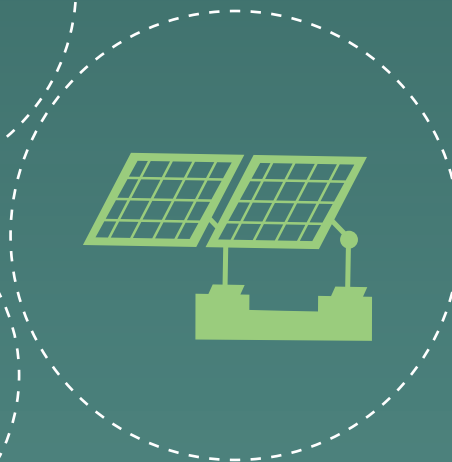




European  
Commission

# Quarterly report

## On European electricity markets



Market Observatory for Energy  
DG Energy

Volume 16

(issue 3, covering third quarter of 2023)

Energy

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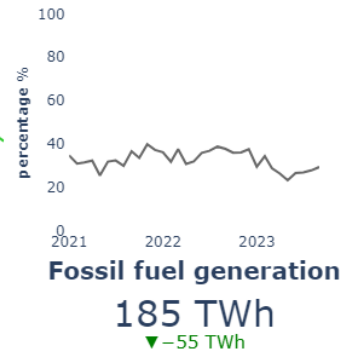
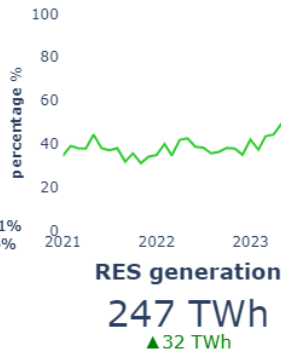
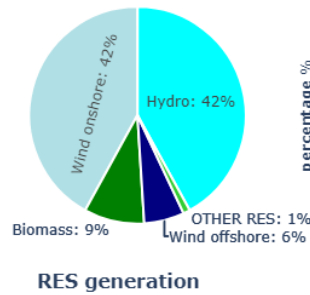
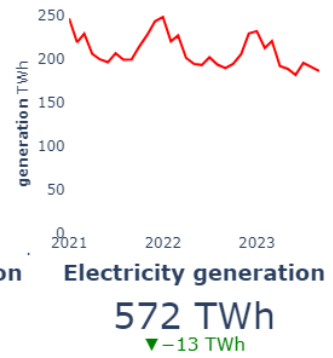
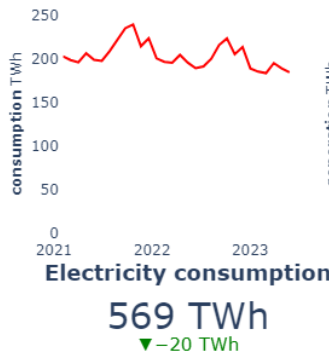
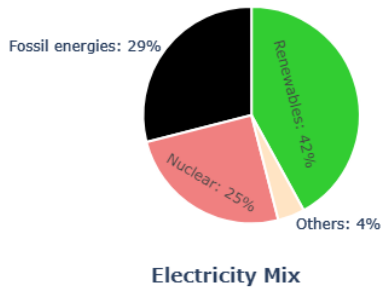
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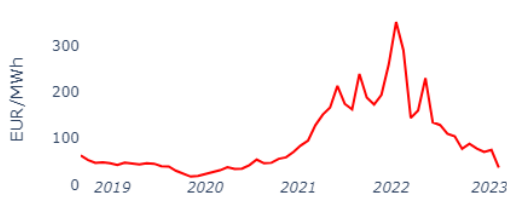
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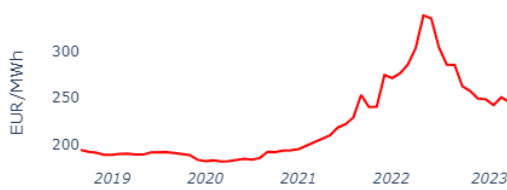
## Electricity generation and consumption in Q3 2023 and year-on-year comparison



## Prices in Q3 2023 and year-on-year comparison

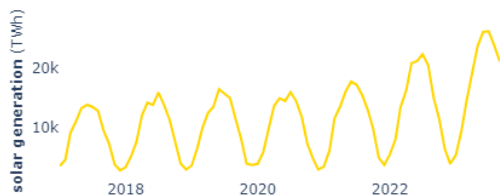


**Wholesale prices**  
85 €/MWh  
Change y-o-y  
-74%  
▼ -225 €/MWh



**Retail prices**  
246 €/MWh  
Change y-o-y  
-16%  
▼ -48 €/MWh

## Focus of the Quarter: Renewable energy generation and year-on-year comparison



**Hydro**  
73 TWh  
▲ 8 TWh

**Solar**  
71 TWh  
▲ 13 TWh

**Wind onshore**  
74 TWh  
▲ 13 TWh

**Wind offshore**  
10 TWh  
▲ 1 TWh

Renewable energy generation: +15%

## HIGHLIGHTS OF THE REPORT

- **The third quarter of 2023 was marked by a continuation of positive market fundamentals that supported lower wholesale electricity prices, mirroring the developments in gas prices.** Low levels of gas prices, combined with subdued demand, higher renewables generation together with enhanced nuclear availability, helped to alleviate wholesale electricity prices across EU markets.
- **The improvements in market fundamentals supported a fall in wholesale electricity prices in European markets in Q3 2023, compared with the historical highs of Q3 2022. The European Power Benchmark averaged 85 €/MWh in Q3 2023, 74% lower than in Q3 2022.** On a yearly basis, wholesale electricity markets in the European Union registered a decline in prices (ranging from -80% to -33%). The largest year-on-year price declines in Member States were registered in Finland and France (-80%) and Denmark (-77%). The lowest quarterly average prices during Q3 2023 were recorded in Sweden and Finland, at 29 €/MWh and 44 €/MWh, respectively. Malta and Italy reported the highest quarterly average prices (116 €/MWh and 113 €/MWh, respectively) still 75% and 76% lower than in Q3 2022.
- **In Q3 2023, electricity consumption in the EU fell (-4%) compared with last year's levels,** following the impact of industrial demand reduction and behavioural changes in consumption due to high prices in 2022, combined with weather related factors. **The Q3 2023, the consumption was lower than the Q3 2020 figure,** which was historically low due to the COVID impact.
- **The share of renewables increased to 46% in Q3 2023** (from 37% in Q3 2022), while **the share of fossil fuels fell significantly decreased to 32%** (from 41% in Q3 2022), supported by reduced electricity demand.
- **Solar and onshore wind generation registered the largest increases in Q3 2023.** Solar generation surged by 23% (+13 TWh) and onshore wind generation rose by 21% (+13 TWh). Hydropower improved its output by 12% (+8 TWh) while offshore wind generation rose by 14% (+1 TWh). Wind and solar generation together were similar than gas-, coal- and lignite-fired generation combined in Q3 2023.
- **In Q3 2023, fossil fuel generation dropped by 23% (-55 TWh),** supported by lower demand and sustained renewables generation. In total, coal-fired generation fell by 39% (-41 TWh), whereas less CO<sub>2</sub>-intensive gas generation dropped by 17% (-19 TWh). Nuclear output in Q3 2023 rose by 7% (+10 TWh), signalling the recovery of the availability of the fleet.
- **Carbon prices were 84 €/tCO<sub>2</sub> in Q3 2023, which was 5% higher than in Q3 2022.** Prices fluctuated between 80 and 90 €/tCO<sub>2</sub>, on a decreasing trend throughout the quarter. High carbon prices, combined with lower gas prices in Q3 2023, have supported coal-to-gas fuel switching in Q3 2023, which resumed through 2023 after the energy crisis between mid-2021 to 2022.
- **The significant year on year decrease in wholesale prices (-74%) registered in Q3 2023 continued alleviating the pressure on household electricity retail prices across the EU.** Retail electricity prices for households in EU capital cities were down by 16% in Q3 2023, compared with the same quarter in 2022. However, retail prices in Q3 2023 were still 31% higher than in Q3 2021.
- **Close to 605,000 new EVs were registered in the EU in Q3 2023,** an increase of 36% in comparison with the same quarter in 2022. Demand for electrically vehicles (EVs) positioned Q3 2023 as the second highest quarterly figure on record. Q3 2023 numbers translated into a 24% of market share, lower than China, but more than two times the market share registered in the United States.
- **The new record number of hours with negative wholesale prices in Q3 2023 (2898) was 85 times higher than in Q3 2022 (32).** Most of negative hourly price instances occurred in September (1518), during periods of high solar and wind generation and low electricity demand.

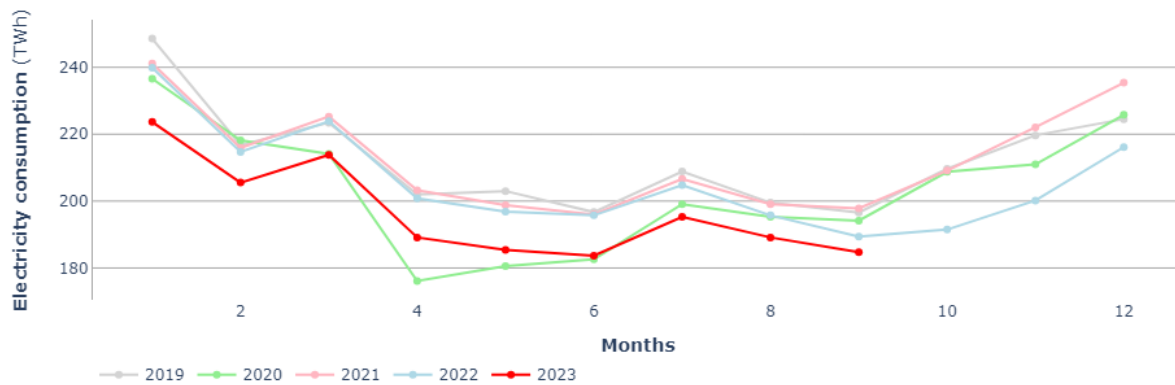
*Methodological Note: The rapid changes in gas and electricity markets happening through the energy transition as well as the significant restructuring of the EU's energy supply following the energy crisis, call for reviewing the Quarterly Reports of the European Electricity and Gas Markets so as to make them best fit for purpose. The aim is to ensure a more timely publication, modernise presentation, increase data transparency and an easier access to the data used to produce the reports. All this should increase usability for readers. The process of the review is planned to be carried out gradually attending the feedback we receive on it. As the Commission advances with its review, the quarterly reports will progressively reflect the methodological, technical, and editing changes as well as the comments received from stakeholders.*

# Electricity market fundamentals

## 1.1 Demand side factors

- In Q3 2023, the total electricity consumption in the EU dropped 4% compared with last year's levels, following the impact of reduced industrial demand due to high prices in 2022 and changes in consumer behaviour-, combined with weather related factors. Despite a temporary higher than usual consumption in July due to warmer-than-usual weather, electricity demand fell again in August and September. Demand levels for the third quarter of 2023 were also well below the 2019-2022 range, registering the lowest value in September. Consumption figures were lower than in the equivalent quarter in 2020, which was a particular year with low levels of demand due to the COVID-19 impact.

**Figure 1 – Monthly EU consumption of electricity**



Source: Eurostat and ENTSO-E

- Figure 2** sums up changes in electricity actual total load over Q3 2023, compared to Q3 2022. EU electricity consumption decreased in Q3 2023 in twenty Member States. The largest declines took place in Belgium, Lithuania and Slovenia (-10%), Estonia and Slovakia (-8%). Conversely, Cyprus (+10%), Greece (+6%), Croatia (+3%), Ireland (+2%) and Bulgaria (+1%) reported increases in consumption during the reference period.

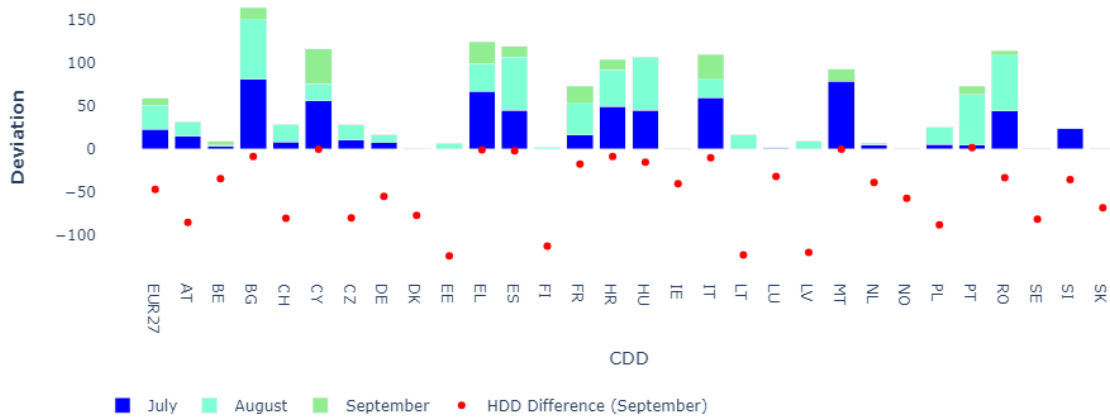
**Figure 2 - Annual changes in electricity actual total load by Member State**



Source: Eurostat and ENTSO-E.

- Figure 3** illustrates the monthly deviation of actual Cooling Degree Days (CDDs) from the long-term average (a period between 1979 and the last calendar year completed) in Q3 2023. EU-wide, the reference quarter was relatively within the historical range. July and August were particularly warmer than the historical average, while September also registered warmer-than-usual temperatures. Overall, Q3 2023 registered 59 CDDs (concentrated mainly in July and August) above the long-term average. The Heating Degree Days (HDDs) in Q3 2023 were lower than usual in September, registering warmer-than-usual temperatures (-47 HDDs). In particular, the Southern and Mediterranean countries experienced hot temperatures in mainly in July and August (e.g. Bulgaria, Cyprus, Greece, Croatia, Spain, Italy, Malta and Romania). Higher temperatures commonly imply additional cooling needs.

