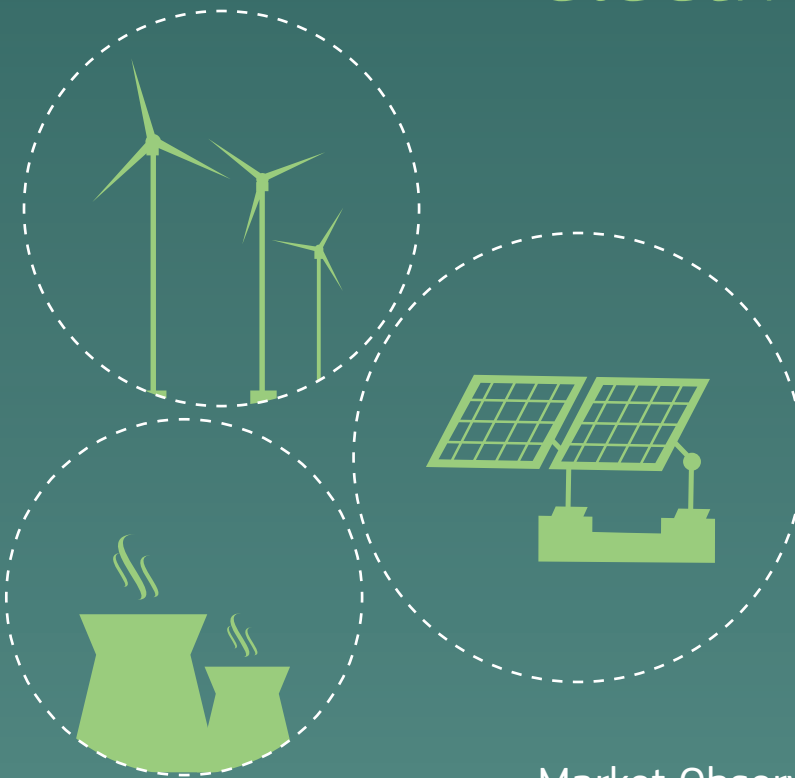




European  
Commission

# Quarterly report

## On European electricity markets



Market Observatory for Energy  
DG Energy

**Volume 16**

(issue 2, covering the second quarter  
of 2023)

Energy

DISCLAIMER: This report prepared by the Market Observatory for Energy of the European Commission aims at enhancing public access to information about prices of electricity in the Member States of the European Union. Our goal is to keep this information timely and accurate. If errors are brought to our attention, we will try to correct them. However, the Commission accepts no responsibility or liability whatsoever with regard to the information contained in this publication.

Copyright notice: Reproduction is authorised provided the source is acknowledged.  
© European Commission, 2023

Directorate-General for Energy, unit A4, Market Observatory for Energy, 2023

Commission Européenne, B-1049 Bruxelles / Europese Commissie, B-1049 Brussel – Belgium  
E-mail: ENER-MARKET-OBSERVATORY-QUARTERLY-REPORTS@ec.europa.eu

## **CONTENT**

HIGHLIGHTS OF THE REPORT .....	3
1 ELECTRICITY MARKET FUNDAMENTALS.....	4
1.1 Demand side factors .....	4
1.2 Supply side factors .....	6
2 EUROPEAN WHOLESALE MARKETS.....	8
2.1 European wholesale electricity markets and their international comparison ....	8
2.2 Traded volumes and cross border flows.....	14
3 RETAIL MARKETS.....	17
3.1 Retail electricity markets in the EU .....	17
4 ANNEX - REGIONAL WHOLESALE MARKETS.....	20
4.1 Central Western Europe (Austria, Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland) .....	20
4.2 British Isles (GB, Ireland) .....	21
4.3 Northern Europe (Denmark, Estonia, Finland, Latvia, Lithuania, Sweden, Norway).....	22
4.4 Apennine Peninsula (Italy, Malta) .....	23
4.5 Iberian Peninsula (Spain and Portugal).....	24
4.6 Central Eastern Europe (Czechia, Hungary, Poland, Romania, Slovakia, Slovenia).....	25
4.7 South-Eastern Europe (Bulgaria, Croatia, Greece and Serbia) .....	26
GLOSSARY .....	27

## HIGHLIGHTS OF THE REPORT

- **The second quarter of 2023 was marked by a continuation of improved market fundamentals that supported an overall fall in wholesale electricity prices, mainly mirroring the decline in gas prices.** Lower gas prices, combined with a further reduction in demand and a sustained renewable generation, helped to alleviate wholesale electricity prices across EU markets. The improved hydro output and the gradual recovering of the nuclear fleet, helped to ease pressure in the market. Prices fell throughout the reference quarter, but rebounded in June, following the developments of the gas market.
- **Improved market fundamentals supported a fall in wholesale electricity prices in European markets in Q2 2023. The European Power Benchmark averaged 89 €/MWh, 53% lower than in Q2 2022.** On a yearly basis, practically all wholesale electricity markets in the European Union experienced a decline in prices (ranging from -63% to -23%). The largest year-on-year price falls in Member States were registered in Finland (-63%), France (-59%) and Spain (-56%). The lowest quarterly average prices during Q2 2023 were recorded in Finland and Sweden, at 44 €/MWh and 54 €/MWh, respectively. Conversely, Ireland and Malta reported the highest quarterly average prices (116 €/MWh), but still they registered 36% and 54% lower prices than in Q2 2022.
- **Electricity consumption in the EU fell (-6%) compared with last year's levels in Q2 2023,** following favourable weather, combined with demand reduction in industry and households in the quarter. The lowest monthly demand value of the quarter (**June 2023**) was even below than June 2020 values (which is a special year with low demand due to the COVID impact).
- **For the second consecutive quarter, reduced electricity demand combined with sustained renewable generation, supported a drop in fossil fuel generation in Q2 2023. The share of renewables increased to 46% in Q2 2023** (from 41% in Q2 2022), while the share of fossil fuels fell to 30% (from 33%). In Q2 2023, solar generation surged by 18% (+11 TWh), hydropower improved its output by 11% (+8 TWh), and onshore and offshore wind generation rose slightly by 1% (+1 TWh) and 6% (+0.5 TWh), respectively. Wind and solar generation together registered an increase of +9% (+12 TWh). Wind and solar combined managed to generate more than the combined gas and coal output. The output from gas and coal fell by 26% (-50 TWh) in Q2 2023. Nuclear output in Q2 2023 rose slightly by 1% (+1 TWh), signalling a slight recovery when compared with Q2 2022.
- **Fossil fuel generation dropped by 21% (-46 TWh) in Q2 2023,** supported by lower demand and sustained renewables generation. Specifically by fuel, coal-fired generation fell by 34% (-32 TWh), whereas less CO<sub>2</sub>-intensive gas generation dropped by 18% (-18 TWh).
- **Carbon prices were 86 €/tCO<sub>2</sub> in Q2 2023, which was 3% higher than in Q2 2022.** Prices fluctuated between 80 and 90 €/tCO<sub>2</sub> during the quarter. High carbon prices, combined with lower gas prices in Q2 2023, supported a second consecutive quarter of favourable conditions for a shift from coal back to gas generation, after nearly one year and half of uneconomical conditions for gas vis-à-vis coal power plants.
- **The decrease in wholesale prices registered in Q2 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 4% in Q2 2023, compared with the same quarter in 2022. Moreover, retail prices in Q2 2023 were 8% lower than in Q1 2023.
- **Close to 552,000 new EVs were registered in the EU in Q2 2023,** an increase of 28% in comparison with the same quarter in 2022. Demand for electrical vehicles (EVs) in Q2 2023 registered the second highest all-time quarterly figure. Q2 2023 numbers translated into a 21% of market share, lower than China, but more than twice the market share registered in the United States.
- **The record number of hours with negative wholesale prices in Q2 2023 (1441 hours) was close to 850% higher than in Q2 2022.** Most of the negative hourly price instances occurred in May (1043 hours), during periods of high solar and wind generation, combined with low electricity demand (weekends and holidays).

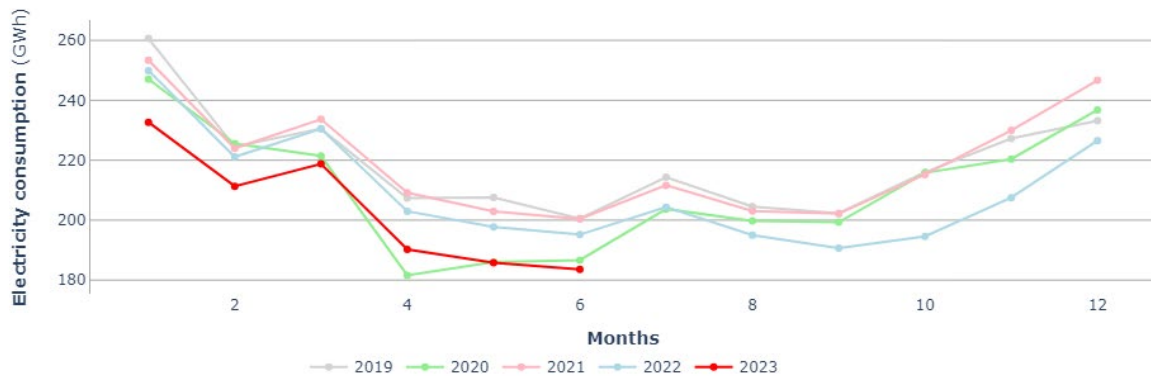
*Methodological Note: The rapid changes in gas and electricity markets happening through the energy transition as well as the significant restructuring of the EU's energy supply following the energy crisis, call for reviewing the Quarterly Reports of the European Electricity and Gas Markets so as to 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.*

# 1 Electricity market fundamentals

## 1.1 Demand side factors

- The total actual load in the EU dropped 6% compared with last year's levels in Q2 2023, following the impact of milder weather, combined with the aftermath of the industrial demand reduction due to high prices in 2022 and behavioural changes in consumption. Demand levels for the second quarter of 2023 were also well below the 2019–2022 range, registering the lowest value in June. In June 2023, consumption figures were lower than in June 2020, which was a particular year with low levels of demand due to the COVID-19 impact.

