whenever the price of natural gas exceeds €20/MWh on average in a given month. The €20/MWh limit established has been justified on the basis that this figure is the approximate average price on the MIBGAS since it was launched in 2017. The average monthly price of natural gas, measured using the MIBGAS index, has exceeded €20/MWh in every month since March 2021.

60 See the Ministry for the Ecological Transition and the Demographic Challenge press release of 14 September 2021.

61 Specifically, between the entry into force of Royal Decree-Law 17/2021 and 31 December 2021, the government reduced the "electricity system charges" component by 96% with respect to August 2021. The amount raised from this component is used to finance various regulated costs, such as renewable energies, the excess cost of generating electricity in non-mainland territories and payment of the annual instalments to pay down the electricity tariff deficit. Part of the 96% reduction in charges was also to be financed with higher income from greenhouse gas emissions rights auctions.

62 A few days after the publication of Royal Decree-Law 17/2021 of 14 September 2021, the Ministry for the Ecological Transition and the Demographic Challenge, in response to an enquiry from Red Eléctrica de España (the system operator), published an explanatory note indicating that any energy covered by a fixed-price forward trading instrument, provided this did not entail a contract between the producer and a company from the same group, was also exempt (see Rodríguez, 2021). In other words, the leading firms in the electricity sector and, by extension, most of the forward trading, would not be exempt from the measure to reduce windfall remuneration.

Table 2

NATIONAL POLICIES TO SHIELD CONSUMERS FROM RISING ENERGY PRICES

	Reduced energy tax / VAT	Retail price regulation	Wholesale price regulation	Transfers to vulnerable groups	Mandate to State-owned firms	Windfall profits tax	Business support
Austria	x	x		x		x	x
Germany	x	x		x		x	x
Belgium	x	x		x		x	x
Denmark	x	x		x		x	x
Spain	x	x	x	x		x	x
Finland	x			x		x	x
France	x	x	x	x	x	x	x
Greece	x	x		x	x	x	x
Ireland	x			x		x	x
Italy	x			x		x	x
Norway	x	x		x		x	x
Netherlands	x	x		x		x	x
Poland	x	x		x		x	x
Portugal	x	x	x	x	x	x	x
United Kingdom	x	x		x		x	x
Sweden	x	x		x		x	x

SOURCE: Sgaravatti, Tagliapietra and Zachmann (2021).

provided the hedging period was one year or more.[63] This significantly reduced the total amount that could potentially be raised under the measure.

In March 2022, with the publication of Royal Decree-Law 6/2022 of 29 March 2022, the measure was extended up to 30 June 2022, while the scope of the regulations was also modified, with a change to the rule exempting electricity sold on a forward basis from the measure to reduce windfall remuneration, whereby only electricity sold on the forward markets for a period of one year or more and a price below €67/MWh would be excluded. Moreover, as from the publication of the Royal Decree-Law, the forward selling price to be borne in mind in the case of intragroup hedging would be the final price charged to the consumer by a group's retailer. The measure was later extended, first until end-2022 (Royal Decree-Law 11/2022 of 25 June 2022) and then until 31 December 2023 (Royal Decree-Law 18/2022 of 18 October 2022).

As noted in Rodríguez (2022), the revenue raised by this measure has been transferred to the system for settling the payables and receivables used to remunerate the regulated costs of the electricity sector, which is managed by the CNMC. According to the CNMC's reports (2022c, 2023b) on the electricity sector's definitive and provisional settlements for 2021 and 2022, respectively, the measure raised a total of €131.8 million in 2021 and €370.4 million in 2022.

63 In the case of forward contracts with partial indexation, the electricity equivalent to the non-indexed portion of the contract was also excluded. See Royal Decree-Law 23/2021 of 26 October 2021.

To understand why the amount raised was significantly lower than that initially envisaged when Royal Decree-Law 17/2021 of 14 September 2021 was published, it is important to note not only the generation structure including hydroelectric and nuclear energy sources, but also the importance of the electricity sold on a forward basis by these types of technologies.