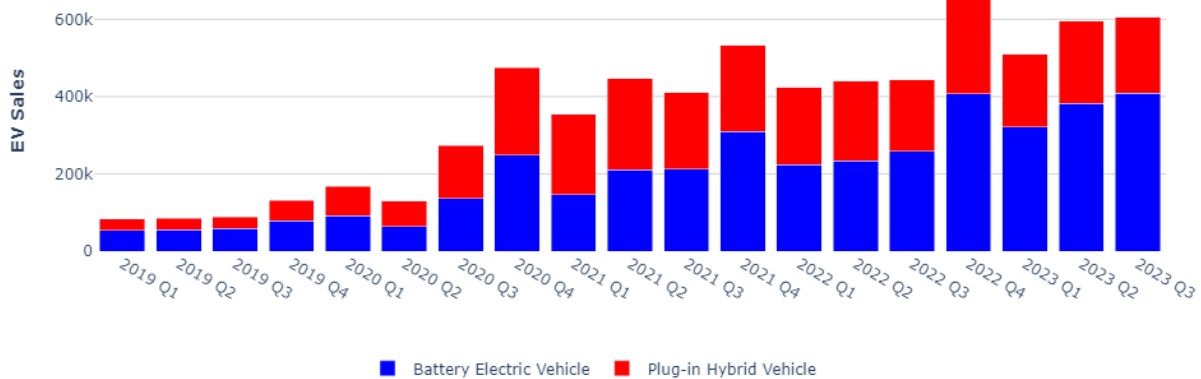
**Figure 3 - Deviation of actual heating days from the long-term average in July-September 2023**



Source: JRC. The colder the weather, the higher the number of HDDs. The hotter the weather, the higher the number of CDDs

- **Figure 5** shows that close to 605,000 new EVs were registered in the EU in Q3 2023 (+36% compared with Q3 2022). This is the second highest quarterly figure on record and translates into a 24% market share; lower than China (39%), but more than two times the market share registered in the United States (10%). The battery electric vehicles segment continued to grow (+58% year-on-year more than 408,000). The demand for plug-in hybrid vehicles registered an increase (+7% year-on-year to more than 196,000). Hybrid electric vehicles (not chargeable) sales amounted to more than 641,000, registering an increase of 30% compared with Q3 2022.

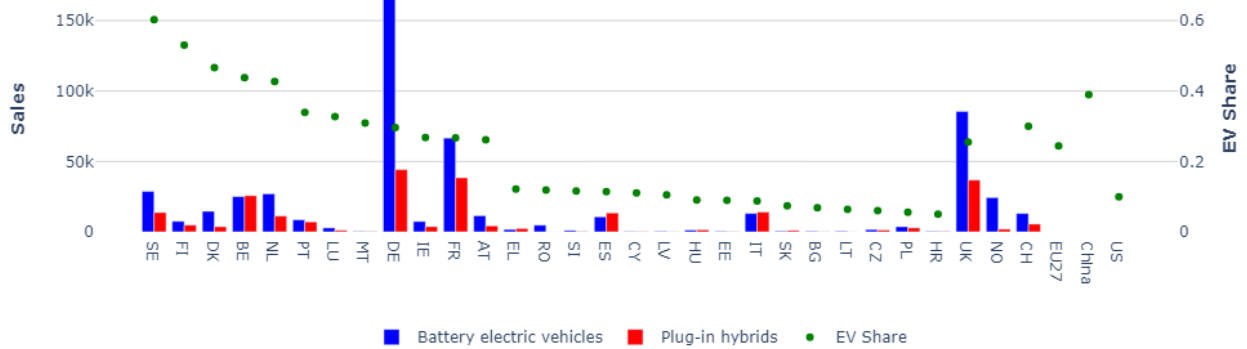
**Figure 4 – Quarterly EV sales in the EU**



Source: ACEA

- The largest share of sales of new EVs was observed in another quarter in Sweden, where 60% of all cars sold in Q3 2023 were EVs. Moreover, in Finland, more than half of all passenger cars sold could be plugged (53%), followed by Denmark (47%), Belgium (44%) and the Netherlands (43%). Germany retained the position of the largest individual market (more than 211,000 EV sales in Q3 2023) followed by France, where sales amounted to more than 105,000 new EVs in the reference quarter.

**Figure 5 – Electrically chargeable passenger vehicle (EV) sales in selected countries in Q3 2023**

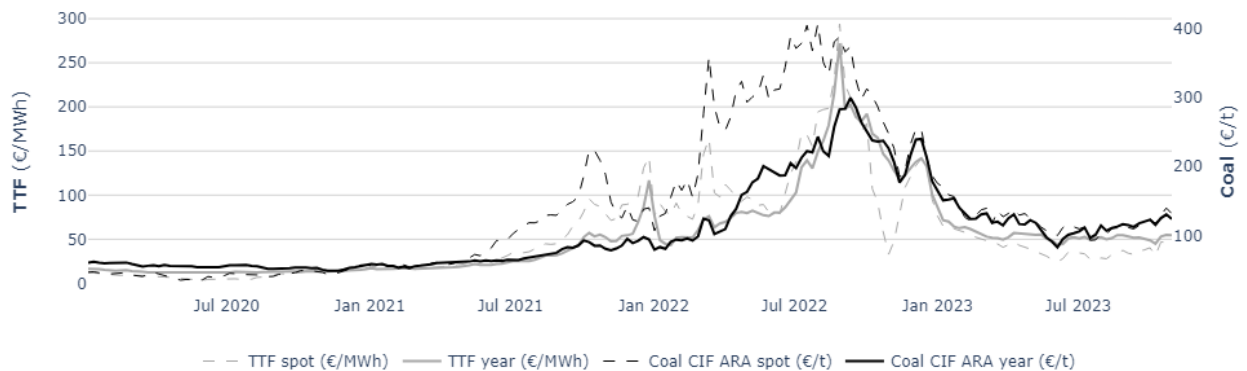


Source: ACEA, CPCA, BloombergNEF

### 1.2 Supply side factors

- Figure 6** reports on developments in European coal and gas prices. Spot and forward gas prices rose for most of the Q3 2023, following strikes at Australian LNG facilities and, later, extended maintenance at major Norwegian gas fields. However, prices remain at lower levels than a year ago, supported by improved market fundamentals (i.e. high storage levels, reduced demand and additional LNG regasification capacities in Europe). Spot gas prices averaged 33 €/MWh in Q3 2023, 83% lower than prices in Q3 2022. TTF day-ahead prices remained at discount with TTF forward contracts (month and year ahead) during Q3 2023. Year-ahead prices averaged 52 €/MWh in Q3 2023, 71% lower than in Q3 2022. This contango gradually decreased in Q4 2023.
- Thermal coal spot prices, represented by the CIF ARA contract, fell to 108 €/t in Q3 2023 (from 116 €/t recorded in the previous quarter). Prices fell only by 2% compared with the previous quarter (Q2 2023) and recorded a considerable drop of 253% compared with Q3 2022. After peaking in summer 2022 (above 400 EUR/ton), coal prices were in a downward trend that ended in the summer of 2023, before rising again during the Autumn supported by higher gas prices and electricity demand.

**Figure 6 – Weekly evolution of spot and year-ahead coal and gas prices**

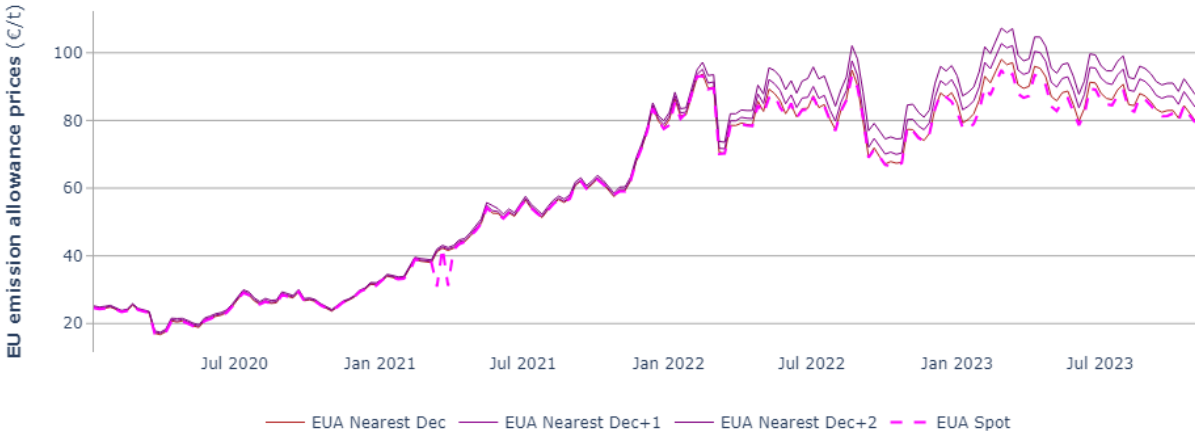


Source: S&P Global Platts

- The European market for emission allowances, shown in **Figure 7**, were relatively stable, but they have been decreasing more markedly since summer. Prices fluctuated between 80 and 90 €/tCO<sub>2</sub> during Q3 2023. The average spot price of CO<sub>2</sub> in Q3 2023 (84 €/tCO<sub>2</sub>) was 5% higher than in Q3 2022 and 2% lower than the previous quarter (Q2 2023). The nearest-December contract averaged 86 €/tCO<sub>2</sub> in Q3 2023, while the nearest-December +1 and +2 contracts, registered an average of 90 and 94 €/tCO<sub>2</sub>, respectively. Lower gas prices have supported coal-to-gas fuel switch, thanks to high carbon prices which put coal and lignite power plants at a greater disadvantage against their less polluting gas-fired competitors (see **Figure 16**).



**Figure 7 – Evolution of EU emission allowance spot and future prices from 2020**



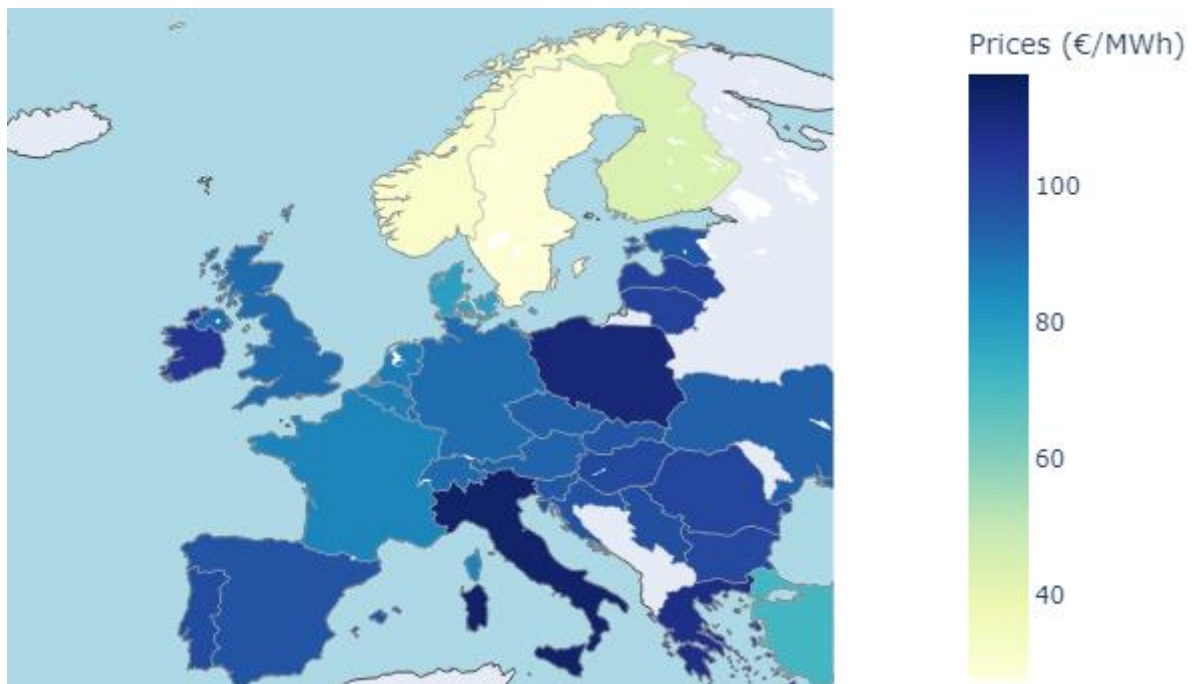
Source: S&P Global Platts

## European wholesale markets

### 1.3 European wholesale electricity markets and their international comparison

- The map below (**Figure 8**) shows average day-ahead wholesale electricity prices in Europe in Q3 2023. Average day-ahead wholesale electricity prices in Europe were lower than in the previous quarter. Low levels of gas prices, combined with moderate demand from industries and households, contributed to the fall in prices. Higher renewable energy generation (in particular, solar and wind, but also improved hydropower output), together with the enhanced nuclear fleet availability, also helped to release some pressure on wholesale electricity markets during Q3 2023. Average prices rose from around 75 to 85 €/MWh throughout the reference quarter, following the developments of the gas market, while remaining well below the levels seen in Q3 2022.
- On a yearly basis, European Union Member States markets experienced a decline in wholesale electricity prices (ranging from -80% to -33%<sup>1</sup>) in Q2 2023. The largest year-on-year price falls in Member States were registered in Finland and France (-80%), and Denmark (-77%). The lowest decreases were seen in Portugal (-33%), Spain (-34%) and Poland (-50%) in Q3 2023, compared with Q3 2022.
- Malta and Italy (116 and 113 €/MWh, respectively), followed closely by Poland and Greece reported the highest quarterly average prices (110 and 108 €/MWh, respectively). However, Malta and Italy registered a 75% and 76% fall in prices, while prices in Poland and Greece were 50% and 73% lower compared with the same period last year. The lowest quarterly average prices during Q2 2023 were recorded in Sweden and Finland, at 29 €/MWh and 44 €/MWh, respectively.
- The European Power Benchmark averaged 85 €/MWh in Q3 2023, 74% lower than a year ago. Compared to Q2 2023, the quarterly average price fell by 5%.

**Figure 8 – Comparison of average wholesale baseload electricity prices, third quarter of 2023**



Source: European wholesale power exchanges, government agencies and intermediaries

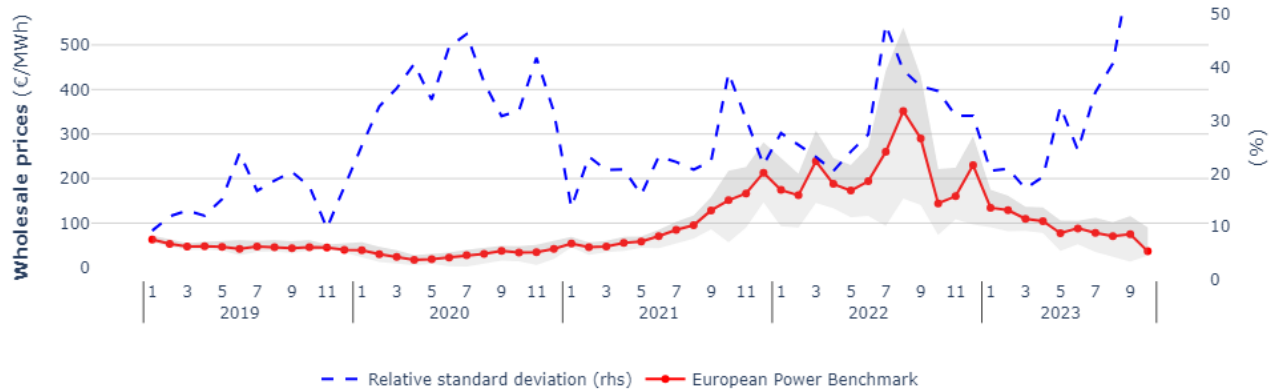
- **Figure 9** shows the lowest and highest regional prices in Europe represented by the two boundary lines of the shaded area, the weighted EU average of these regional markets (European Power Benchmark), as well as the relative standard deviation of regional prices. The relative standard deviation metric shows Q3 2023 divergence levels rose compared with Q2 2023, as some Member States registered a more significant decrease in prices than

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<sup>1</sup> One EU MS registered a decrease over 50%, while twenty-one MS saw a fall of over 50% in prices, compared to Q2 2022.

others during the reference quarter (e.g. the Nordic countries). Moreover, divergence levels continued to increase in October. **Annex** provides graphics of the monthly and daily evolution of regional prices in Europe.