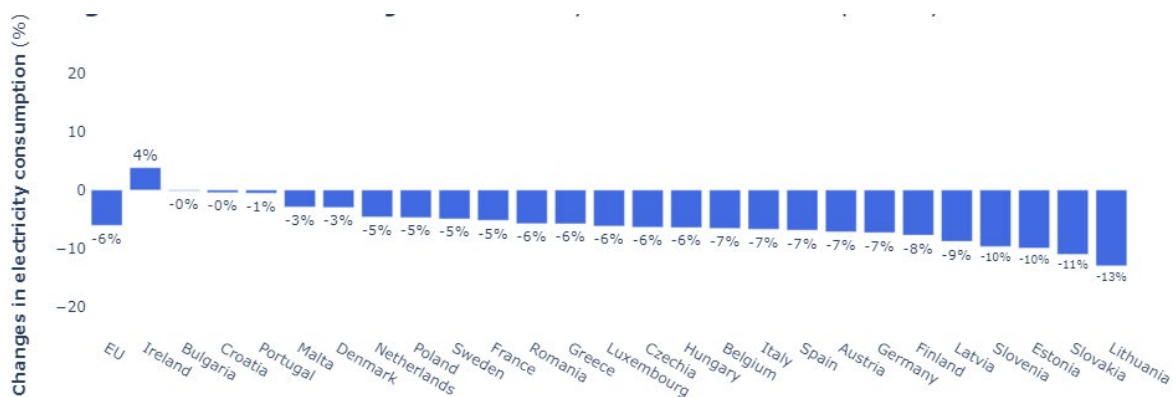
**Figure 1 – Monthly EU consumption of electricity**



Source: Eurostat and ENTSO-E

- Figure 2** sums up changes in electricity actual total load over Q2 2023, compared to Q2 2022. EU electricity consumption decreased in Q2 2023, with Ireland (+4%) being the only Member State to slightly increase consumption during the reference period. Indeed, twenty-three Member States registered decreases in electricity consumption, the biggest of which occurred in Lithuania (-13%), Slovakia (-11%) and Estonia (-11%). Additionally, Czechia, Bulgaria and Croatia did not register changes in their consumption.

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

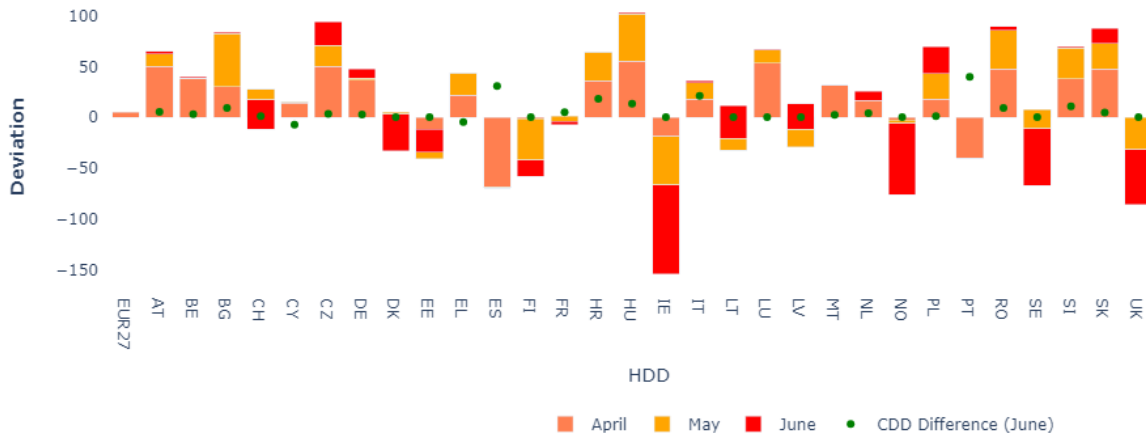


Source: Eurostat and ENTSO-E.

- Figure 3** illustrates the monthly deviation of actual Heating Degree Days (HDDs) from the long-term average (a period between 1979 and the last calendar year completed) in Q2 2023. EU-wide, the reference quarter was relatively within the historical range. April and May were colder than the historical average, while June registered warmer-than-usual temperatures. Overall, Q2 2023 registered only 4 HDDs (concentrated mainly in April and May)

above the long-term average. The Cooling Degree Days (CDDs) in Q2 2023 were higher than usual as June registered warmer-than-usual temperatures (8 CDDs). In particular, the Iberian Peninsula and some Mediterranean countries experienced hot temperatures in June (Spain, Portugal, Italy and Croatia). Higher temperatures commonly imply additional cooling needs.

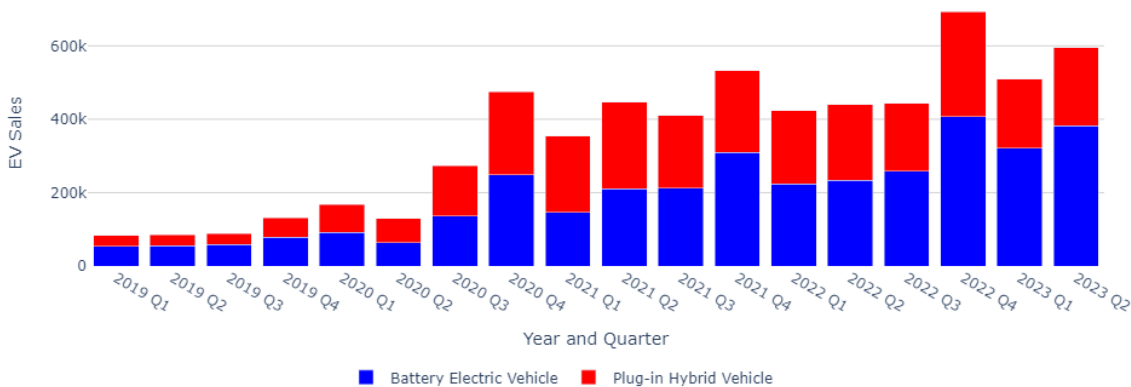
**Figure 3 - Deviation of actual heating days from the long-term average in April-June 2023**



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 552,000 new EVs were registered in the EU in Q2 2023 (+28% compared with Q2 2022). This is the second highest quarterly figure on record and translates into a 21% market share; lower than China (33%), but more than twice the market share registered in the United States (9%). The battery electric vehicles segment continued to grow (+54% year-on-year more than 350,000). The demand for plug-in hybrid vehicles registered a slight decrease (-1% year-on-year to more than 200,000). Hybrid electric vehicles (not chargeable) sales amounted to more than 677,000, registering an increase of 23% compared with Q2 2022.

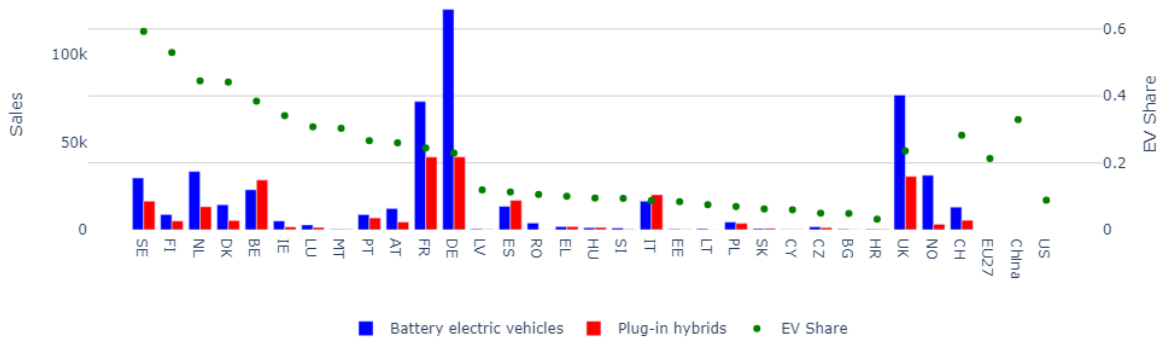
**Figure 4 – Quarterly EV sales in the EU**



Source: ACEA

- The highest EV penetration was observed for another quarter in Sweden where 59% of the cars sold in Q2 2023 were EVs. Moreover, in Finland, half of the passenger cars sold could be plugged (53%), followed by the Netherlands and Denmark (44%). Germany retained the position of the largest individual market (more than 167,000 EV sales in Q2 2023) followed by France, where sales amounted to more than 114,000 new EVs in the reference quarter.

**Figure 5 – Electrically chargeable passenger vehicle (EV) sales in selected countries in Q2 2023**

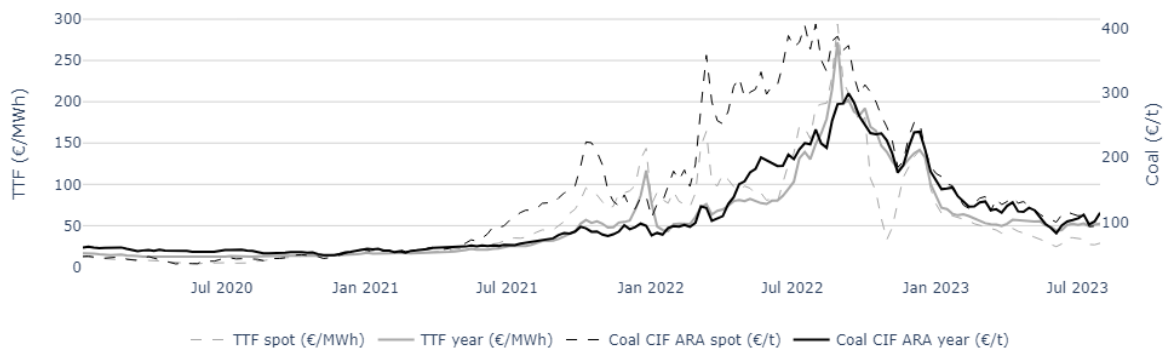


Source: ACEA, CPCA, BloombergNEF

## 1.2 Supply side factors

- Figure 6** reports on developments in European coal and gas prices. Gas spot and forward prices remained at lower and stable levels for most part of Q2 2023, supported by improved market fundamentals (i.e. high storage levels, reduced demand and additional LNG regasification capacities in Europe). Spot gas prices averaged 35 €/MWh in Q2 2023, 64% lower than prices in Q2 2022. TTF day-ahead prices remained at discount with TTF forward contracts (month and year ahead) during Q2 2023. Year-ahead prices averaged 52 €/MWh in Q2 2023, 37% lower than in Q2 2022. This contango continued well into Q3 2023.
- Thermal coal spot prices, represented by the CIF ARA contract, fell to 116 €/t in Q2 2023 (from 137 €/t recorded in the previous quarter). Prices fell by 15% compared with the previous quarter (Q1 2023) and recorded a drop of 64% compared with Q2 2022. Coal price was on a marked decreasing trend since September, supported by coal-to-gas switch on lower gas prices and reduced demand. This trend ended in Summer 2023, with coal rising again.