In Spain, around one-third of the electricity generated comes from nuclear or hydroelectric plants (see Chart 7.1). In turn, the main corporate groups in the sector account for the bulk of this energy. Specifically, according to OMIE data, 100% of nuclear energy is generated by such groups. Moreover, two of those groups account for around 90% of the total. In 2022, for example, 47.2% and 42.8% of nuclear energy was generated by Endesa and Iberdrola, respectively, with the Naturgy group (7.9%) and EDP (2.1%) accounting for the rest (see Chart 7.2). In the case of hydroelectricity generation, the number of companies involved is slightly larger. Nonetheless, here too Endesa and Iberdrola stand out in terms of their share of this type of energy, accounting respectively for around 25% and 47% of the total hydroelectricity generated in 2022 (see Chart 7.3). After these two firms, the biggest players in hydroelectricity generation were Naturgy (8.5%), Repsol (7.4%), Acciona (7.3%) and EDP (2.8%).

All of the above shows that the bulk of the energy potentially affected by the measure to reduce the windfall remuneration associated with higher gas prices was essentially generated by the main groups in the sector. However, as already noted, the measure did not significantly affect electricity sold on a forward basis, at least until March 2022. Given that public information on forward sales contracts is hard to come by, one potential minimum estimate of forward sales of nuclear and hydroelectric energy is based on the electricity sold under bilateral intragroup contracts[64] (which does not mean that a significant portion of the energy sold on the spot market is not also covered by some sort of forward hedging). In any event, OMIE data can be used to ascertain the percentage of the electricity generated using nuclear and hydraulic technologies allocated to such intragroup contracts. In 2022, 91.5% of the nuclear energy generated was sold under bilateral intragroup contracts, a figure that stood at around 72% in the case of the hydroelectricity generated by the four biggest corporate groups.

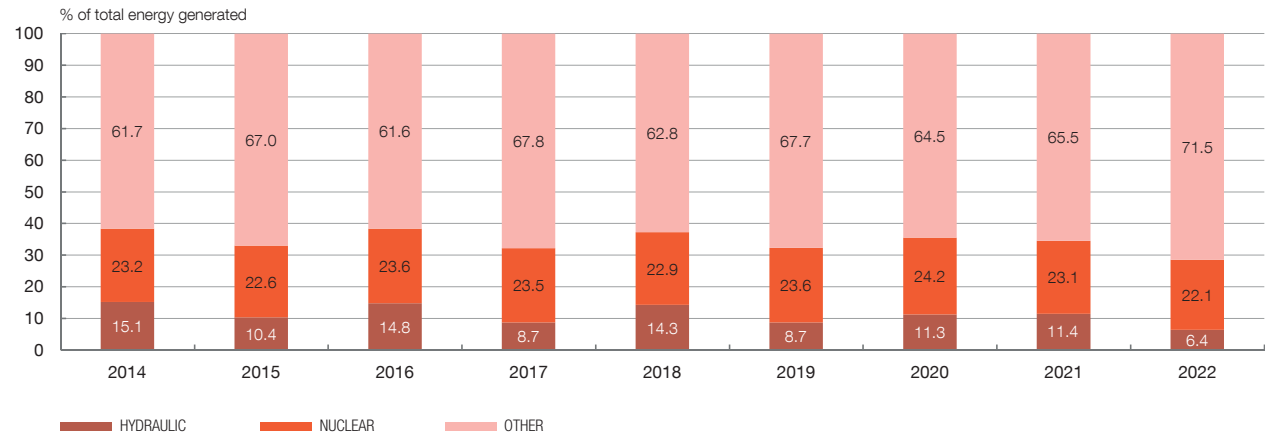
In addition to the measure described above, 27 December 2022 saw the publication of Law 38/2022, which provided (among other measures) for a temporary tax on energy firms. This tax is levied on net turnover for 2022 and 2023, and essentially affected electric utilities and gas and oil companies whose net turnover in 2019 exceeded €1 billion. In other words, the tax would be levied on the main firms in the sector. The tax rate (1.2%) is applied to net turnover, covering only the activities of such firms in Spain and excluding any revenue generated by regulated activities. This exception is particularly important in

64 The energy sold under bilateral intragroup contracts may not be channelled through the wholesale electricity market, and is not therefore be affected by the price variations on that market. It makes sense to assume that part of the energy acquired by a group's retailers under such contracts is used as a hedge to comply with their fixed-price electricity contracts.