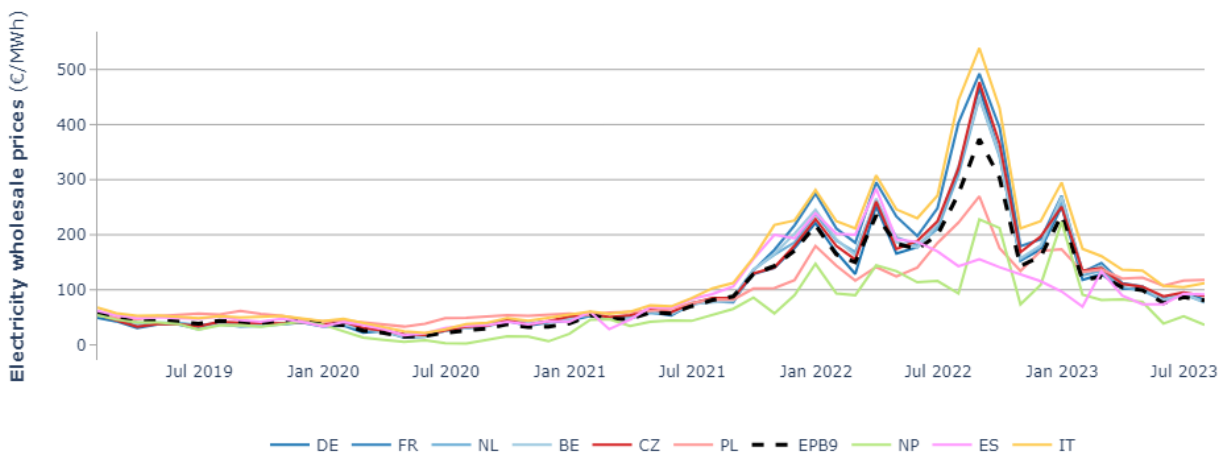
**Figure 9 - The evolution of the lowest and the highest regional wholesale electricity prices in the European day-ahead markets and the relative standard deviation of the regional prices**



Source: S&P Global Platts, European power exchanges. The shaded area delineates the spectrum of prices across European regions.

- Figure 10** presents the evolution of weekly average electricity wholesale prices in nine selected European markets. Thanks to demand reduction, higher wind and solar, combined with recovering hydro and enhanced nuclear generation; Germany, France and the Netherlands were able to decrease their fossil fuel output, registering a fall in prices. The French nuclear fleet improved its availability in Q3 2023, which helped to decrease pressure on prices and consolidating back power flows into the historical net exporting position of France. Germany, France and the Netherlands average quarterly prices were around 88 €/MWh in Q3 2023. Strong solar generation supported lower prices in Spain, averaging 97 €/MWh during the reference quarter. At 28 €/MWh, prices in Northern Europe remained significantly lower than in the continent. Central Eastern Europe markets followed prices at a higher level than in Central Western Europe, as for another quarter, prices in Poland were in the upper bound of prices in the CEE region.

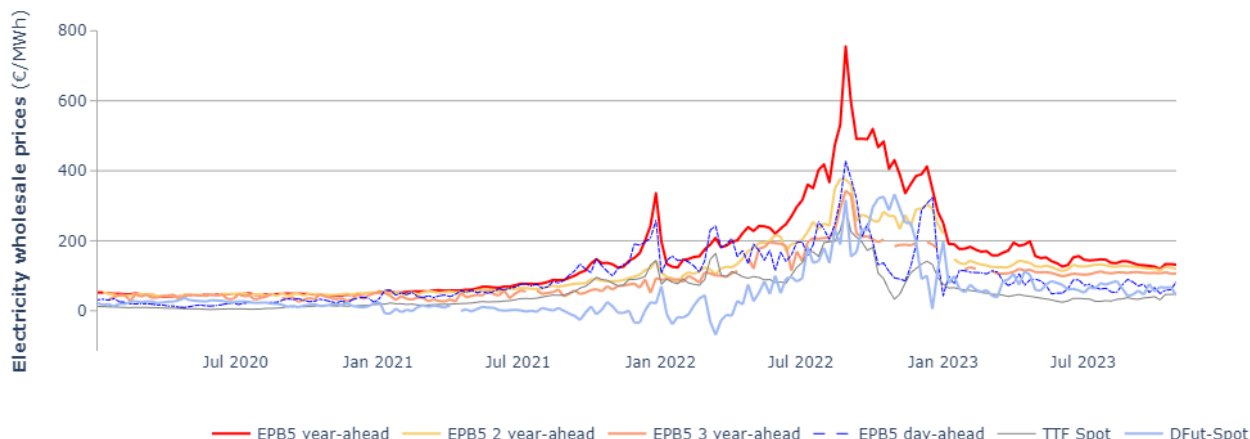
**Figure 10 – Weekly average electricity wholesale prices in nine selected European markets**



Source: S&P Global Platts, European power exchanges, ENER

- Figure 11**, shows how gas prices (TTF spot prices) have been driving expectations of future electricity prices since the first quarter of 2021. Since second half of 2021, we roughly observe a high correlation between gas and electricity prices, with a two-fold leverage effect (proportionality factor induced by gas power plants efficiency and gas being the marginal power plant in electricity price setting). In line with TTF price developments, the year ahead power benchmark fell since mid-December 2022 and then stabilised throughout the previous and the reference quarter. This stabilisation took place while remaining on an overall declining trend, following favourable fundamentals of the TTF.
- In Q3 2023, the weekly average electricity year-ahead, two-year ahead and three-year ahead contracts were respectively 138 €/MWh, 127 €/MWh and 108 €/MWh. The premium of the weekly average between the year-ahead contract and the spot price fluctuated between 50 €/MWh and 75 €/MWh during Q3 2023.

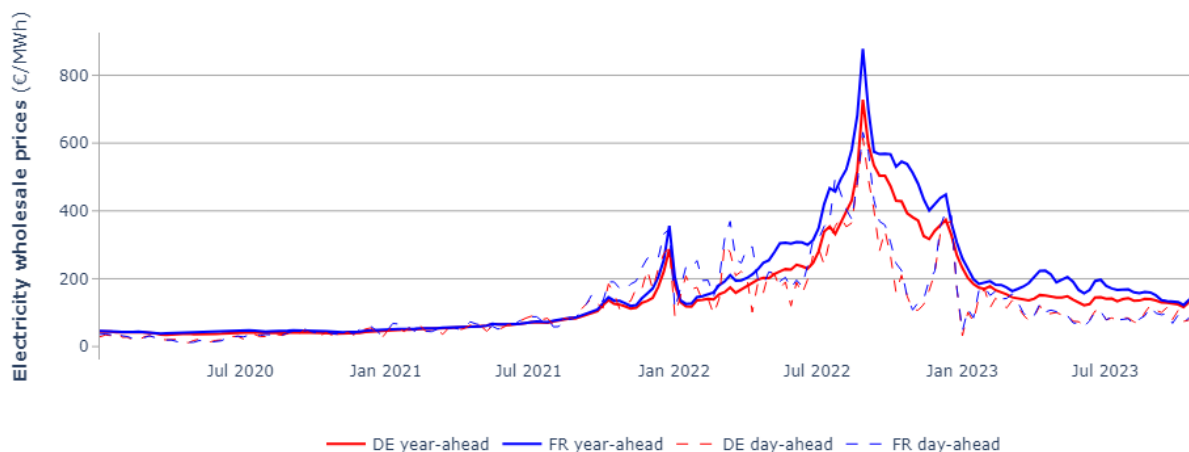
**Figure 11 – Weekly futures baseload prices – weighted average of selected European markets**



Source: S&P Global Platts.

- Figure 12** shows the evolution of year-ahead contracts of Germany and France, together with their equivalent spot (day-ahead) prices. The divergence between the two forward contracts increased during 2022, reflecting structural differences between the two markets (i.e. the high proportion of French nuclear power plants under maintenance in and the relevance of wind generation when can cover a significant part of the demand at times in Germany). However, the difference between the two contracts declined during 2023. The average premium of the French contract over their German equivalent contract averaged 19 €/MWh during the reference quarter (88% lower than in Q3 2022 and 62% lower than in Q2 2023). Moreover, the premium between the two contracts ranged between 7 €/MWh and 26 €/MWh during Q3 2023

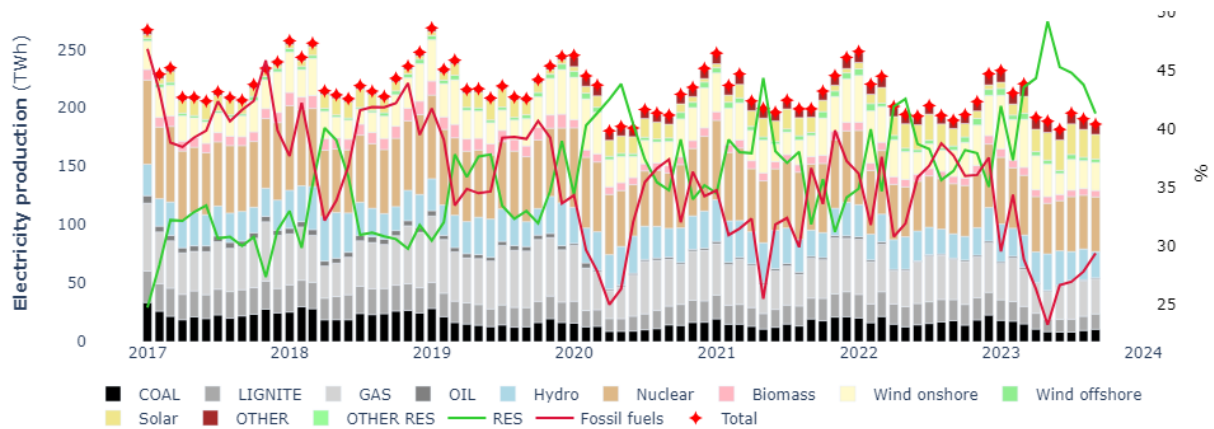
**Figure 12 – Weekly German and French year-ahead contracts**



Source: S&P Global Platts.

- Figure 13** shows the monthly evolution of the electricity mix in the EU. In Q3 2023, reduced electricity demand and relevant increase in renewable energy generation, supported the decrease in fossil fuels generation in the mix compared to the previous year (-23%). Renewable energy generation managed to increase its output by 15% in Q3 2023, reaching a share of 43% in the mix (from 37% in Q3 2022). The share of electricity generated by burning coal, gas and oil (fossil fuel generation) fell significantly to 32% in Q3 2023 (from 41% in Q3 2022), driven by a drop in coal, lignite and gas generation. Nuclear generation improved its availability during Q3 2023, vis-à-vis Q2 2022. The share of nuclear generation in Q3 2023 was 24%, above Q3 2022 (22%).

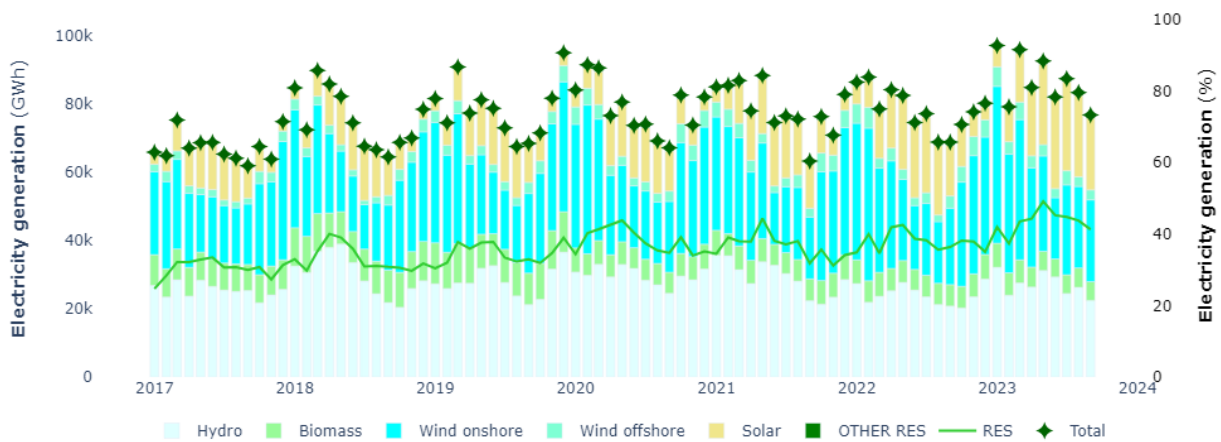
**Figure 13 – Monthly electricity generation mix in the EU**



Source: ENTSO-E. Fossil fuel share calculation covers power generation from coal, lignite, gas and oil.

- Figure 14** depicts the evolution of monthly renewable energy generation in the EU, alongside its share in the electricity generation mix. The growth in the share of renewable energy generation during Q3 2023, compared to Q3 2022 (43% and 37%, respectively) was supported mainly by a remarkable increase of +23% in solar generation (+13 TWh) and 21% of onshore wind (+13 TWh). The increase was also supported by a +12% of improved hydro-power (+8 TWh) and +14% of offshore wind (+1 TWh) generation. The notorious rise in solar and wind onshore generation was supported by the record levels of new solar and wind onshore installed capacity in the EU in the last years. Wind and solar generation together (155 TWh) registered an increase of +21% (+27 TWh) and were similar to coal, lignite and gas generation combined (157 TWh).