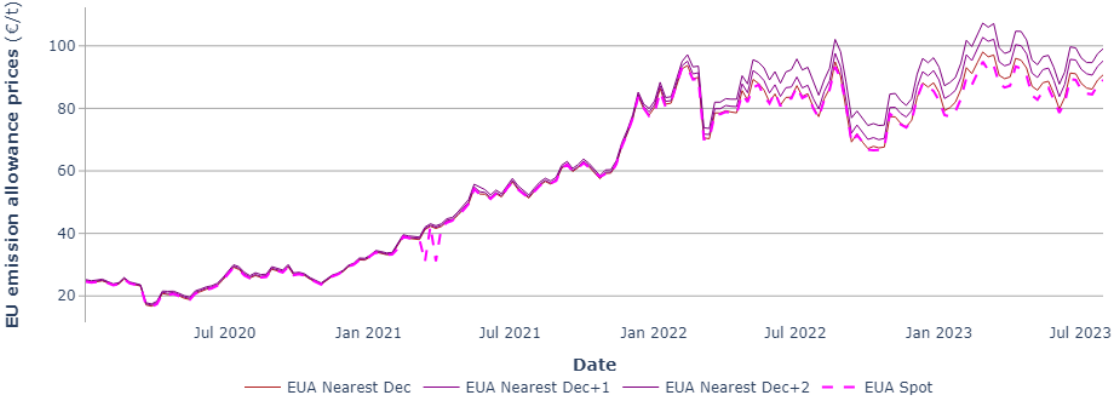
**Figure 6 – Weekly evolution of spot and year-ahead coal and gas prices**



Source: S&P Global Platts

- The European market for emission allowances, shown in **Figure 7**, continued at relative stable high levels in Q2 2023, fluctuating between 80 and 90 €/tCO<sub>2</sub>. The average spot price of CO<sub>2</sub> in Q2 2023 (86 €/tCO<sub>2</sub>) registered an increase of 3% compared with Q2 2022 and a marginal decrease in relation to the previous quarter (Q4 2022). The nearest-December contract averaged 88 €/tCO<sub>2</sub> in Q2 2023, while the nearest-december +1 and +2 contracts, registered an average of 93 and 97 €/tCO<sub>2</sub>, respectively. Falling gas prices in Q2 2023 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

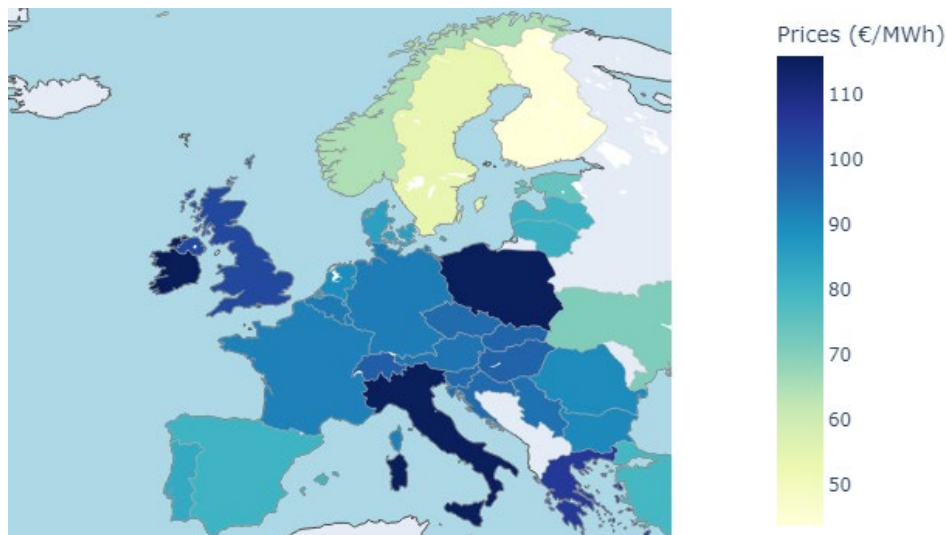


## 2 European wholesale markets

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

- The map on the next page (**Figure 8**) shows average day-ahead wholesale electricity prices across Europe in Q2 2023. The average day-ahead wholesale electricity prices across Europe were lower than in the previous quarter. Lower gas prices and demand from industries and households, supported falling prices. Higher renewables generation (in particular, solar and recovering hydro), together with improved nuclear fleet availability, also helped to release some pressure on wholesale electricity markets during Q2 2023. Prices fell throughout the reference quarter, but they rebounded in June, following the developments of the gas market.
- On a yearly basis, European Union Member States markets experienced a decline in wholesale electricity prices (ranging from -63% to -23%<sup>1</sup>) in Q2 2023. The largest year-on-year price falls in Member States were registered in Finland (-63%), France (-59%) and Spain (-56%). The lowest decreases were in Poland (-23%), Sweden (-39%) and Ireland (-36%) in Q2 2023, compared with Q2 2022.
- Ireland and Malta, followed closely by Italy and Poland reported the highest quarterly average prices (116 and 115 €/MWh, respectively). Ireland and Malta registered a 36% and 54% fall in prices, while prices in Italy and Poland were 54% and 23% lower compared with the same period last year. The lowest quarterly average prices during Q2 2023 were recorded in Finland and Sweden, at 44 €/MWh and 54 €/MWh, respectively.
- The European Power Benchmark averaged 89 €/MWh in Q2 2023, 53% lower on yearly basis. Compared to Q1 2023, the quarterly average price fell by 27%.

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

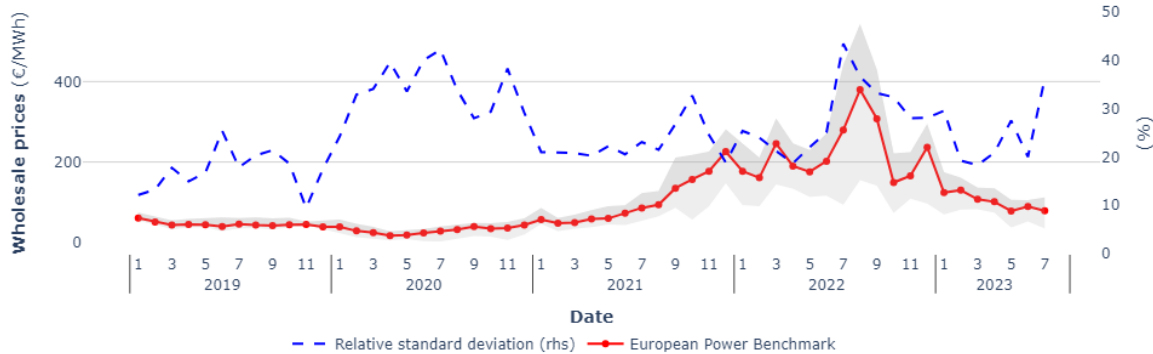


Source: European wholesale power exchanges, government agencies and intermediaries

- **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 that Q2 2023 divergence levels rose slightly when compared with Q1 2023, as most markets registered a relatively similar decrease in prices during the reference quarter. However, divergence levels increased again in July. **Annex 4**, provides graphics of the monthly and daily evolution of regional prices in Europe.

<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.

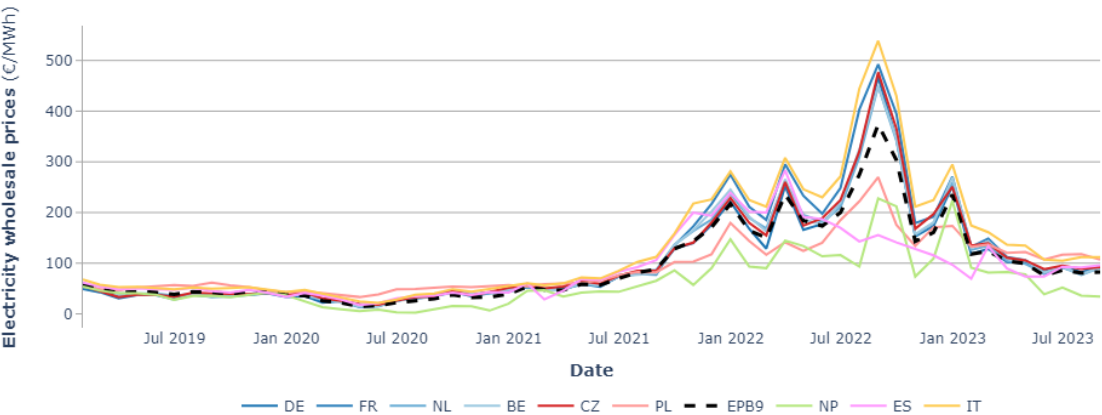
**Figure 9 - The evolution of the lowest and the highest regional wholesale electricity prices in the European day-ahead markets and the relative standard deviation of the regional prices**



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, mild weather, higher solar, recovering hydro; Germany, France and the Netherlands were able to decrease their fossil fuel output, registering a fall in prices. The French nuclear fleet, despite maintenances, improved its availability in Q2 2023, which helped to decrease pressure on prices and reversing back power flows into the historical net exporting position of France. Germany, France and the Netherlands average quarterly prices were around 90 €/MWh in Q2 2023. Strong solar generation supported lower prices in Spain, averaging 80 €/MWh during the reference quarter. The fossil-fuel cost adjustment mechanism ('Iberian exception') measure was not activated during Q2 2023 (due to prices lower than the subsidy threshold) and it has been de facto inactive since March 2023. At 65 €/MWh, prices in Northern Europe remained lower than in the continent. Central Eastern Europe markets followed prices in Central Western Europe, at a slightly higher level, as prices in Poland were in the upper bound of the prices in the CEE region.