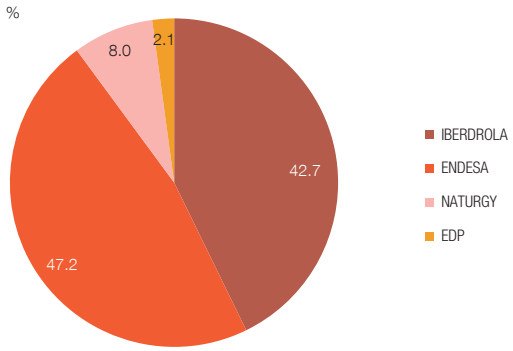
Chart 7

AROUND A THIRD OF ALL OF THE ENERGY GENERATED IN SPAIN IS FROM NUCLEAR AND HYDRAULIC TECHNOLOGIES AND IS CONCENTRATED IN A HANDFUL OF FIRMS

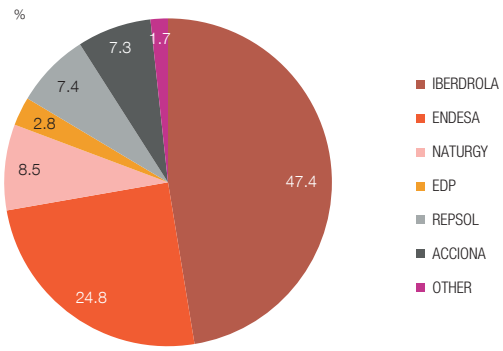
1 STRUCTURE OF ELECTRICITY GENERATION IN SPAIN



2 ELECTRICITY GENERATION BASED ON NUCLEAR TECHNOLOGY. SHARE OF THE MAIN UTILITIES IN 2022



2 ELECTRICITY GENERATION BASED ON HYDRAULIC TECHNOLOGY. SHARE OF THE MAIN UTILITIES IN 2022



SOURCE: OMIE.
NOTE: PERCENTAGES BASED ON DATA FROM OMIE'S "DAILY OPERATING SCHEDULE".

the electricity sector since, as already noted, transmission and distribution activities are regulated, while a significant portion of the retail business is subject to a regulated tariff (the regulated rate for small consumers). The first instalment of this temporary tax on energy firms raised €817.4 million, a 50% advance payment of the total amount due in 2023.[65] In other words, the tax should raise around €1.6 billion in 2023 and (probably) 2024. It is nonetheless worth noting that this calculation includes not only electric utilities, but also gas and oil companies.[66]

65 See the Ministry of Finance and the Civil Service press release of 21 February 2023.

66 Based on the information appearing in the press in late February 2023, drawing on declarations by the corporate groups themselves, in 2023 Naturgy was set to pay around €300 million on its 2022 operations, with Iberdrola and ENDESA paying around €200 million and EDP around €50 million. It is worth clarifying that the amount paid by these for corporate groups cannot be attributed solely to their activities in the electricity sector.

6 Conclusions

The high prices seen on the wholesale electricity market in 2021 and 2022 have affected firms in the sector unevenly. The direction, scale and persistence of the impact depend largely on the activities pursued by the different firms and the extent of their vertical integration.