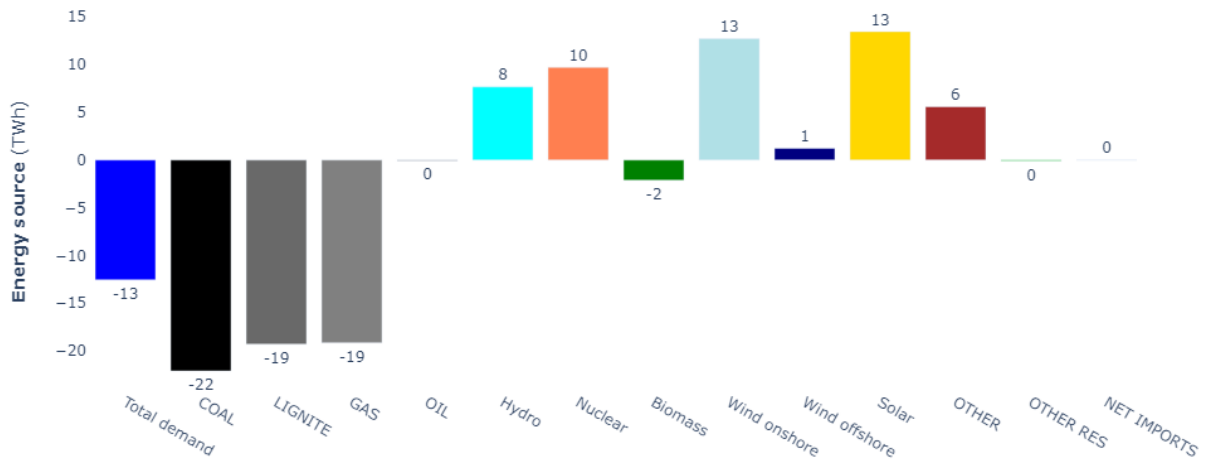
**Figure 14 – Monthly renewable generation in the EU and the share of renewables in the power mix**



Source: ENTSO-E. Data represent net generation.

- Figure 15** visualises changes in the EU27 electricity generation, imports and consumption in Q3 2023 compared to Q3 2022. Milder weather and the aftermath of the unprecedented prices registered in 2023, supported a reduction in power demand during the reference quarter (-4%). The decrease in demand contributed to a decline in fossil fuel generation, with coal and lignite generation falling by 44% and 35%, respectively. Moreover, gas generation decreased by 17%, lignite generation by 35%. Nuclear generation registered a moderate growth of 8%, signalling an improvement of the availability of the fleet. The most notable increases were observed in solar generation, rising by 23%, and onshore wind generation, which increased by 21%.

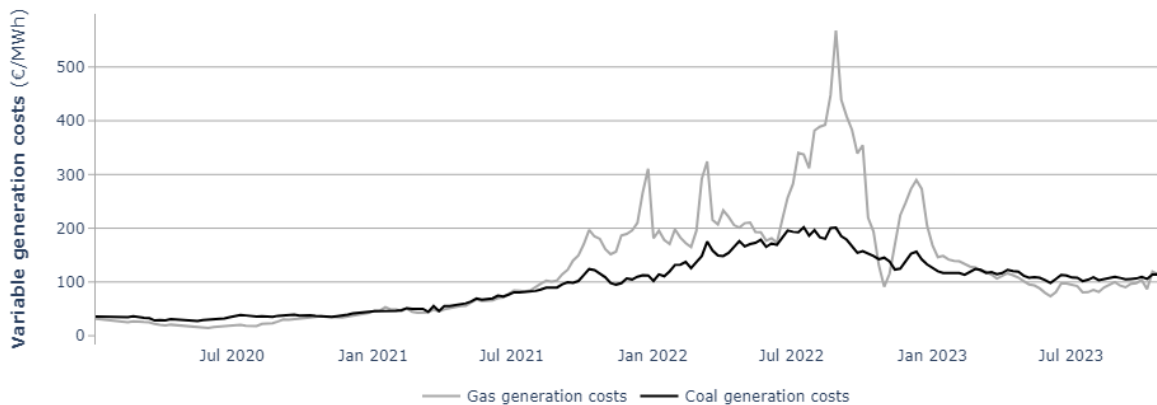
**Figure 15 – Changes in power generation in the EU between Q3 2022 and Q3 2023**



Source: ENTSO-E. Data represent net generation

- **Figure 16** shows the impact of gas prices on estimated gas and coal-fired generation variable costs for estimated average power plants (fuel and emission allowances costs). Lower gas prices and relative high level of carbon prices have supported coal-to-gas fuel switching in Q3 2023, which resumed through 2023 after the energy crisis mid-2021-2022. Despite some rebound in gas prices, the overall trend continued into Q4 2023.

**Figure 16 – Estimated variable generation costs of coal- and gas-fired power plants**

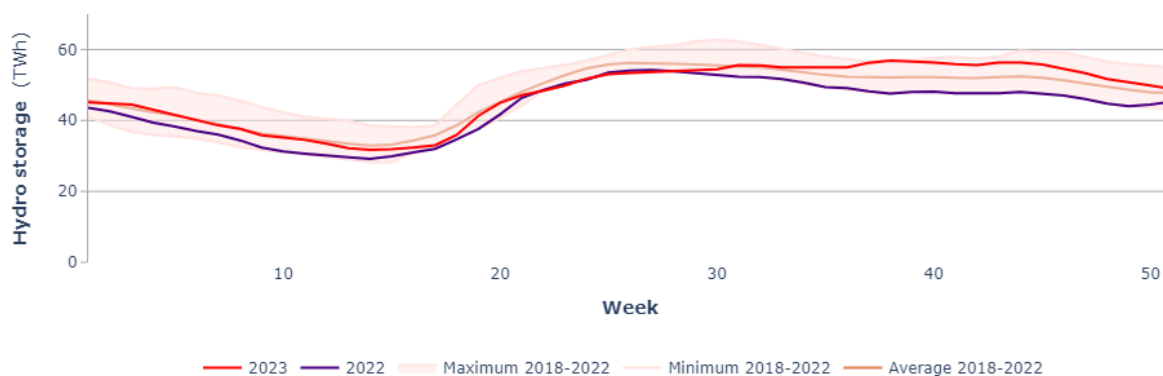


Source: S&P Platts, ENER

Note: Thermal efficiency values used for coal- and gas-fired plants were 41% and 55% respectively. Emissions intensity values used were 0.85 and 0.37 tCO<sub>2</sub>e/MWh respectively for coal- and gas-fired generation.

- **Figure 17** shows the sum of 2023 levels of hydro reservoirs in the reported markets. In Q3 2023, the overall sum of hydropower reservoirs recorded a recovery from the low levels registered in 2022 (+8% compared with Q3 2023 levels). During the last weeks of September, levels progressively approached the upper bound of the five year average. Overall, Q3 2023 hydropower reservoirs were 29% higher than in Q2 2023. However, the overall trend approached the 5-year average towards the end of Q4 2023.

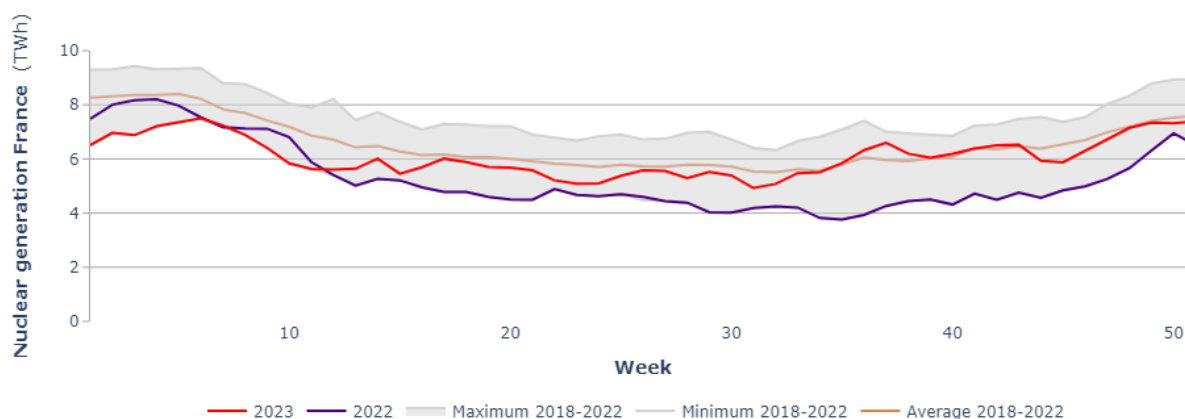
**Figure 17 - Aggregated EU hydropower reservoirs**



Source: ENTSO-E. Aggregated hydropower reservoirs for Austria, Bulgaria, Spain, Finland, France, Greece, Hungary, Italy, Lithuania, Latvia, Portugal, Romania and Sweden.

- As shown in **Figure 18**, French nuclear output amounted to 74 TWh in Q3 2023 and was up by 36% (+20 TWh) year-on-year, showing a significant recovery compared with Q3 2022. The French nuclear output in 2022 (279 TWh) was the lowest since 1998. Conversely, the 2023 nuclear availability stood at 320 TWh (+15%), thanks to an improvement in the maintenance situation of the fleet.

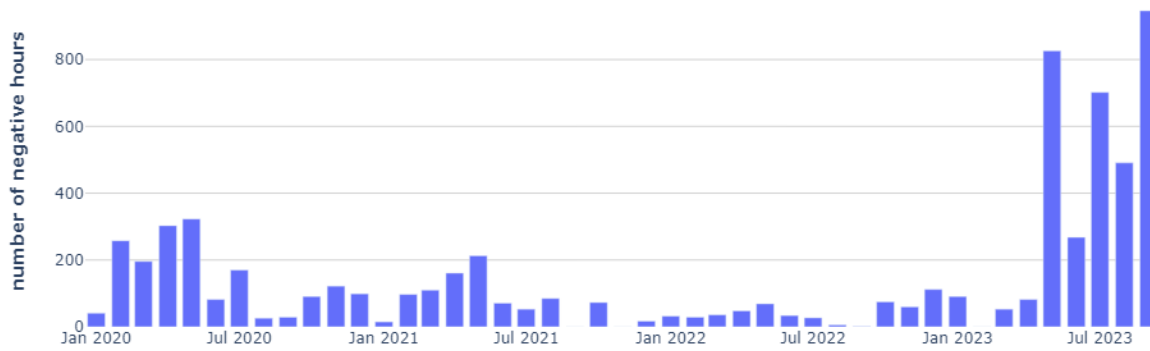
**Figure 18 – Weekly nuclear electricity generation in France**



Source: ENTSO-E

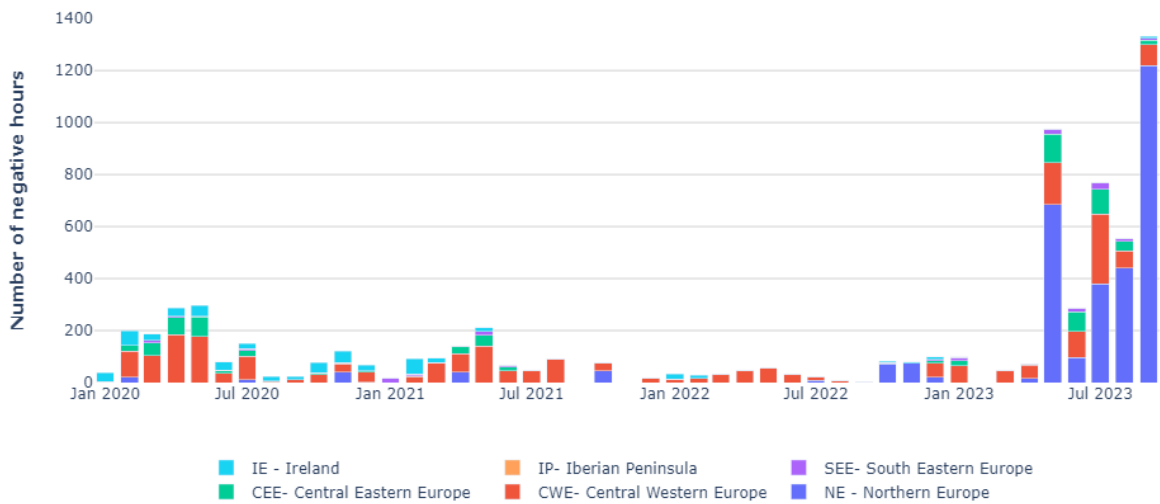
- **Figure 19** and **Figure 20** show the monthly frequency of the occurrence of negative hourly wholesale electricity prices in selected European markets. Negative hourly prices generally occur when electricity demand is lower than expected and when variable renewable energy generation is abundant, combined with large and relatively inflexible baseload electricity generation (e.g. nuclear or lignite). In such cases, conventional power plants offer their output for a negative price in an effort to avoid switching the unit off and having to go through the costly and high-maintenance operation of restarting the facility when they want to enter the market again.
- At 2898, the number of hours with negative wholesale prices reached a record number in Q3 2023, being unprecedently 8423% higher in the observed bidding zones (considering only 34 hours with negative prices in Q3 2022). Most of the falls into negative territory occurred in September (1518) and took place in days when low consumption coincided with high renewable generation. Demand reduction and higher levels of renewable generation registered in Q3 2023 may also have influenced the occurrence of negative prices. The highest daily number of negative prices (421) was recorded on 8 August, when weak demand and low consumption, combined with strong solar and wind generation, pushed Central Western Europe (CWE), Central Eastern Europe (CEE) and especially the Nordic markets below zero during several hours of the day. Notably, almost the 24 hours of that day registered negative prices in Sweden, Finland, Denmark and Norway.

**Figure 19 – Number of negative hourly wholesale prices on selected day-ahead trading platforms**



Source: ENTSO-E.

**Figure 20 – Number of negative hourly wholesale prices on selected day-ahead trading platforms in Europe.**

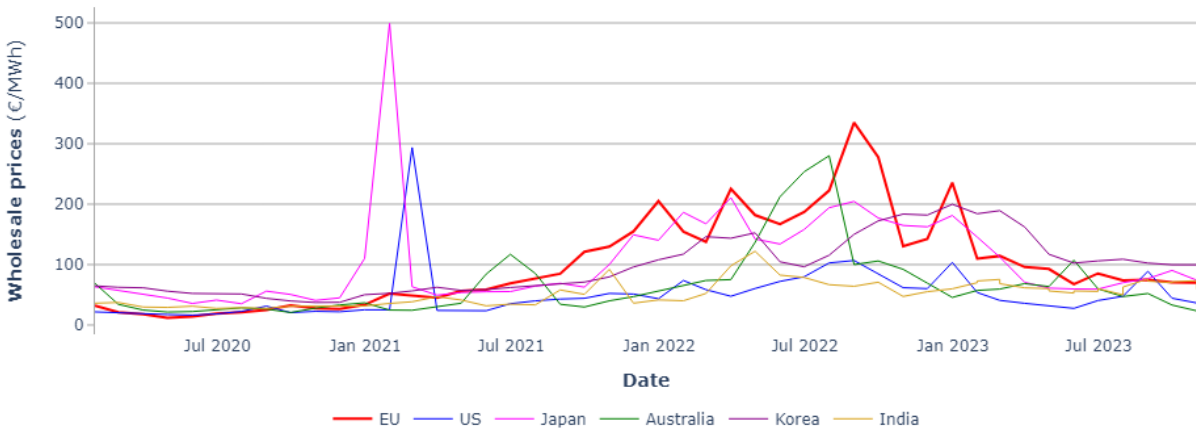


Source: ENTSO-E.