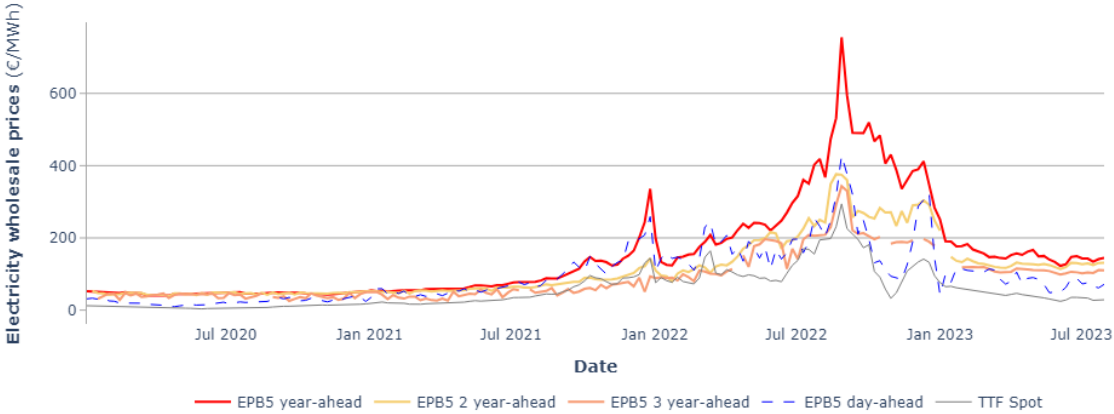
**Figure 10 – Weekly average electricity wholesale prices in nine selected European markets**



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

- Figure 11**, shows how gas prices (TTF spot price) 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 during the reference quarter, following favourable fundamentals of the TTF.
- In Q2 2023, the weekly average electricity year-ahead, two-year ahead and three-year ahead contracts were respectively 146 €/MWh, 125 €/MWh and 107 €/MWh. The premium of the weekly average between the year-ahead contract and the spot price fluctuated between 60 €/MWh and 80 €/MWh during Q2 2023. The contango for most of the reference quarter reflected the risks of potential tightness in the market, which did not materialise in the second quarter of 2023.

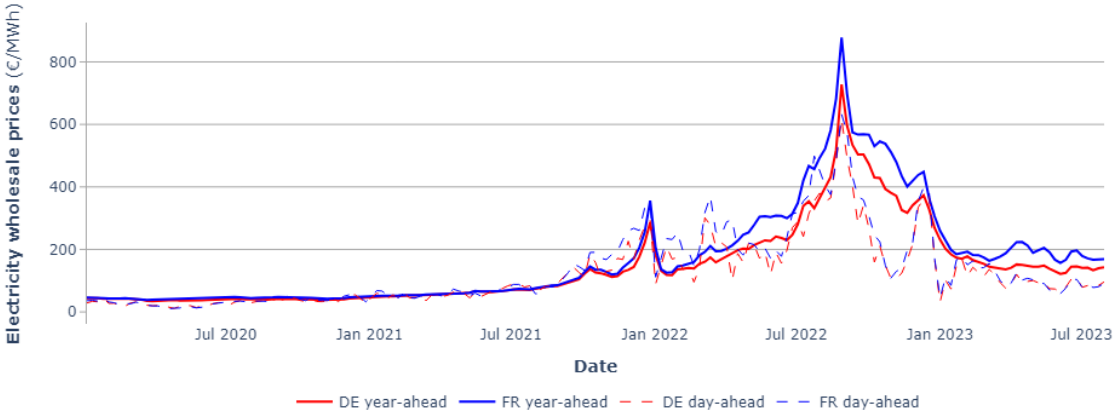
**Figure 11 – Weekly futures baseload prices – weighted average of selected European markets**



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 has been increasing since the beginning of 2022, reflecting structural differences between the two markets (i.e. the high proportion of French nuclear power plants under maintenance in 2022 and the relevance of wind generation when can cover a significant part of the demand at times in Germany). The premium of the French contract over their German equivalent contract averaged 50 €/MWh during the reference quarter (17% lower than in Q2 2022).

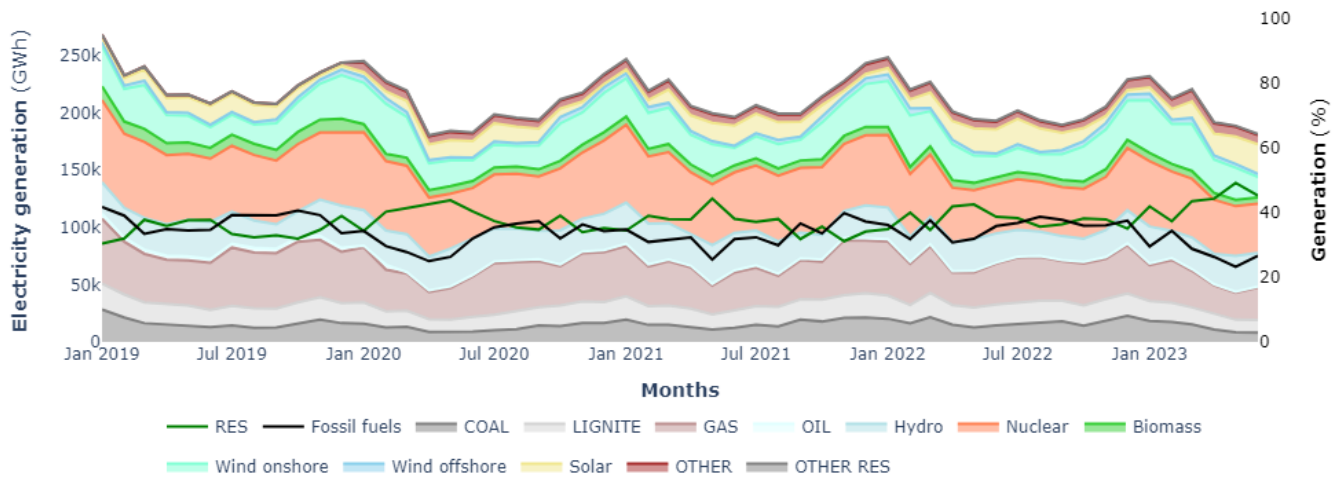
**Figure 12 – Weekly German and French year-ahead contracts**



Source: S&P Global Platts.

- Figure 13** shows the monthly evolution of the electricity mix in the EU. In Q2 2023, reduced electricity demand and relevant increase in renewable generation, supported the decrease in fossil fuels generation in the mix. Renewables managed to increase to 46% in Q2 2023 (from 41% in Q2 2022), reaching 49% in May 2023, the highest monthly record share of RES in the EU. The share of electricity generated by burning coal, gas and oil (fossil fuel generation) fell to 30% in Q2 2023 (from 33% in Q2 2023), driven by a drop in EU gas and coal generation. Nuclear generation improved its availability during Q2 2023, vis-à-vis Q2 2022, despite delays in scheduled maintenance and new unplanned outages in France. The share of nuclear generation in Q2 2023 was 24%, slightly above Q2 2022 (close to 23%).

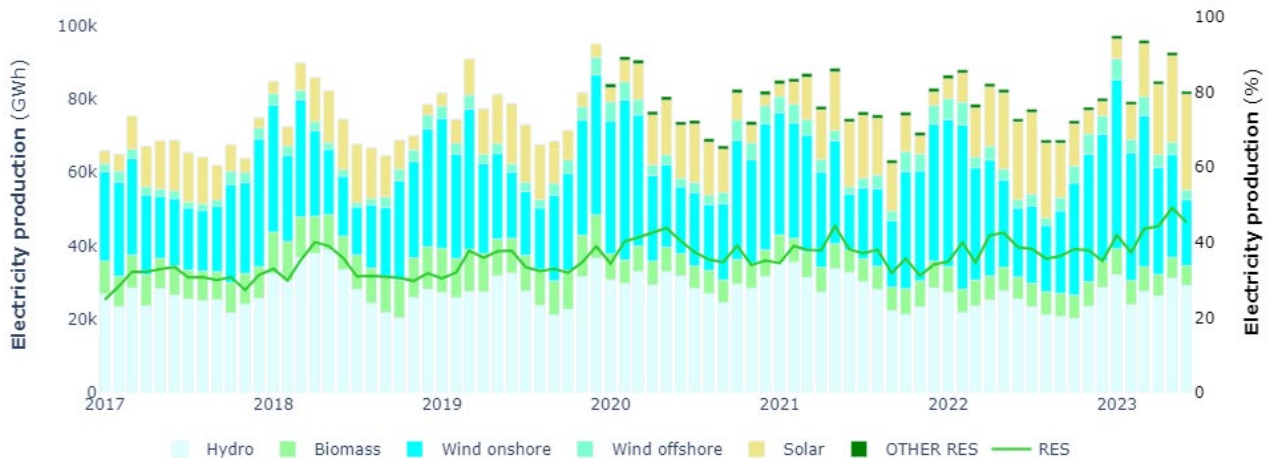
**Figure 13 – Monthly electricity generation mix in the EU**



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

- Figure 14** depicts the evolution of monthly renewable generation in the EU, alongside its share in the electricity generation mix and highlights the record of renewables share in May (49%). The growth in renewable penetration during Q2 2023 was supported mainly by a remarkable increase of +18% in solar generation (+11 TWh), +11% of improved hydropower (+8 TWh), +6% of wind offshore (+0.5 TWh) and +1% of onshore wind (+1 TWh) generation, in comparison with Q2 2022. The notorious rise in solar generation was supported by the record levels of new solar installed capacity in the EU in 2022, and the ongoing expansion of additional capacity during 2023. Wind and solar generation together (154 TWh) registered an increase of +9% (+12 TWh) and were higher than gas-, coal- and lignite-fired generation combined (140 TWh), decreasing by -26% (-50 TWh) in Q2 2023.