Electricity producers have seen their operating income rise since spring 2021 thanks to higher prices on the wholesale spot market and in their forward sales. Given that a sizeable share of energy retailers' sales are made at a fixed price, they found it hard to do business in the first months of price rises. Nonetheless, subsequent renewals of contracts with customers have increasingly helped to ease such difficulties. In any event, there is considerable cross-sector heterogeneity, with vertically integrated retailers finding it easiest to operate, thanks both to their greater ability to purchase energy on a forward basis under bilateral intragroup contracts, and to their lower exposure to the increase in the collateral required to make forward energy purchases.

A series of (in principle, transitional) measures have been set in place to curb the sharp rise in revenue at electric utilities. In Spain, notable examples include the Iberian electricity mechanism (which essentially aims to limit the rise in wholesale electricity market prices associated with changes in the price of gas), the measure to reduce the windfall remuneration arising as a result of higher gas prices (established by the government in late 2021) and the temporary tax on energy firms (applicable in 2022 and 2023). The impact of these measures on the operating income of the different electric utilities has also been highly uneven.

References

Banco de España. (2023a). "Chapter 4. Spain and the European Union in the face of the energy crisis: near-term adjustments and challenges pending". In Banco de España, *Annual Report 2022,* pp 184-220. https://repositorio.bde.es/handle/123456789/29665

Banco de España. (2023b). "Box 1.1. Macroeconomic impact of support measures to address the surge in inflation and the energy crisis". In Banco de España, *Annual Report 2022,* pp 67-69. https://repositorio.bde.es/handle/123456789/29662

Comisión Nacional de los Mercados y la Competencia. (2021a). *Acuerdo por el que se emite informe relativo a la estructura liquidez y profundidad de los mercados de electricidad a plazo en España,* 6 May 2021, INF/DE/016/20. https://www.cnmc.es/sites/default/files/3597649.pdf

Comisión Nacional de los Mercados y la Competencia. (2021b), *Boletín anual de mercados a plazo de energía eléctrica en España (Balance 2020),* 6 May 2021, IS/DE/003/20. https://www.cnmc.es/sites/default/files/3498804_0.pdf

Comisión Nacional de los Mercados y la Competencia. (2021c). *La CNMC modifica varios procedimientos para mejorar el funcionamiento del sistema eléctrico en un contexto de precios elevados* [Press release], 14 December 2021. https://www.cnmc.es/sites/default/files/editor_contenidos/Notas%20de%20prensa/2021/20211214_NP_DCOOR.pdf

Comisión Nacional de los Mercados y la Competencia. (2022a). *Informe de supervisión de los mercados minoristas de gas y electricidad. Año 2020 y avance sobre la situación de crisis energética actual,* 8 March 2021, IS/DE/027/21. https://www.cnmc.es/sites/default/files/3981989.pdf

Comisión Nacional de los Mercados y la Competencia. (2022b). *Boletín anual de mercados a plazo de energía eléctrica en España (Balance 2021),* 24 March 2022, IS/DE/003/21. https://www.cnmc.es/sites/default/files/4003418.pdf

Comisión Nacional de los Mercados y la Competencia. (2022c). *Informe sobre la liquidación definitiva de 2021 del sector eléctrico,* 24 November 2022, LIQ/DE/007/22. https://www.boe.es/buscar/pdf/2022/BOE-A-2022-17040-consolidado.pdf

Comisión Nacional de los Mercados y la Competencia. (2022d). *Informe de supervisión de los cambios de comercializador – cuarto trimestre de 2021,* de 22 de diciembre de 2022, IS/DE/014/21. https://www.cnmc.es/sites/default/files/4487990.pdf

Comisión Nacional de los Mercados y la Competencia. (2023a). *Informe de supervisión del mercado peninsular mayorista al contado de electricidad. Año 2021,* 13 April 2023, IS/DE/013/22. https://www.cnmc.es/sites/default/files/4638493.pdf

Comisión Nacional de los Mercados y la Competencia. (2023b). *Informe sobre la liquidación provisional 14/2022 del sector eléctrico. Análisis de los resultados y de los desvíos respecto de la previsión anual de los ingresos y costes del sistema eléctrico,* 20 April 2023, LIQ/DE/001/22. https://www.cnmc.es/sites/default/files/4667722.pdf