- **Figure 21** compares price developments in wholesale electricity markets of selected major economies. Most markets saw power prices easing due to year-on-year improved fundamentals in global energy markets.
- In the U.S., wholesale electricity prices in selected regional markets fell between 30% and 60% year-on-year in Q3 2023, supported by lower gas prices. The exception was ERCOT, registering rising prices (+67% year-on-year) due to a heat wave in Q3 2023. In Q3 2023, the US average prices of selected markets were 31% lower than in Q3 2022, but 68% higher than in Q2 2023.
- In Japan, year-on-year prices fell by 45% in Q3 2023, supported by prices lower international LNG prices. Japan relies heavily on fossil-fuel power generation, and it is one of the most important LNG buyers in the global market. Prices in Korea also fell by 32% during the reference quarter.
- In Australia, wholesale electricity prices fell by 62% year-on-year in Q3 2023, as above average temperatures supported reduced demand across the National Electricity Market. Despite lower levels, prices rose in May, supported by increased demand due to colder temperatures. Negative prices were also more frequent during the reference quarter, driven by increasing renewable generation combined with episodes of low demand. Prices in India registered a year-on-year fall of 3% in Q3 2023.



**Figure 21 – Monthly average wholesale electricity prices in international markets (D-A markets)**

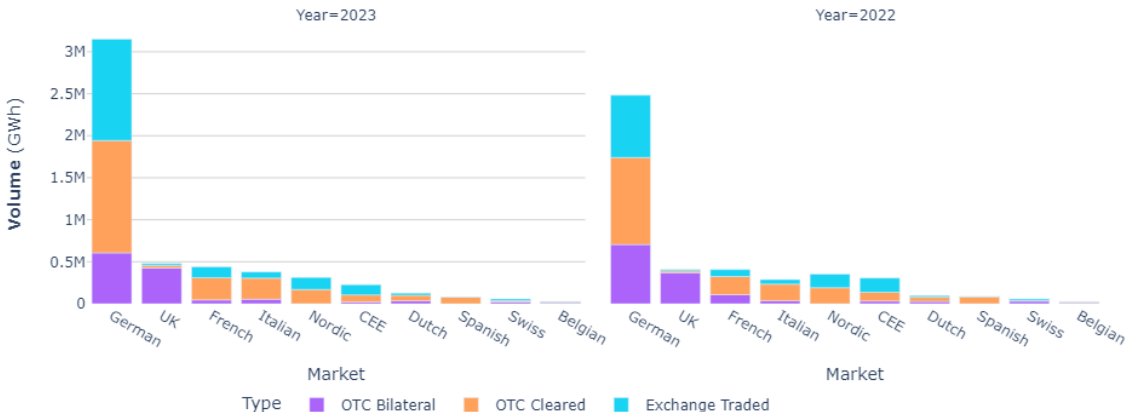


Source: European Power Benchmark based on S&P Global Platts and ENTSO-E Transparency Platform, JPEX (Japan), AEMO (Australia), and the arithmetic average of selected PJM West, ERCOT, MISO Illinois, CAISO, NYISO Hudson Valley and ISONE Internal regional wholesale hubs in the United States.

**1.4 Traded volumes and cross border flows**

- **Figure 22** shows annual changes of traded volumes of electricity in the main European markets up to the second quarter of 2023, including exchange-executed trade and over-the-counter (OTC) trade. For the second reporting period since the end of the energy crisis, selected markets and regions witnessed a year-on-year improvement in trading activity (+17%). The increase in total traded volumes (+768 TWh) reflects the level of recovery in trading activity in the electricity sector. Activity also grew in OTC contracts (+9%) and increased considerably on exchanges (+38%) in the total traded volumes under observation up to Q3 2023. The total traded volume in all markets under observation rose by 17% to 5289 TWh.
- Germany was by far the largest and most liquid European market, as total volumes reached 3150 TWh (equivalent to 60% of the total traded volumes under observation). Overall, total activity rose (+27%) in Germany during the reporting period.
- Overall, the market share of power exchanges rose to 33% during the reporting period. Overall, exchange-based trading volumes increased by 482 TWh (+38%). The OTC segment traded 278 TWh more of volume in the reporting period.

**Figure 22– Annual change in traded volume of electricity on the most liquid European markets**

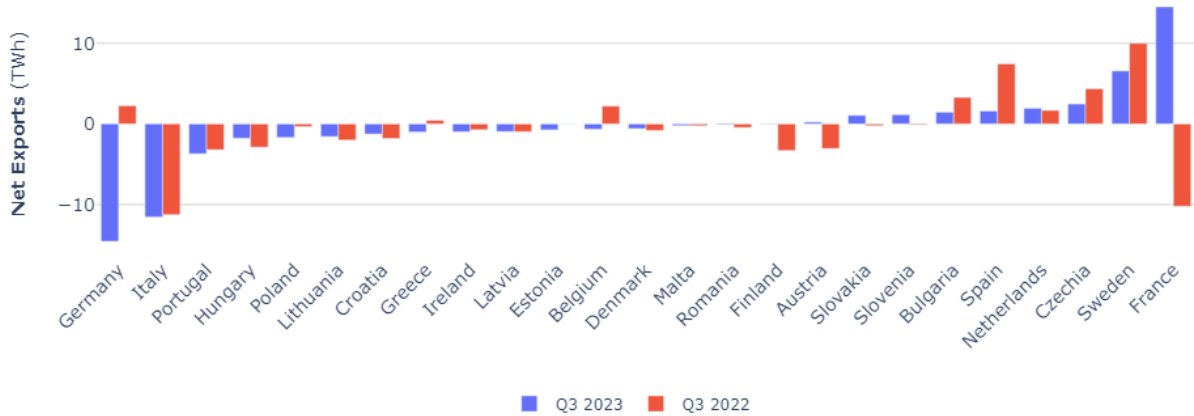


Source: Trayport, London Energy Brokers Association (LEBA) and DG ENER computations

- **Figure 23** compares net balances of physical electricity flows among EU Member States in Q3 2023 and Q3 2022. The net trading position in Q3 2023 was more balanced and closer to historical behaviour than in 2022, where normal flows reversed in some key markets.
- For another consecutive quarter, France managed to reverse the 2022 trend and go back to its position as a net exporter in Q3 2023 (15 TWh). France managed to keep the role of primary net exporter in the EU during the quarter.

The improved situation of the nuclear fleet supported a rise in export flows. Sweden was the second largest net exporter (7 TWh), thanks to a significant discount in wholesale electricity prices vis-à-vis the neighbouring and other continental European markets. The list is followed by Czechia, with 2 TWh of net exports during the reference quarter. Germany was the largest EU net importer in Q3 2023 (-15 TWh) followed by Italy (-12 TWh).

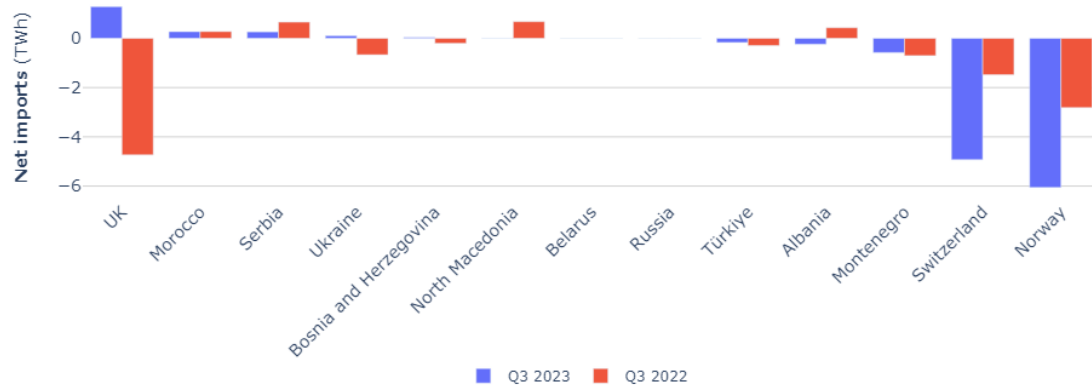
**Figure 23 – Member States’ net scheduled commercial export/import positions within the EU in Q3 2023 and Q3 2022**



Source: Scheduled Commercial flows ENTSO-E, TSOs

- Figure 24** shows netted electricity exchanges with EU neighbours in Q3 2023. For another consecutive quarter, Great Britain registered a fall in its export balance, becoming a net importer during Q3 2023 (1 TWh). Norway improved its position as the largest net exporter to the EU (-6 TWh), supported by a 115% increase of net exports compared with Q3 2022. Net exports from the EU to Ukraine rose to 106 GWh in Q3 2023. Commercial exchanges of electricity between Continental Europe and Ukraine/Moldova started in June 2022, after the successful synchronisation of the power systems. Ukraine halted exports to Continental Europe after the massive Russian attacks of their energy infrastructure in October 2022. Since then, the TSOs of Continental Europe have regularly increased the capacity available for trading. [ENTSO-E](#) indicated on 28 November 2023 the successful competition of the synchronisation project with Ukraine. The trade capacity from Continental Europe to Ukraine and Moldova stands at 1.7 GW, increasing by 500 MW from the previous limit.

**Figure 24 – Extra-EU electricity commercial scheduled exchanges in Q2 2023 and Q2 2022 – netted**



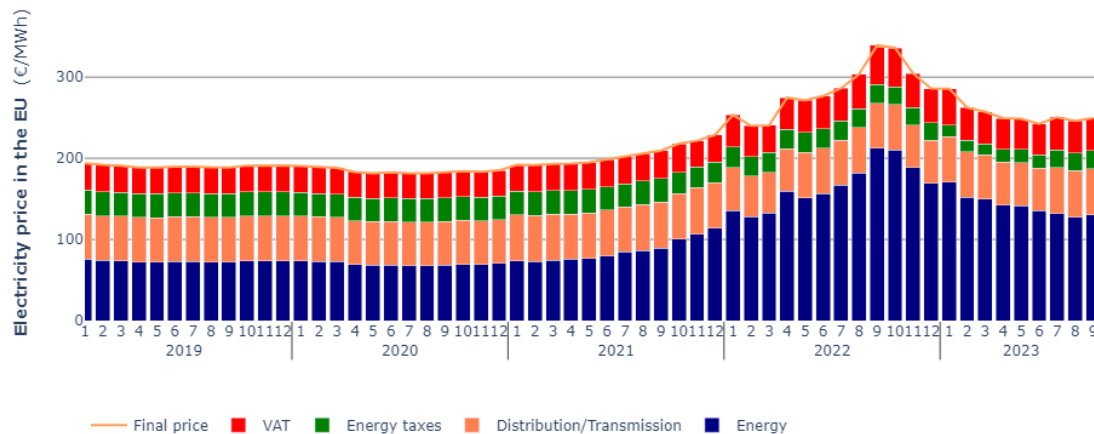
Source: Scheduled Commercial Flows ENTSO-E, TSOs. Negative values indicate net imports to the EU.

## Retail markets

### 1.5 Retail electricity markets in the EU

- Increasing wholesale prices in 2022 put upward pressure on retail prices, as high wholesale prices were passed through into consumer contracts. Government interventions in some Member States alleviated the bill for consumers. A decrease in wholesale prices was registered in since Q1 2023, albeit prices remaining at higher levels than two years ago.
- **Figure 25** shows the monthly evolution of the EU average residential retail electricity prices over the last few years. The average retail electricity prices for household costumers in EU capital cities felt slightly from July to September 2023, from 260 EUR/ MWh to 257 EUR/ MWh (- 1%). Prices in Q3 2023 remained only marginally below the previous quarter (Q2 2023). However, in Q3 2023 prices registered a fall of 17% compared with the third quarter of 2022, but were still 31% higher than in Q3 2021.

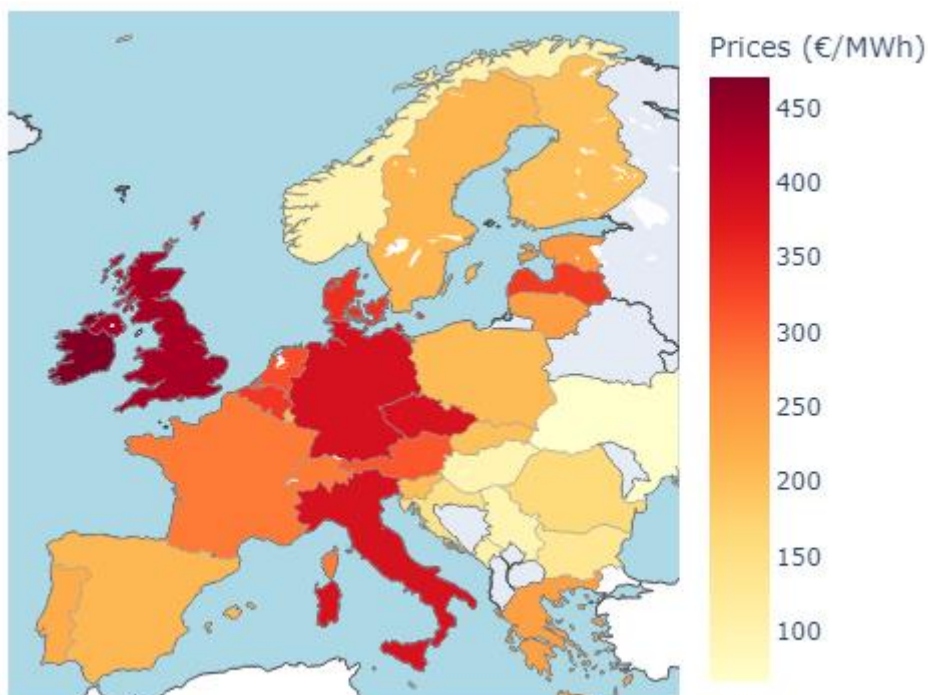
**Figure 25 - Monthly average electricity price in the EU, paid by typical household customers**



Source: Vaasaett

- **Figure 26** shows the average quarterly electricity prices paid by households in capital cities in EU Member States and other European countries with typical annual consumption.