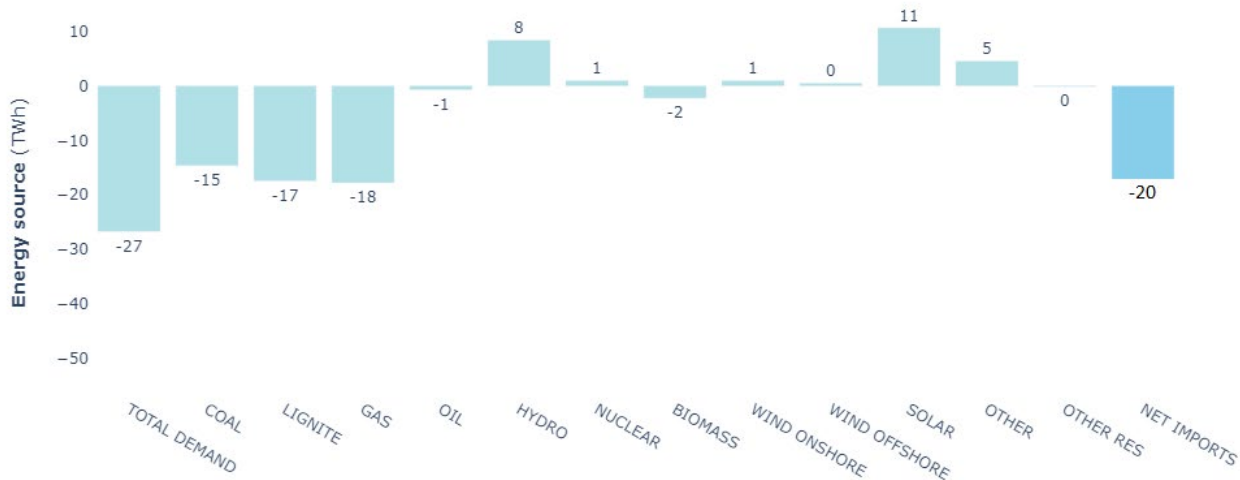
**Figure 14 – Monthly renewable generation in the EU and the share of renewables in the power mix**



Source: ENTSO-E. Data represent net generation.

- Figure 15** visualises changes in the EU27 electricity generation, imports and consumption in Q2 2023 compared to Q2 2022. Milder weather and the aftermath of the unprecedented prices registered in 2022, supported a reduction in power demand during the reference quarter. The demand reduction supported less fossil generation: gas-fired generation fell by 18 TWh (-18%), while coal and lignite decreased their output by 15 TWh (-35%) and 17 TWh (-33%), respectively in Q2 2023 (a total drop of 34% and -32 TWh combined). Overall, fossil fuel generation fell by 21% (-46 TWh) in Q2 2023. Nuclear output rose by 1 TWh (+1%) in Q2 2023.

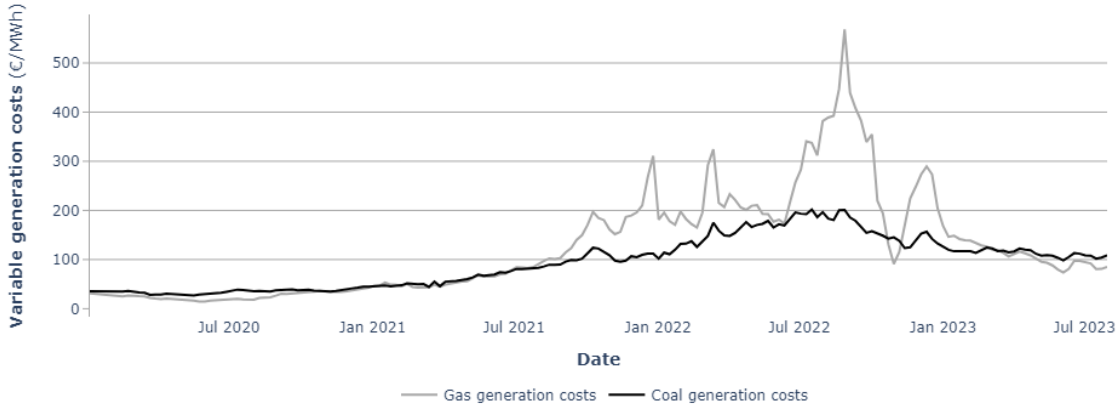
**Figure 15 – Changes in power generation in the EU between Q2 2022 and Q2 2023**



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). Decreasing gas prices and stable at high level carbon prices have created favourable conditions for a shift from coal to gas, after nearly one year and half of uneconomical conditions for coal-to-gas fuel switch. Despite some rebound in gas prices, the trend continued well into Q3 2023.

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

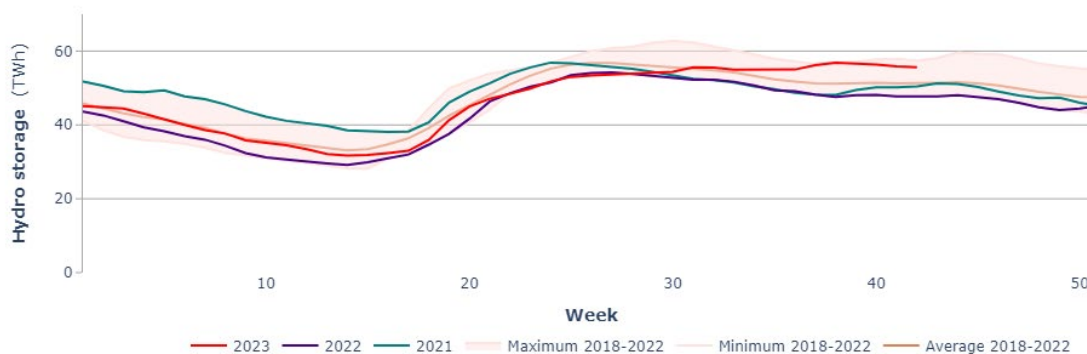


Source: S&P Platts, ENER.

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 Q2 2023, the overall sum of hydropower reservoirs was still recovering from the low levels registered 2022. During the last week of June, levels remained above the lower bound of the 5-year average, evolving according to the seasonal developments. However, levels considerably improved towards the end of Q3 2023, as reservoirs approached the upper bound of the 5-year average.

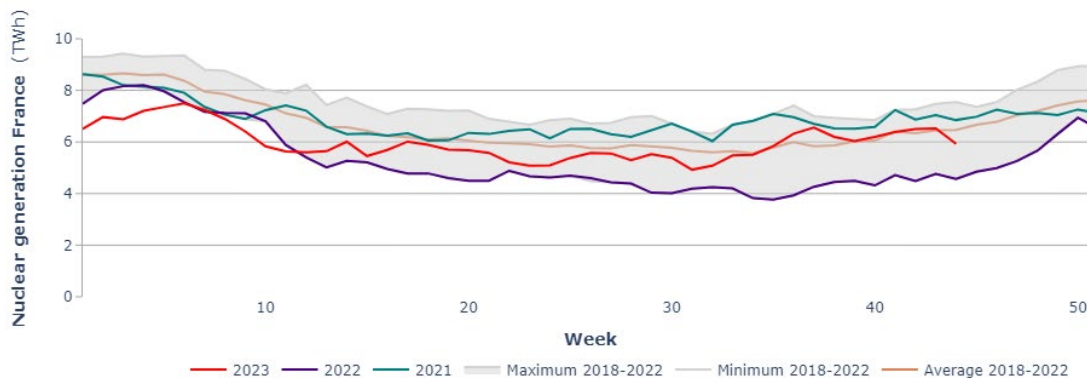
**Figure 17 - Aggregated EU hydropower reservoirs**



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 72 TWh in Q2 2023 and was up by 16% (+10 TWh) year-on-year, showing a relevant recovery compared with Q2 2022. The French nuclear output in 2022 (279 TWh) was the lowest since 1998. In February 2023, EDF confirmed its nuclear availability for the year between 300 and 330 TWh, following the high number of outages combined with scheduled maintenance registered in 2022.

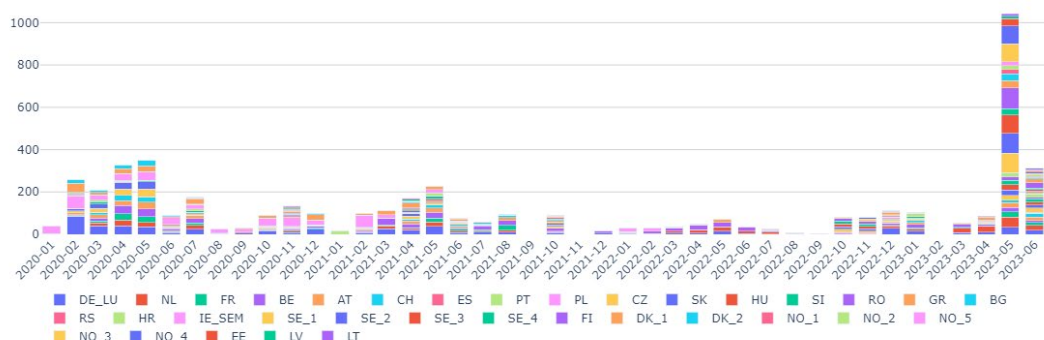
**Figure 18 – Weekly nuclear electricity generation in France**



Source: ENTSO-E

- **Figure 19** shows the monthly frequency of the occurrence of negative hourly wholesale electricity prices in selected European markets. Negative hourly prices usually appear when demand for electricity is lower than expected and when variable renewable generation is abundant, combined with ongoing relatively non-flexible large baseload power 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 1441, the number of hours with negative wholesale prices reached a record number in Q2 2023, being 848% higher in the observed bidding zones than in the previous second quarter. Most of the falls into negative territory occurred in May (1043) and took place in days when low consumption coincided with high renewable generation. Demand reduction and higher levels of renewable generation registered in Q2 2023 may also have influenced the occurrence of negative prices. The highest number of negative prices (274) was recorded on 28 May, when weak demand and low consumption during the weekend, combined with strong solar and wind generation, pushed Central Wester Europe, Central Eastern Europe and Nordic markets below zero during several hours of the day. Notably, 18 hours of that day registered negative prices in Finland, and 16 hours were recorded in some Swedish and Norwegian zones.