Comisión Nacional de los Mercados y la Competencia. (2023c). *Informe de supervisión de los mercados minoristas de gas y electricidad. Año 2021 y avance 2022,* 11 May 2023, IS/DE/027/22. https://www.cnmc.es/sites/default/files/4692868.pdf

Enagás. (2023). *Statistical bulletin, December 2022,* 10 January 2023. https://www.enagas.es/content/dam/enagas/en/files/gestion-tecnica-del-sistema/energy-data/publicaciones/boletin-estadistico-del-gas/Monthly-Bulletin-Gas-December-2022.pdf

European Commission. (2007). *Communication from the Commission to the European Council and the European Parliament,* 10 January 2007. COM(2007) 1 final. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0001:FIN:EN:PDF%20

European Commission. (2021). *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions,* 13 October 2021. COM(2021) 660 final. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0660

European Commission. (2022a). *Save Gas for a Safe Winter: Commission proposes gas demand reduction plan to prepare EU for supply cuts* [Press release], 20 July 2022. https://ec.europa.eu/commission/presscorner/detail/en/ip_22_4608

European Commission. (2022b). *Energy prices: Commission proposes emergency market intervention to reduce bills for Europeans* [Press release], 14 September 2022. https://ec.europa.eu/commission/presscorner/detail/en/IP_22_5489

Hidalgo Pérez, Manuel, Natalia Collado Van-Baumberghen, Jorge Galindo and Ramón Mateo Escobar. (2023). "The Effects of the Spanish Gas Cap on Prices, Inflation, and Consumption Six Months Later". ***EsadeEcPol Policy Insight,*** No. 43, Esade. https://www.esade.edu/ecpol/en/publications/the-effects-of-the-spanish-gas-cap-on-prices-inflation-and-consumption-six-months-later/

International Energy Agency. (2023). *Electricity Market Report 2023.* https://iea.blob.core.windows.net/assets/255e9cba-da84-4681-8c1f-458ca1a3d9ca/ElectricityMarketReport2023.pdf

OMIClear. (2022). *Annual report and accounts 2021.* https://www.omiclear.pt/sites/default/files/2022-05/omiclear_ra2021_eng_017.pdf

Pacce, Matías José, Isabel Sánchez García and Marta Celia Suárez-Varela Maciá. (2021). "Recent developments in Spanish retail electricity prices: the role played by the cost of CO2 emission allowances and higher gas prices". Occasional Papers, 2120, Banco de España. https://repositorio.bde.es/handle/123456789/17371

Pacce, Matías José and Isabel Sánchez García. (2022), "Box 4. Impact on inflation of the mechanism to cap gas prices on the Iberian market". *Economic Bulletin - Banco de España,* 2/2022, pp. 25-27. https://repositorio.bde.es/handle/123456789/21578

Rodríguez Rodríguez, Diego. (2021), "Una nota sobre las nuevas medidas de choque para bajar el precio de la electricidad". *Fedea Policy Papers,* 2021/10. https://documentos.fedea.net/pubs/fpp/2021/10/FPP2021-10.pdf

Rodríguez Rodríguez, Diego. (2022). "Un año de intervenciones regulatorias en electricidad y gas: un análisis de situación". *Fedea Apuntes,* 2022/27. https://documentos.fedea.net/pubs/ap/2022/ap2022-27.pdf

Sgaravatti, Giovanni, Simone Tagliapietra, Cecilia Trasi, and Georg Zachmann. (2021). *National policies to shield consumers from rising energy prices.* Bruegel Datasets, first published 4 November 2021. https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices

Villaplana, Pablo and Álvaro Cartea. (2011). "Un análisis de la evolución de los precios a plazo de energía eléctrica en España". In *Los nuevos mercados energéticos,* pp. 193-242. Fundación de Estudios Financieros.

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