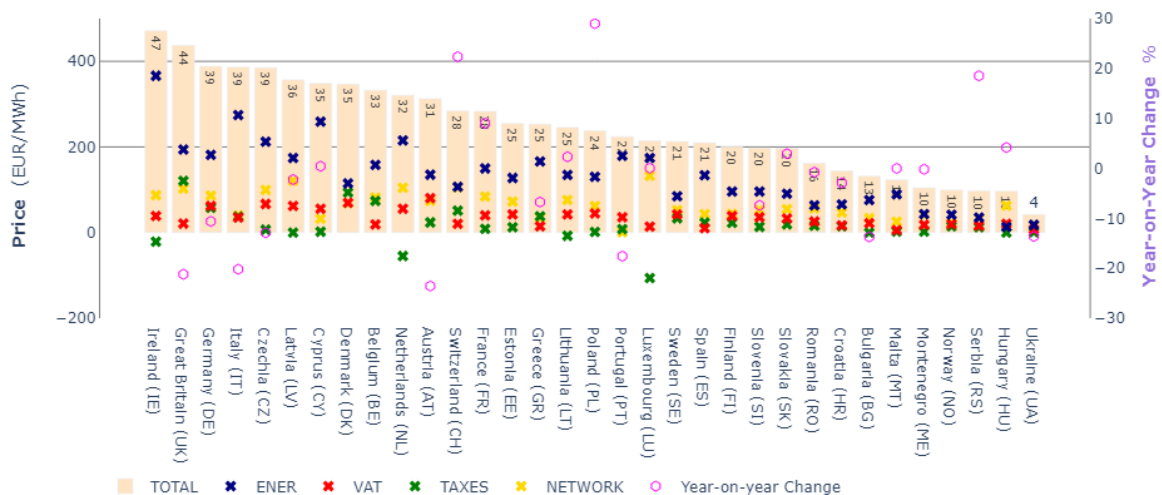
**Figure 26 –Average household retail electricity prices in European capitals, third quarter of 2023**



Source: Vaasaett

- **Figure 27** shows retail electricity prices for representative household consumers in European capital cities, and their composition divided into four categories (energy, network charges, energy taxes and the value added tax). The highest quarterly prices were observed in Dublin, Berlin and Rome (471, 388 and 386 €/MWh, respectively).
- In Q3 2023, the energy component share surpassed 50% of the total retail price in 15 EU capitals. The energy component share is the highest in Luxembourg (81%), Lisbon (80%) and Dublin (78%). The lowest prices among EU capitals were recorded in Budapest (96 €/Wh), Valletta (123 €/MWh) and Sofia (131 €/Wh). EU-wide, retail prices started a steep climb since September 2021. Moreover, pushed by high wholesale prices, retail prices kept increasing throughout the year, intensifying the pressure on inflation throughout 2022. A peak in retail prices for electricity consumers was registered in October 2022. Since then, retail electricity prices have followed a falling trend, stabilising as of May 2023.
- The tax reduction subcomponent (tax credit) that applies to electricity customers in the Netherlands is currently higher than the annual energy tax amount that corresponds to a typical residential customer in Amsterdam. Even in cases when the tax credit is higher than the tax amount, the customers still receive the full credit as a discount from their overall annual bill. In practice, this has resulted in a negative value of the Dutch tax component in the price breakdown. This development has also significantly reduced household electricity prices countrywide and contributed to the unusual effect in which lower consumption encourages lower prices per MWh. Similarly, consumers in Vilnius receive a tax refund in their energy tax. Finally, in Dublin, due to increased amount of tax credit (PSO Payments), a typical consumer is effectively paying negative energy taxes.

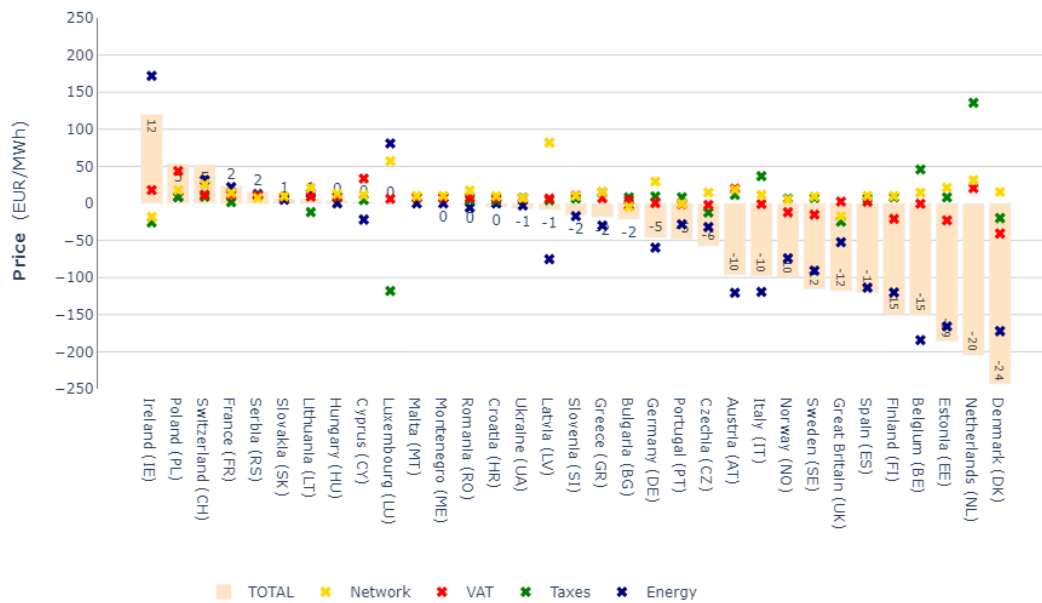
**Figure 27 – The Household Energy Price Index (HEPI) in European capital cities in Eurocents per kWh, Q3 2023**



Source: Vaasaett

- Compared to the same quarter of the previous year, the largest price increase in relative terms in the EU in Q3 2023 was observed in Dublin (+120 €/MWh), Warsaw (+53 €/MWh) and Paris (+23 €/MWh). The largest decreases were observed in Copenhagen (-243 €/MWh), Amsterdam (-204 €/MWh) and Estonia (-186 €/MWh). As shown in **Figure 28**, decreasing prices in some EU capitals were driven by not only by lower wholesale prices, but also by government interventions in some Member States aimed at helping to alleviate the bill for consumers.

**Figure 28 – Year-on-year change in electricity prices by cost components in the European capital cities comparing Q3 2023 with Q3 2022**

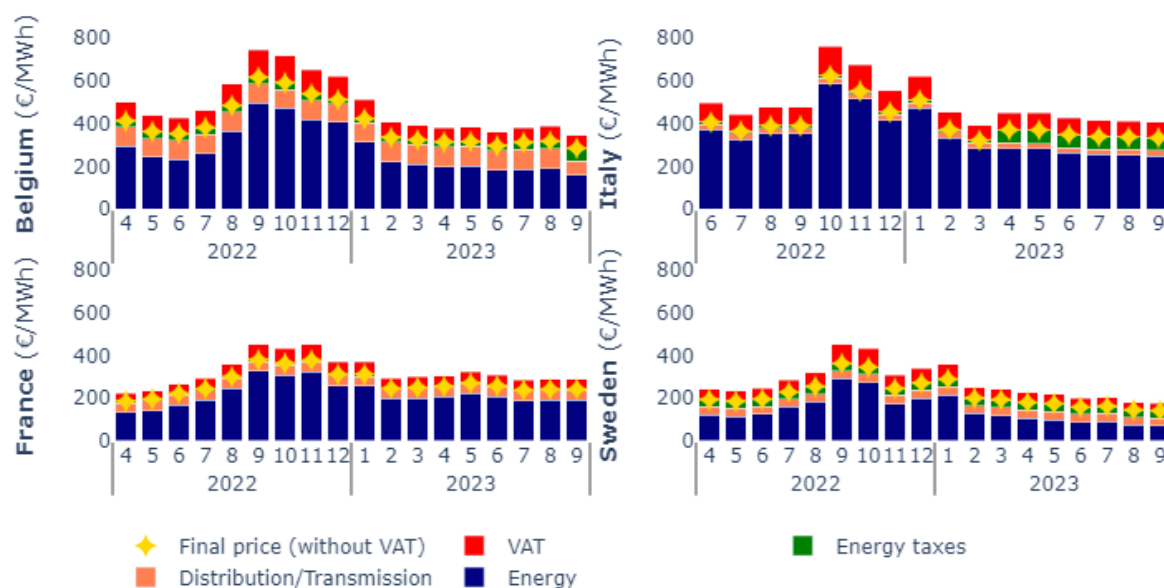


Source: Vaasaett

- **Figure 29** shows industrial (IB Band<sup>2</sup>) electricity prices for selected Member States in Q3 2023. Prices in Belgium were at 305 €/MWh without the VAT and 369 €/MWh including VAT. The average price in Italy during Q3 2023 was at 334 €/MWh without the VAT and 408 €/MWh with VAT.
- Interestingly, France and Sweden, have the Value Added Tax (VAT) contributing significantly to the final industrial electricity price. In Sweden, the VAT constitutes 25% of the final price (18% in Italy). However, when it comes to energy taxes, the scenario is quite different. In France, energy taxes for the selected consumption band of prices are close to zero. Contrastingly, in Italy, these taxes contribute significantly, reaching 15% of the final price. Another noteworthy factor is the distribution costs. Italy shows low distribution costs, constituting only 6 % of the final price. In contrast, both France and Sweden experience higher distribution costs, reaching 21%, in Sweden.
- These variations highlight the complex interplay of factors shaping industrial electricity prices for small and medium consumption in different regions of the EU. The almost negligible taxes in France, contrasting with Italy's substantial contribution, and the divergent distribution cost structures among the selected Member States, underscore the nuanced nature of pricing dynamics. These disparities are influenced by a combination of market dynamics, regulatory policies, and the energy mix.

<sup>2</sup> Eurostat IB electricity consumption band for industries: annual consumption between 20 and 500 MWh.

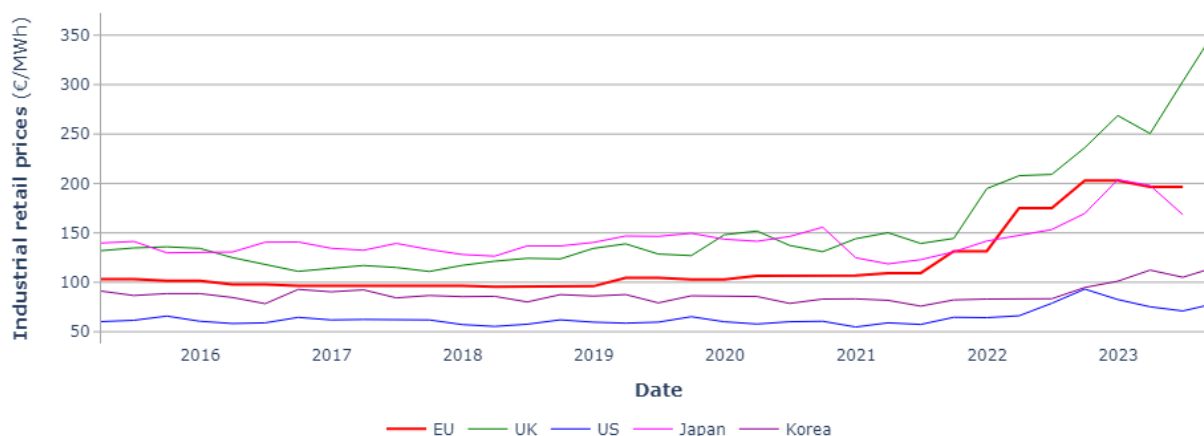
**Figure 29 - Industrial retail prices for SMEs (IB Eurostat consumption band) in selected EU MS**



### 1.6 International comparison of retail electricity prices

- **Figure 30** displays industrial retail prices paid by consumers in the EU<sup>3</sup> and in its major trading partners. Prices include VAT (with the exception of US prices) and other recoverable taxes for the purpose of comparability.
- Electricity prices for industrial users in the EU registered a year-on-year increase in the first half of 2023 compared to the first half of 2022. More generally, EU retail electricity prices paid by industrial consumers are increasing since the second half of 2021. We observe a similar tendency in Q3 2023 in the UK (+51% y-o-y), South Korea (+21%) and in the US (+21%). However, the US and Korean prices remain lower than in the EU, while prices in the UK are higher than in the EU since the second half of 2020.

**Figure 30 – Retail electricity prices paid by industrial customers in the EU and its main trading partners**

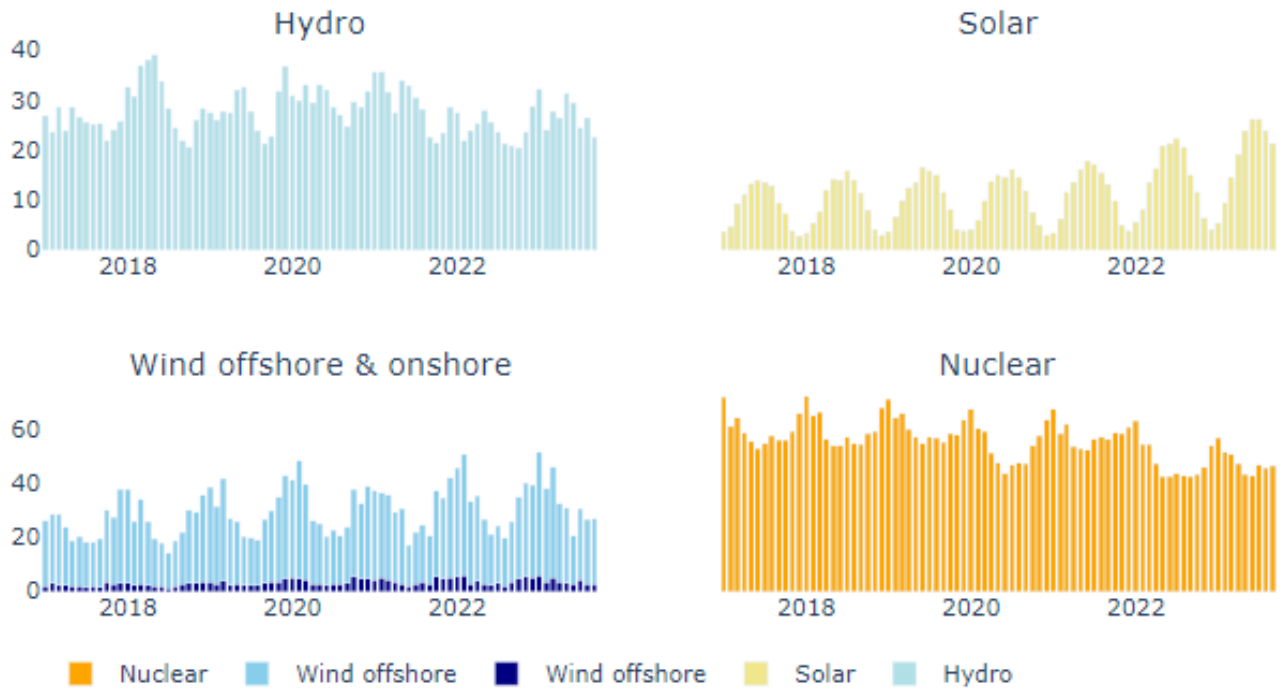


Source: Eurostat, EIA, DESNZ, IEA, DG ENER computations. Industrial prices in the EU are represented by the ID consumption band for the purposes of international comparison.