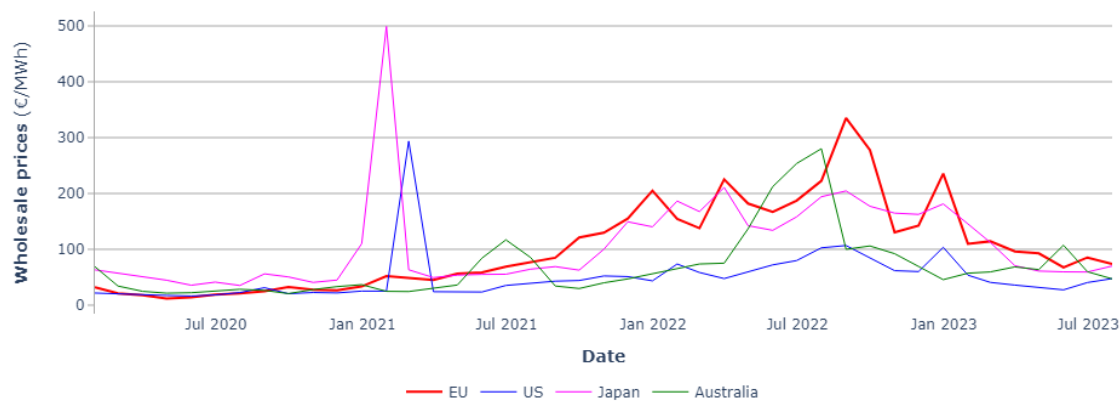
**Figure 19 – Number of negative hourly wholesale prices on selected day-ahead trading platforms.**



Source: ENTSO-E.

- **Figure 20** 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 particular, lower Q2 2023 gas and coal international prices and overall demand reduction, contributed to reduce pressure on markets.
- In the U.S., wholesale electricity prices in selected regional markets fell within the range of 30-60% year-on-year in Q2 2023, supported by lower gas prices. However, electricity prices rose in July due to increased demand as heat waves affected some markets (e.g. California). In Q2 2023, the US average prices were 52% lower than in Q2 2022, and 14% lower than in Q1 2023.
- In Japan, year-on-year prices fell by 59% in Q2 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.
- In Australia, wholesale electricity prices fell by 61% year-on-year in Q2 2023. 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.

**Figure 20 – Monthly average wholesale electricity prices in international markets (D-A markets)**



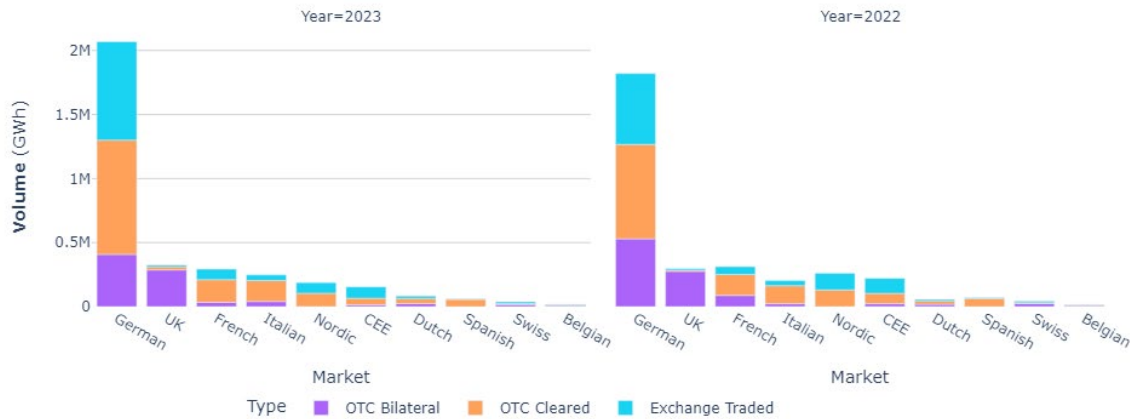
Source: European Power Benchmark based on S&P Global Platts and ENTSO-E Transparency Platform, JPEX (Japan), AEMO (Australia), and the arithmetic average of selected PJM West, ERCOT, MISO Illinois, CAISO, NYISO Hudson Valley and ISONE Internal regional wholesale hubs in the United States.

**2.2 Traded volumes and cross border flows**

- **Figure 21** 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 first reporting period since the energy crisis, selected markets and regions witnessed a year-on-year improvement in trading activity (+6%). The increase in total traded volumes (+183 TWh) reflects certain level of recovery in trading activity in the electricity sector. Activity remained stable in OTC contracts (+0%) and increased considerably on exchanges (+19%) in the total traded volumes under observation during the first half of 2023. The total traded volume in all markets under observation rose by 6% to 3437 TWh.

- Germany was by far the largest and most liquid European market, as total volumes reached 2069 TWh (equivalent to 60% of the total traded volumes under observation). Overall, total activity rose (+14%) in Germany during the reporting period.
- Overall, the market share of power exchanges rose to 32% during the reporting period. Overall, exchange-based trading volumes increased by 176 TWh (+19%). The OTC segment traded 6 TWh more of volume in the reporting period.

**Figure 21 – Annual change in traded volume of electricity on the most liquid European markets**



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

- **Figure 22** compares net balances of physical electricity flows among EU Member States in Q2 2023 and Q2 2022. The net trading position in Q2 2023 was more balanced and closer to historical behaviour than in 2022, where normal flows reversed in some key markets.
- For another quarter, France managed to reverse the 2022 trend and go back to its position as a net exporter during Q2 2023 (15 TWh) and it managed to reclaim the role of primary net exporter in the EU during the quarter. The improved situation of the French nuclear fleet supported an increase in exports. Sweden was the second largest net exporter (6 TWh), thanks to a discount in wholesale electricity prices due to nuclear, hydro and wind generation vis-à-vis the neighbouring and other continental European markets. The list is followed by Spain, with almost 5 TWh of net exports during the reference quarter. Italy remained as the larger net importer in the EU (-12 TWh), followed by Germany, with net imports of -9 TWh in Q2 2023.

**Figure 22 – Member States’ net scheduled commercial export/import positions within the EU in Q2 2023 and Q2 2022**



Source: Scheduled Commercial flows ENTSO-E, TSOs

- **Figure 23** shows netted electricity exchanges with EU neighbours in Q2 2023. For another quarter in a row, Great Britain returned to its traditional position of net importer during Q2 2023 (5 TWh). Norway retained its position as main net exporter to the EU (-3 TWh), despite a decrease of 11% of net exports compared with Q2 2022. Net



exports from the EU to Ukraine registered 25 GWh in Q2 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 that on 20 June 2023, the trade capacity from Continental Europe to Ukraine and Moldova had been increased to more than 1.2 GW.

**Figure 23 – Extra-EU electricity commercial scheduled exchanges in Q2 2023 and Q2 2022 – netted**



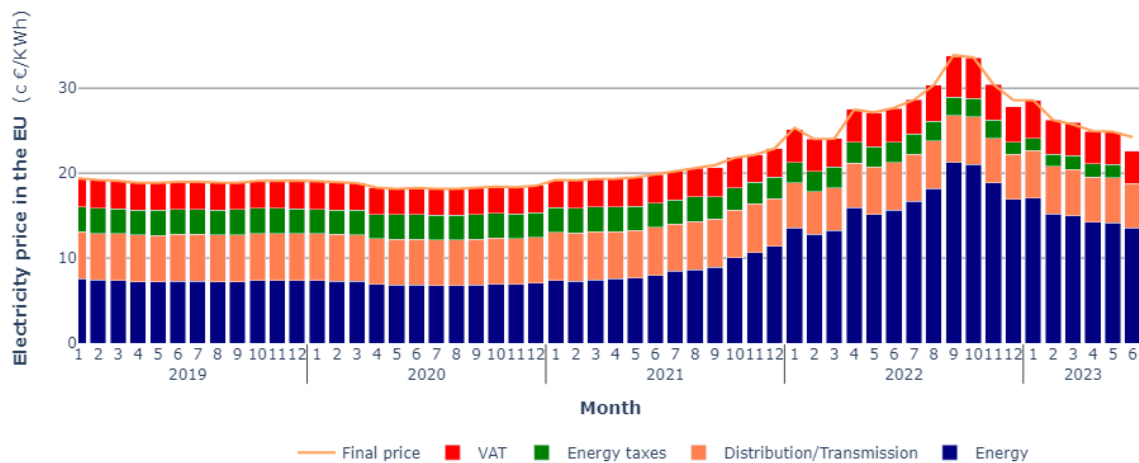
Source: Scheduled Commercial Flows ENTSO-E, TSOs. Negative values indicate net imports to the EU.

### 3 Retail markets

#### 3.1 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 Q1 2023 and kept on in Q2 2023, albeit prices remaining at higher levels than before the energy crisis.
- **Figure 24** 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 decreased from April to June 2023 from 26.5 c€/kWh to 25,8 c€/kWh being in average at 26.3 c€/kWh in Q2 2023, down by 4% compared with Q2 2022. Moreover, wholesale prices in Q2 2023 were 8% lower than in Q1 2023.