<sup>3</sup> The EU average is reported biennially in the [Eurostat database](#). The prices in the quarter reflect electricity non-household retail prices from 1H 2023 for the ID band.

## Annex

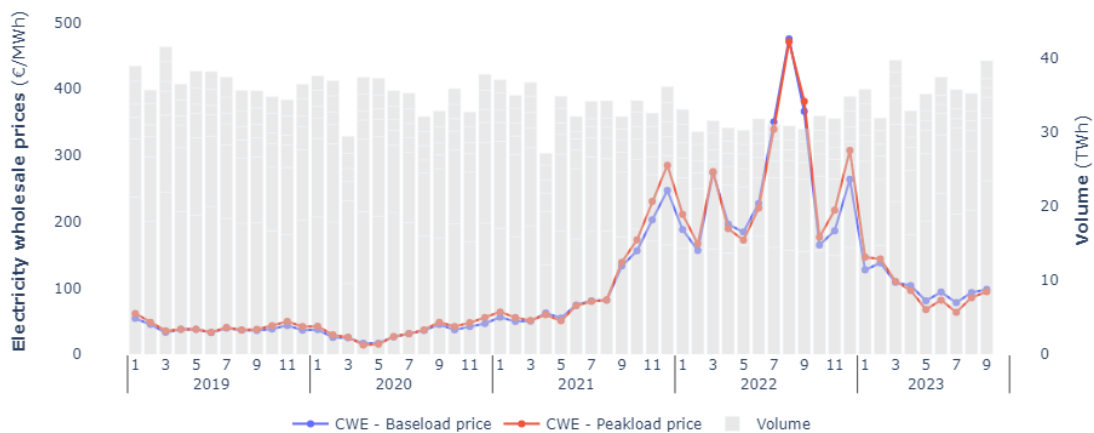
### Monthly renewable generation in the EU (TWh)



## Regional wholesale markets

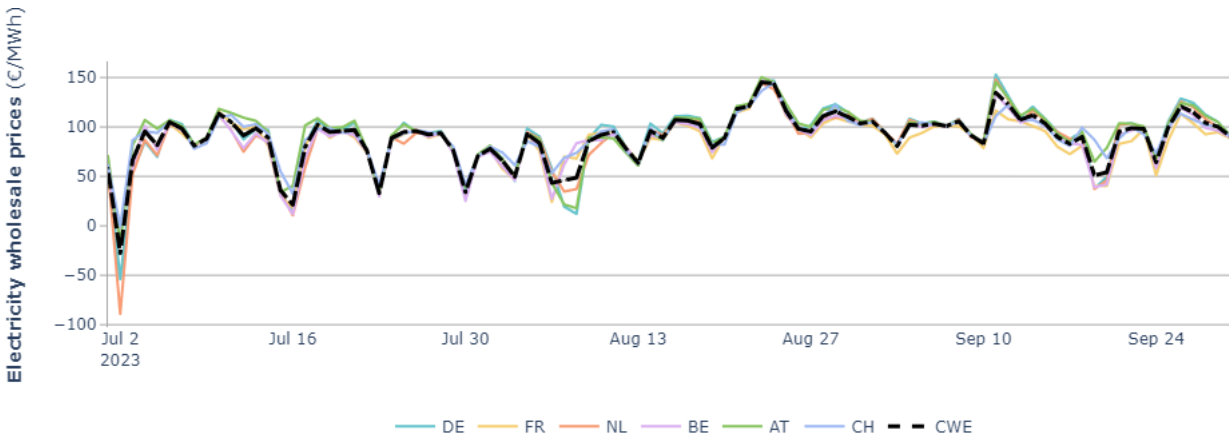
### 1.7 Central Western Europe (Austria, Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland)

**Figure 31 – Monthly exchange traded volumes of day-ahead contracts and monthly average prices in Central Western Europe**



Source: S&P Global Platts, ENTSO-E, EPEX.

**Figure 32 – Daily average power prices on the day-ahead market in the CWE region**

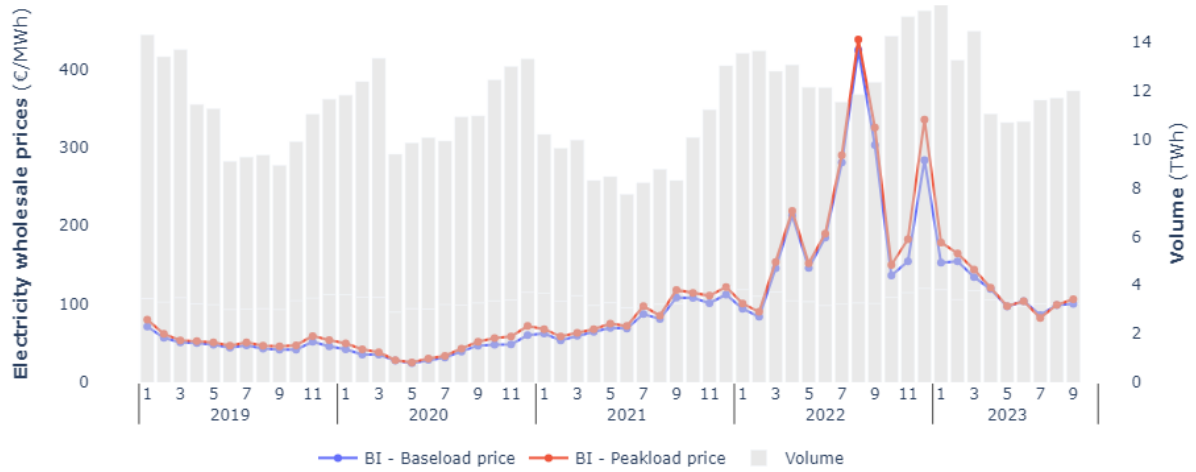


Source: S&P Platts, ENTSO-E, EPEX



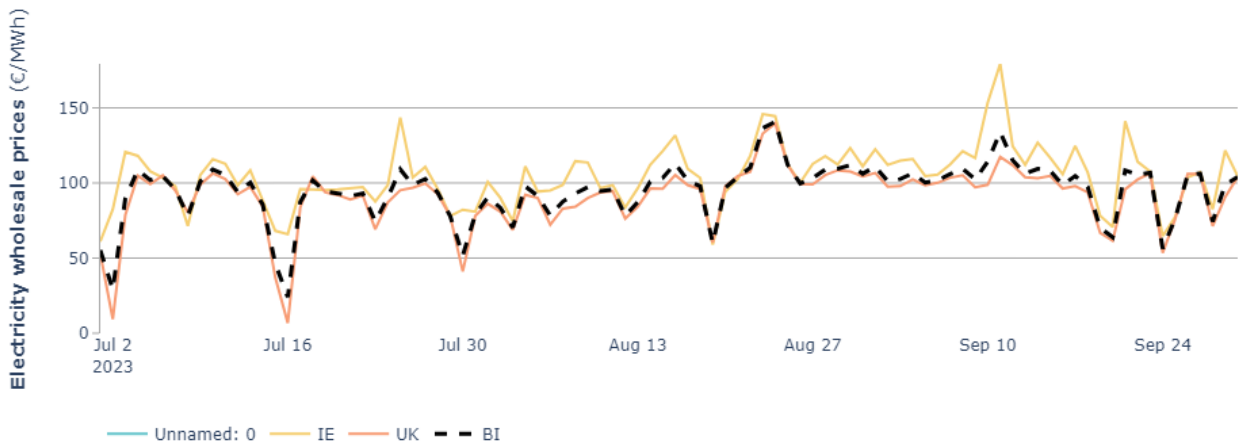
## 1.8 British Isles (GB, Ireland)

**Figure 33 – Monthly exchange traded volumes of day-ahead contracts and monthly average prices in Great Britain and Ireland**



Source: Nord Pool N2EX, SEMO, Utility Regulator

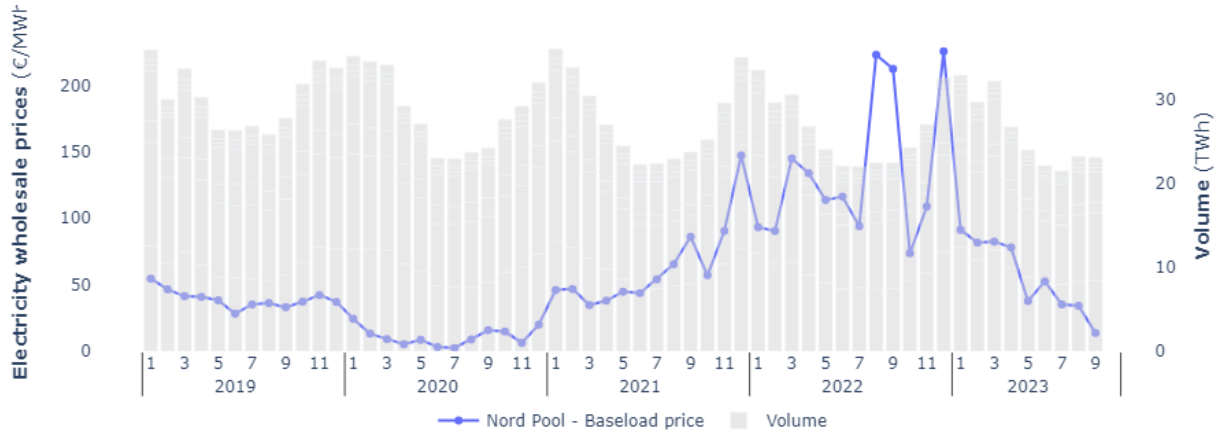
**Figure 34 – Daily average electricity prices on the day-ahead market in Great Britain and Ireland**



Source: Nord Pool N2EX, SEMO

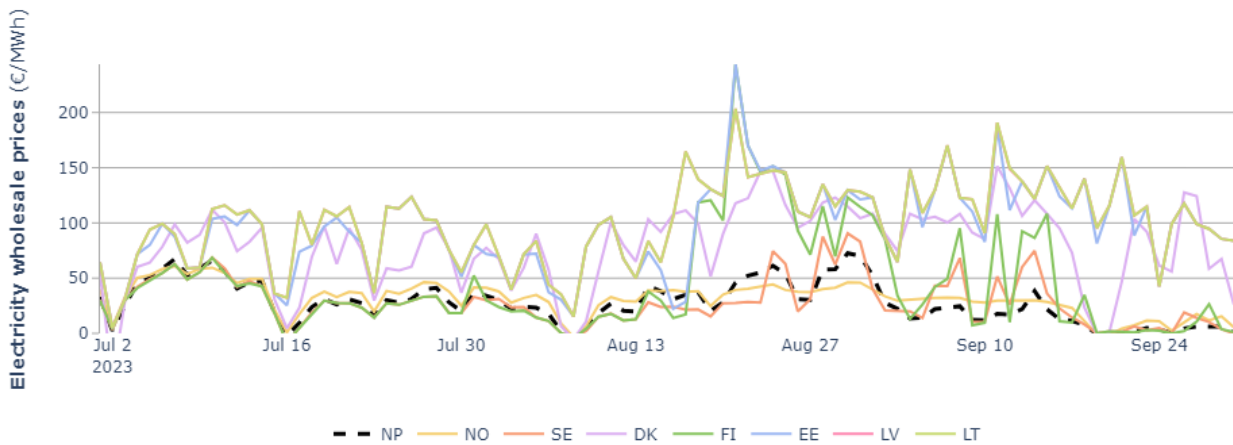
1.9 Northern Europe (Denmark, Estonia, Finland, Latvia, Lithuania, Sweden, Norway)

**Figure 35 – Monthly electricity exchange traded volumes and the average day-ahead wholesale prices in Northern Europe**



Source: S&P Global Platts, Nord Pool spot market

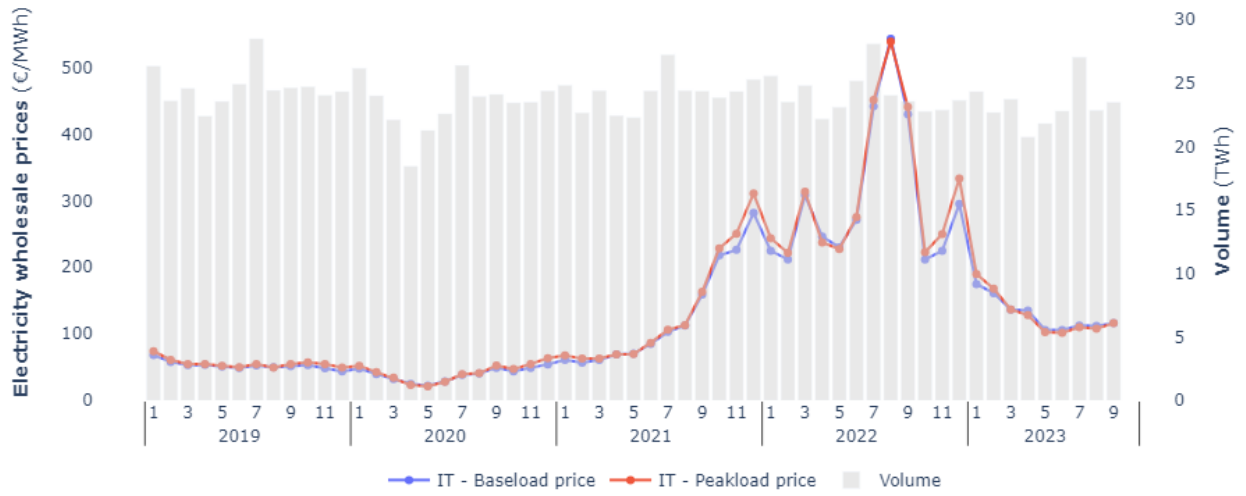
**Figure 36 – Daily average regional prices and the system price on the day-ahead market in the Nordic region**



Source: S&P Global Platts, Nord Pool spot market

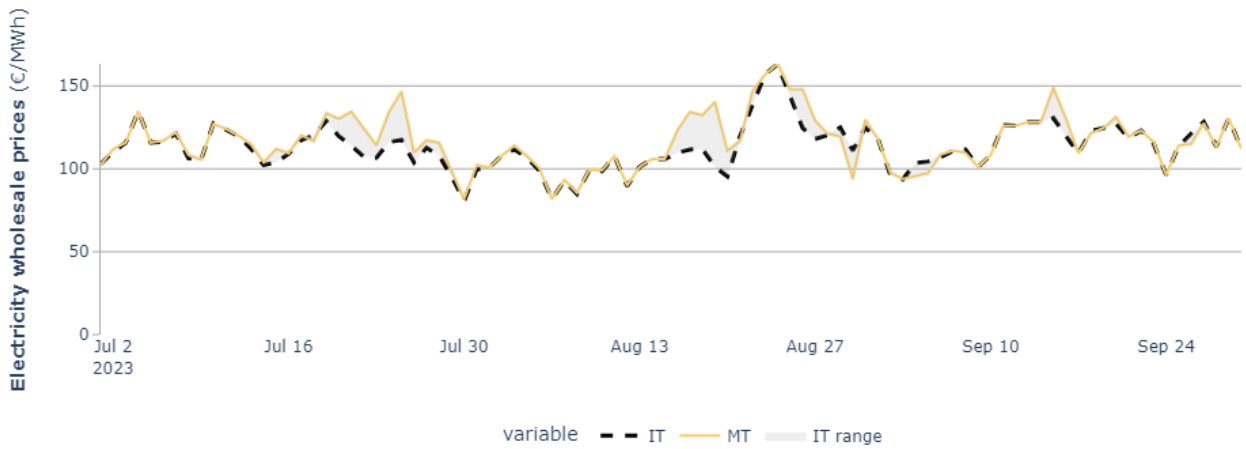
1.10 Apennine Peninsula (Italy, Malta)

Figure 37 – Monthly electricity exchange traded volumes and average day-ahead wholesale prices in Italy



Source: GME (IPEX)

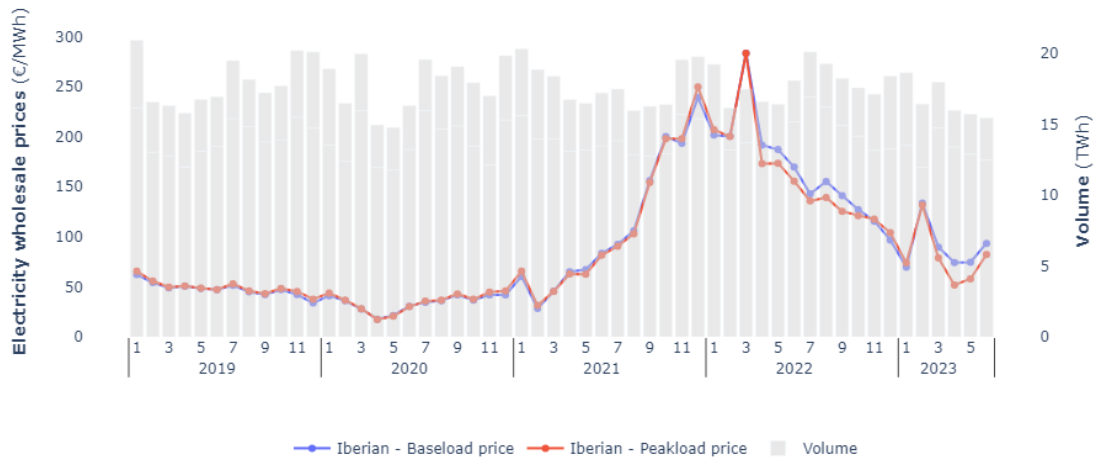
Figure 38 – Daily average electricity prices in the Italian day-ahead market, within the range of different area prices



Source: GME (IPEX)

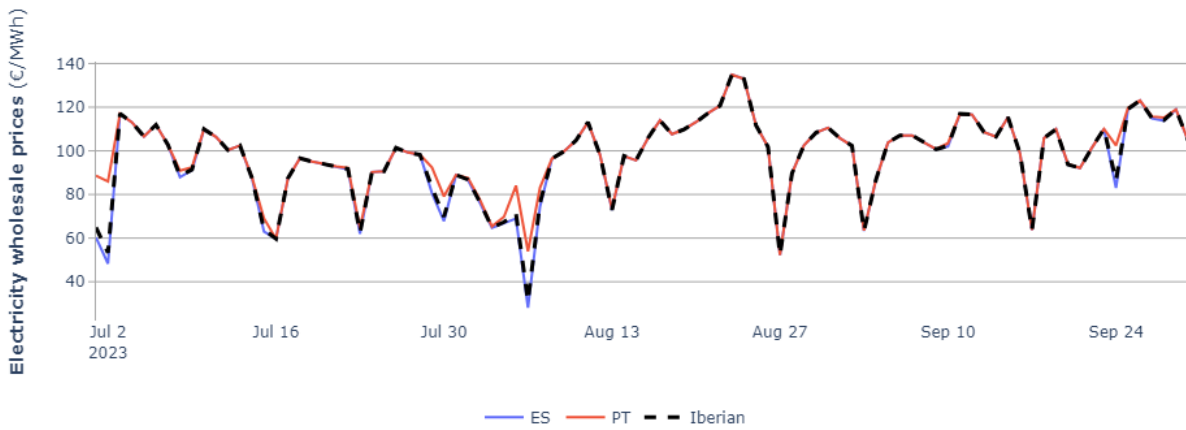
### 1.11 Iberian Peninsula (Spain and Portugal)

**Figure 39 – Monthly electricity exchange traded volumes and average day-ahead prices in the Iberian Peninsula**



Source: S&P Global Platts, OMEL, DGEG

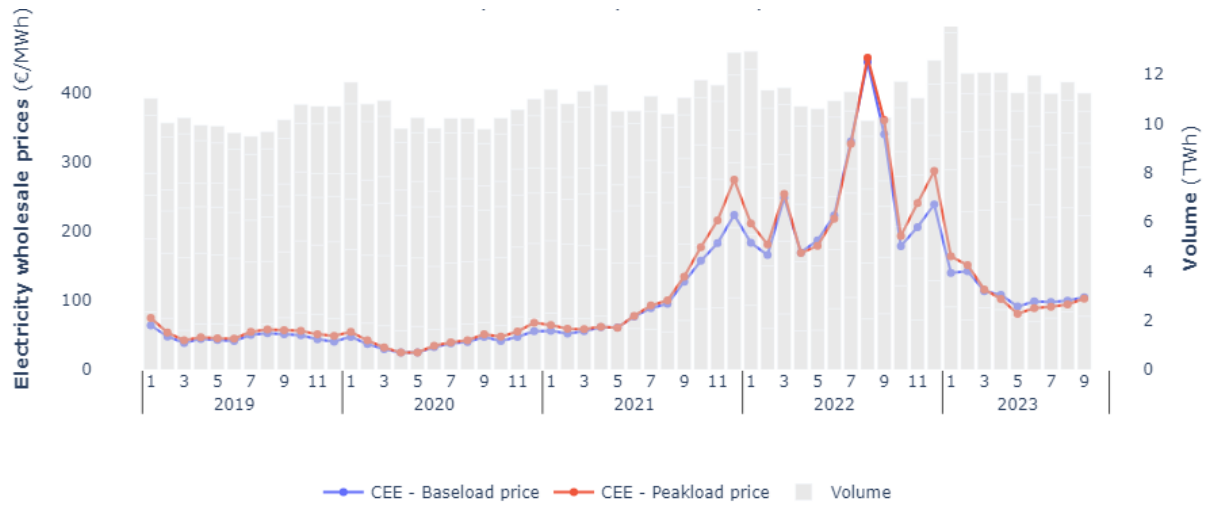
**Figure 40 – Daily average electricity prices on the day-ahead market in the Iberian Peninsula**



Source: S&P Global Platts, OMEL, DGEG

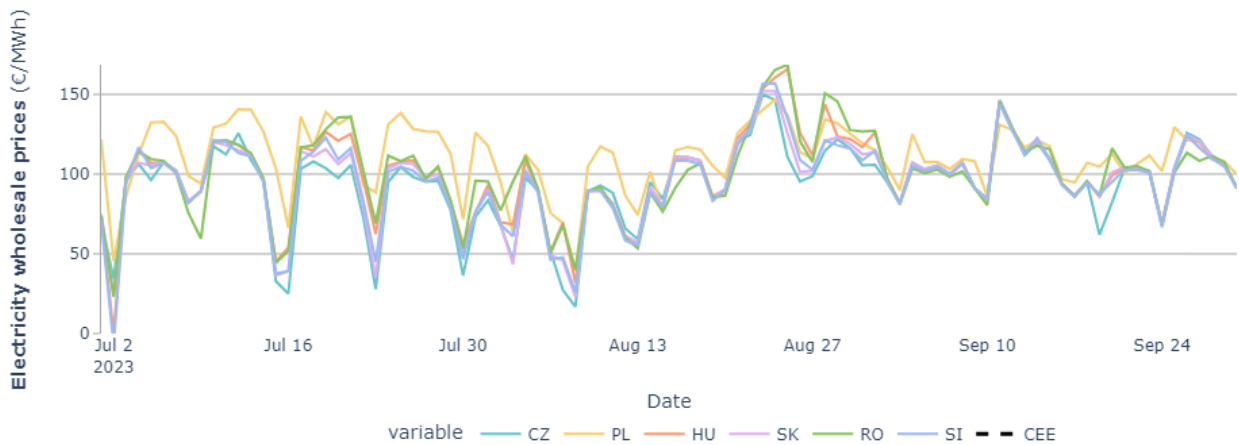
1.12 Central Eastern Europe (Czechia, Hungary, Poland, Romania, Slovakia, Slovenia)

**Figure 41 – Monthly electricity exchange traded volumes and average day-ahead prices in Central Eastern Europe (CEE)**



Source: Regional power exchanges, Central and Eastern Europe (CEE), CEE: CZ, HU, RO, PL, SK, SI

**Figure 42 – Daily average power prices on the day-ahead market in the CEE region**



Source: Regional power exchanges

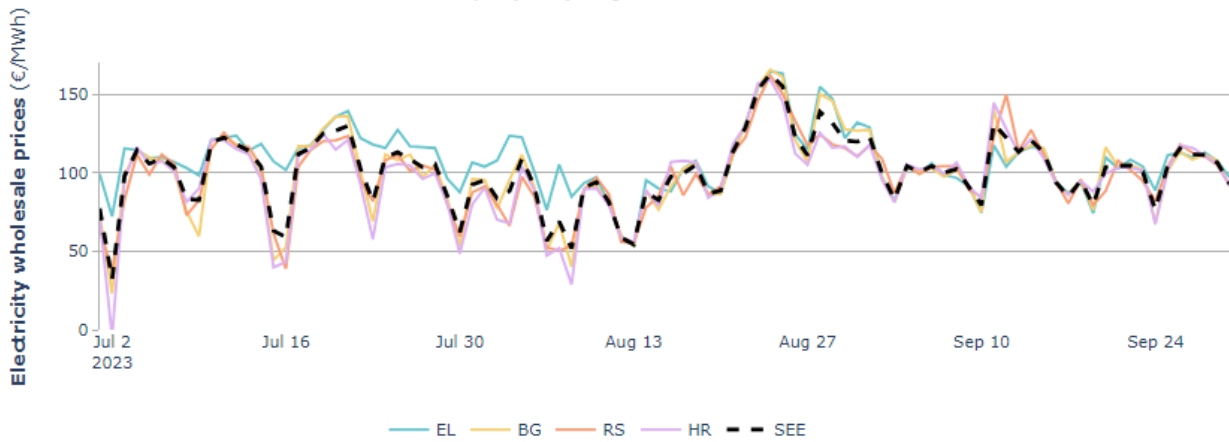
1.13 South-Eastern Europe (Bulgaria, Croatia, Greece and Serbia)

Figure 43 – Monthly traded volumes and baseload prices in South-Eastern Europe (SEE)



Source: ENTSO-E, IBEX, LAGIE, CROPEX, SEEPEX

Figure 44 – Daily average power prices on the day-ahead market in Bulgaria, Croatia, Greece and Serbia



Source: ENTSO-E, IBEX, LAGIE, SEEPEX, CROPEX

## Glossary

**Backwardation** occurs when the closer-to-maturity contract is priced higher than the contract which matures at a later stage.

**Contango:** A situation of contango arises when the closer to maturity contract has a lower price than the contract which is longer to maturity on the forward curve.

**Emission allowances' spot prices** are defined as prices for an allowance traded on the secondary market and with a date of delivery in the nearest December.

**European Power Benchmark (EPB9)** is a replacement of the former Platt's PEP index discontinued at the end of 2016, computed as weighted average of nine representative European markets' (Belgium, Czechia, France, Italy, Germany, Netherlands, Spain, the United Kingdom and the Nord Pool system price) day-ahead contracts.

**EPS** is a consumption-weighted baseload benchmark of five most advanced markets offering a 3-year visibility into the future Markets included in the benchmark are France, Germany, the Netherlands, Spain and Nord Pool. Prices are weighted according to the consumption levels in individual markets. Forward prices are rolled over towards the end of each year, meaning that the year-ahead benchmark in 2021 shows the price for 2022; and the year-ahead curve in 2022, in turn, shows baseload prices for delivery in 2023.

**Flow against price differentials (FAPDs):** By combining hourly price and flow data, FAPDs are designed to give a measure of the consistency of economic decisions of market participants in the context of close to real time operation of electrical systems.

With the closure of the day-ahead markets (D-1), the prices for each hourly slot of day D are known by market participants. Based on the information from the power exchanges of two neighbouring areas, market participants can establish hourly price differentials. Later in D-1, market participants also nominate commercial schedules for day D. An event named 'flow against price differentials' (FAPD) occurs when commercial nominations for cross border capacities are such that power is set to flow from a higher price area to a lower price area. The FAPD chart in this quarterly report provides detailed information on adverse flows, presenting the ratio of the number of hours with adverse flows to the number of total trading hours in a quarter.

**Relative standard deviation** is the ratio of standard deviation (measuring the dispersion within a statistical set of values from the mean) and the mean (statistical average) of the given set of values. It measures in percentage how the data points of the dataset are close to the mean (the higher is the standard deviation, the higher is the dispersion). Relative standard deviation enables to compare the dispersion of values of different magnitudes, as by dividing the standard deviation by the average the impact of absolute values is eliminated, making possible the comparison of different time series on a single chart.

**Retail prices** paid by households include all taxes, levies, fees and charges. Prices paid by industrial customers exclude VAT and recoverable taxes. Monthly retail electricity prices are estimated by using Harmonised Consumer Price Indices (HICP) based on bi-annual retail energy price data from Eurostat.

**Tariff deficit** expresses the difference between the price (called a tariff) that a *regulated utility*, such as an electricity producer is allowed to charge and its generation cost per unit.