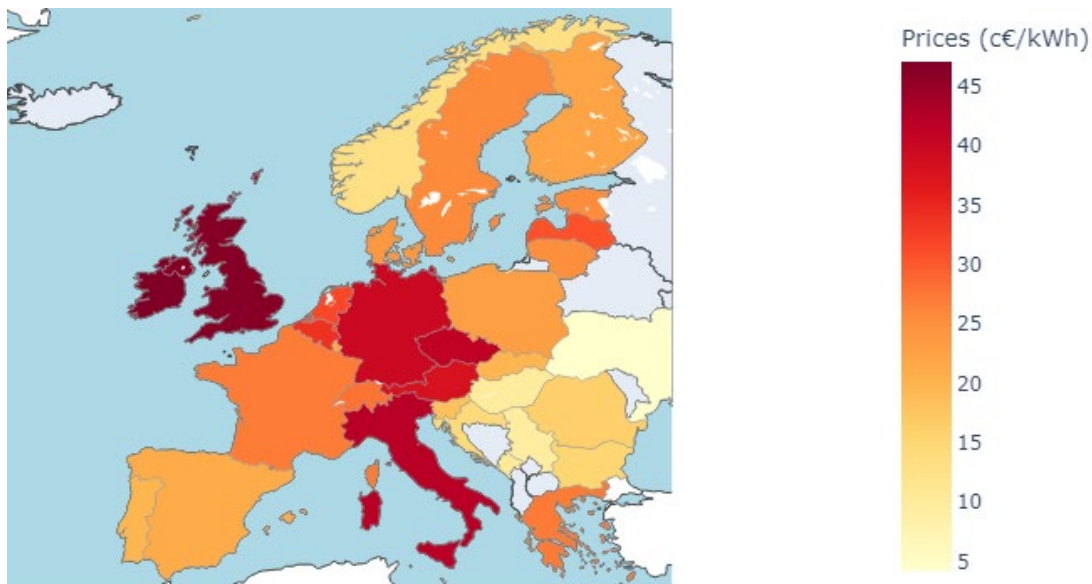
**Figure 24 - Monthly average electricity price in the EU, paid by typical household customers**



Source: Vaasaett

- **Figure 25** 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 25 – Comparison of average household retail electricity prices in European capitals, second quarter of 2023**

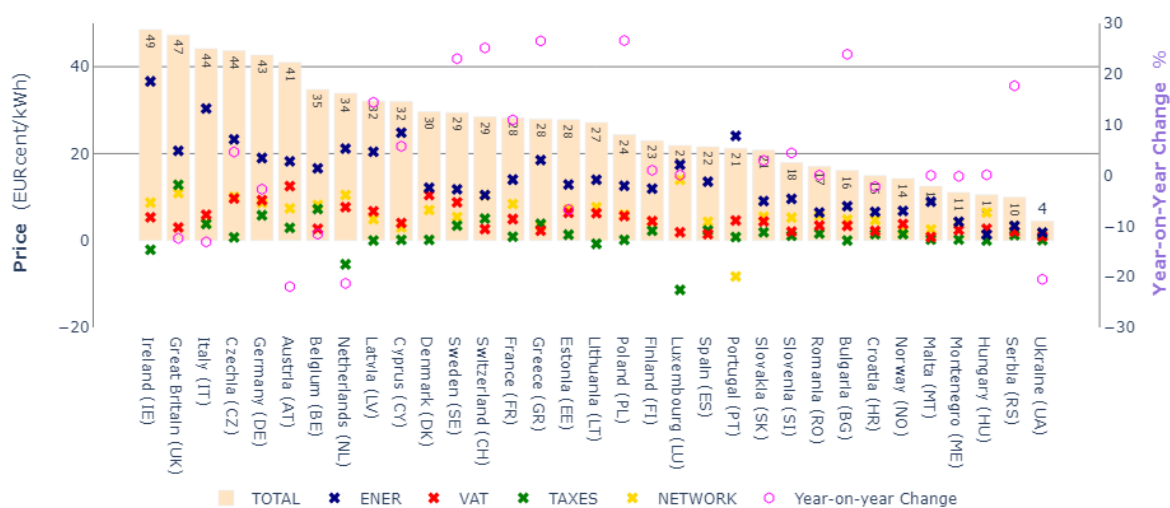


Source: Vaasaett

- **Figure 26** 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, Rome and Prague (47.1, 41.8 and 41.2 c€/kWh, respectively).

- In Q2 2023, the energy component share surpassed 50% of the total retail price in 19 EU capitals, up from 16 in Q2 2022. The energy component share is highest in Nicosia (75%) and Rome (72%). Amsterdam, Dublin, Vilnius, Luxembourg, and Lisbon, represent a special case as explained below. The lowest prices among EU capitals were recorded in Budapest (9.9 c€/kWh), Valletta (12.3 c€/kWh) and Zagreb (14.4 c€/kWh). 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 the lower the consumption, the lower the price per kWh. Similarly, consumers in Vilnius and Luxembourg receive a tax refund in their energy tax. Lisbon consumers receive a refund for the use of energy infrastructure, following a reduction in network access tariffs. Finally, in Dublin, due to increased amount of tax credit (PSO Payments), a typical consumer is effectively paying negative energy taxes.

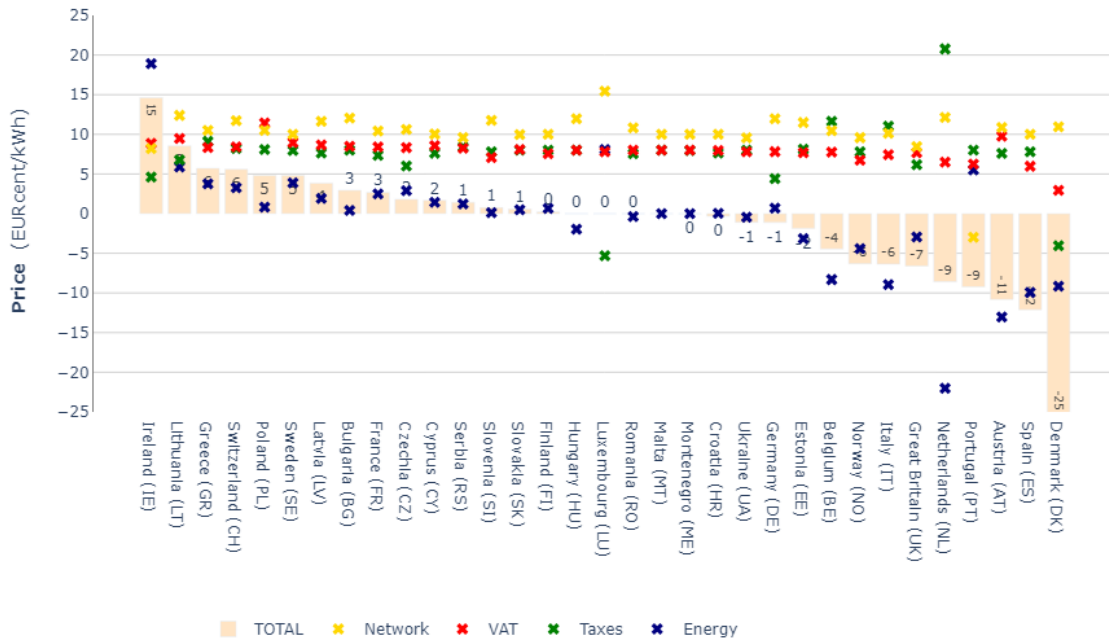
**Figure 26 – The Household Energy Price Index (HEPI) in European capital cities in Eurocents per kWh, Q2 2023**



Source: Vaasaett

- Compared to the same quarter of the previous year, the largest price increase in relative terms in Europe in Q2 2023 was observed in Rome (+239%), Prague (+180%) and Stockholm (+161%). The largest decreases were observed in Budapest (-63%), Lisbon (-51%) and Athens (-49%). As shown in **Figure 27**, 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 27 – Year-on-year change in electricity prices by cost components in the European capital cities comparing Q2 2023 with Q2 2022**

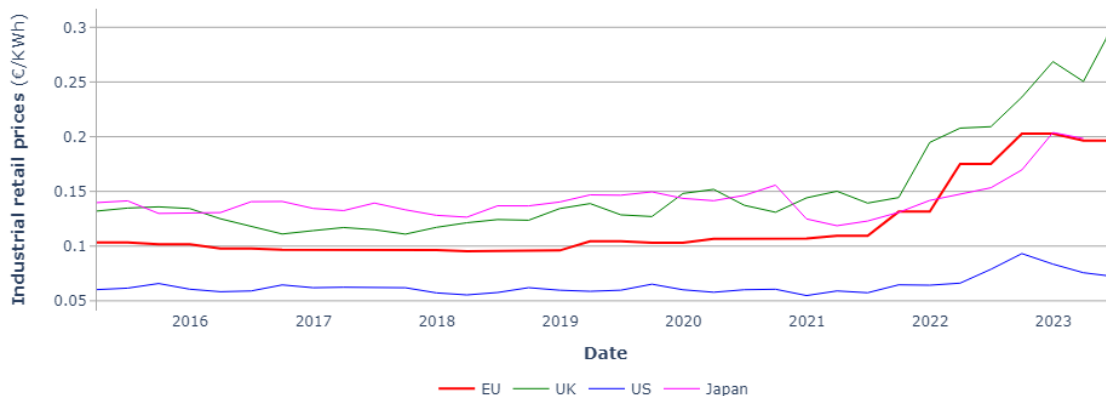


Source: Vaasaett

### 3.2 International comparison of retail electricity prices

- **Figure 28** displays industrial retail prices paid by consumers in the EU 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 of 12% in Q2 2023<sup>2</sup> compared with the equivalent quarter in 2022. Prices were still 3% lower than in the second half of 2022. Meanwhile, industrial electricity prices in the United States fell by 8% year-on-year, continuing a downward trend since the peak in the third quarter of 2022. Industrial electricity prices in the United Kingdom rose by 45% year-on-year in Q2 2023. Japanese prices were at a similar level as EU industrial prices.

**Figure 28 – 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>2</sup> 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.

## 4 Annex - Regional wholesale markets

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

**Figure 29 – 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 30 – Daily average power prices on the day-ahead market in the CWE region**



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

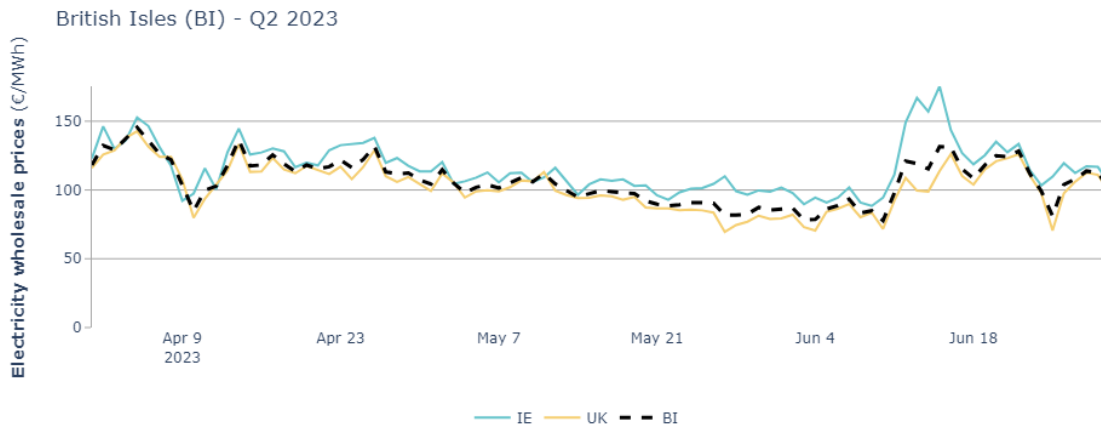
## 4.2 British Isles (GB, Ireland)

**Figure 31 – Monthly exchange traded volumes of day-ahead contracts and monthly average prices in Great Britain and Ireland**



Source: Nord Pool N2EX, SEMO, Utility Regulator

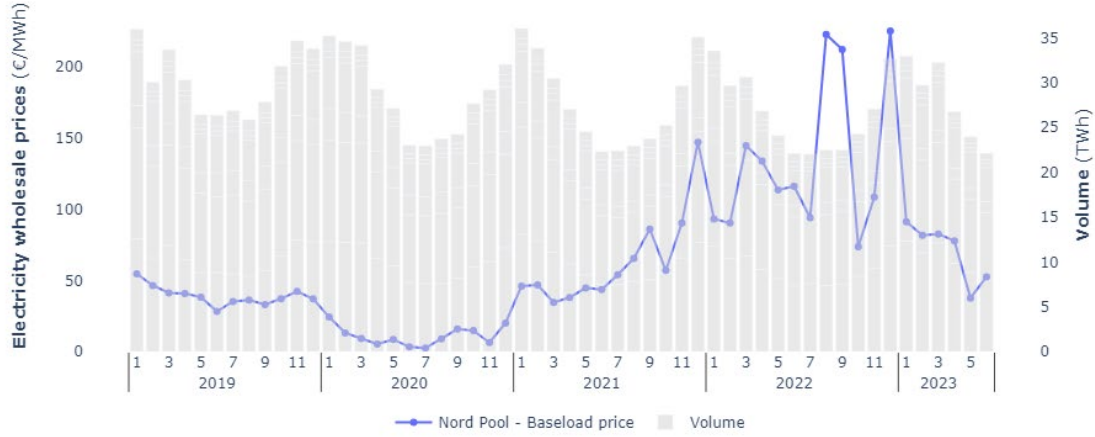
**Figure 32 – Daily average electricity prices on the day-ahead market in Great Britain and Ireland**



Source: Nord Pool N2EX, SEMO

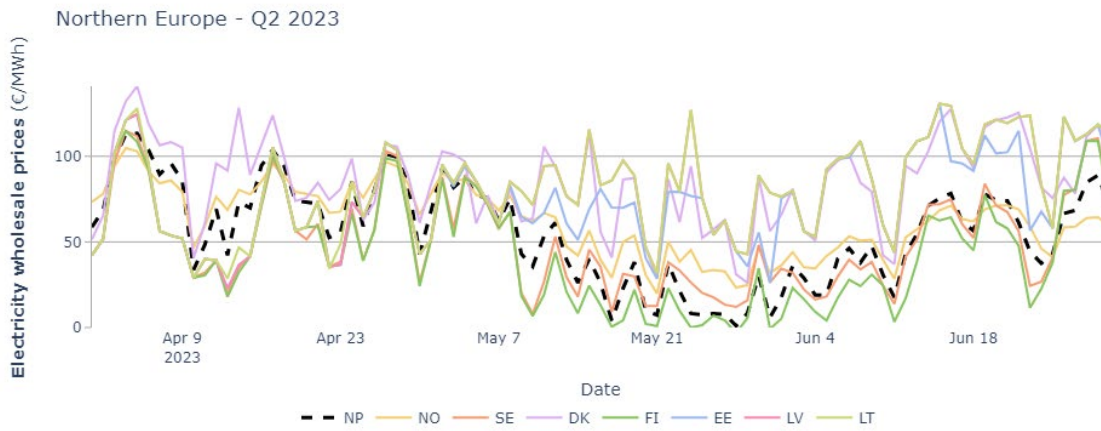
### 4.3 Northern Europe (Denmark, Estonia, Finland, Latvia, Lithuania, Sweden, Norway)

**Figure 33 – Monthly electricity exchange traded volumes and the average day-ahead wholesale prices in Northern Europe**



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

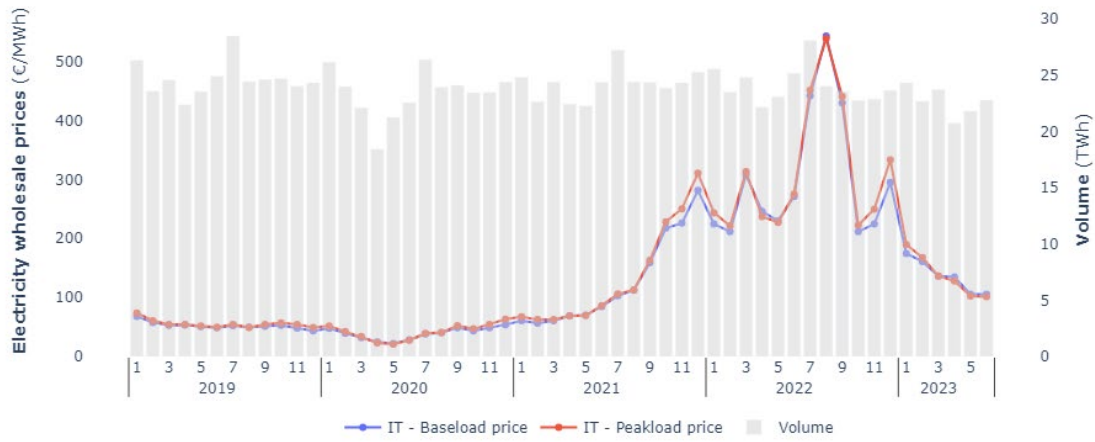
**Figure 34 – Daily average regional prices and the system price on the day-ahead market in the Nordic region**



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

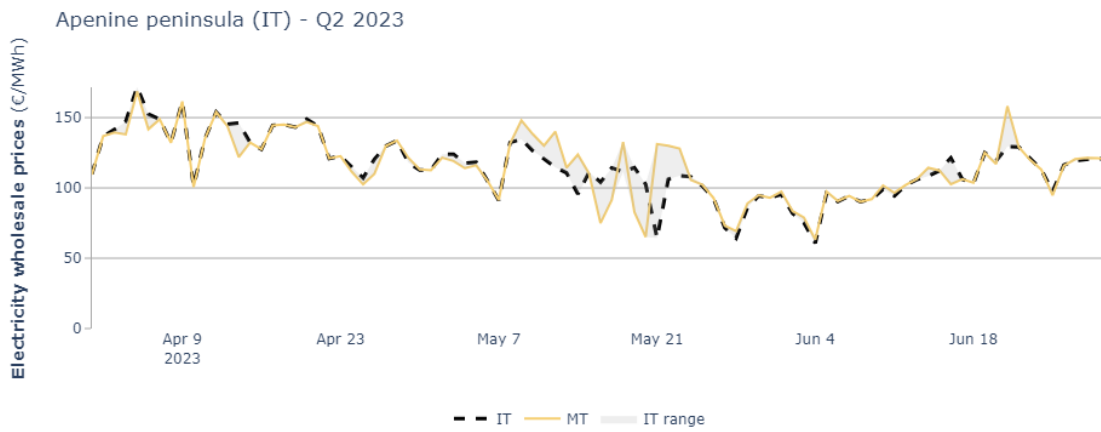
#### 4.4 Apennine Peninsula (Italy, Malta)

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



Source: GME (IPEX)

**Figure 36 – Daily average electricity prices in the Italian day-ahead market, within the range of different area prices**



Source: GME (IPEX)



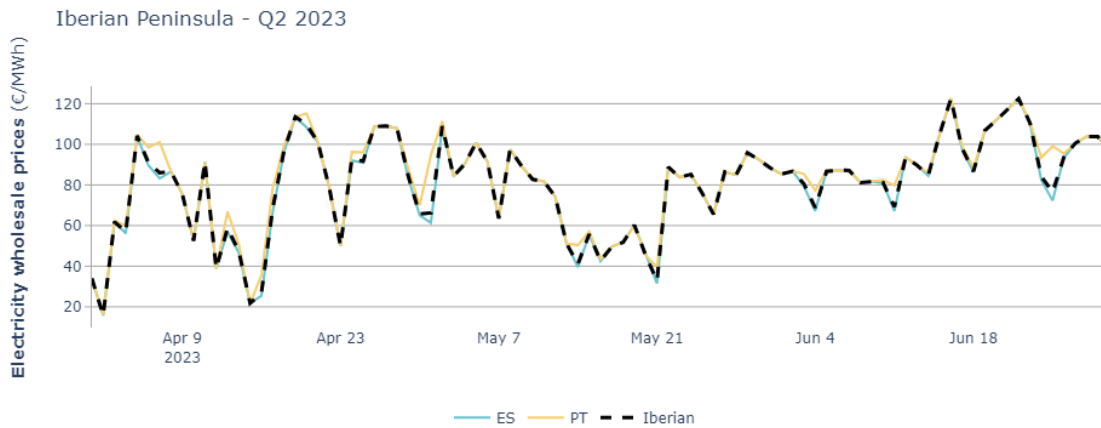
#### 4.5 Iberian Peninsula (Spain and Portugal)

**Figure 37 – Monthly electricity exchange traded volumes and average day-ahead prices in the Iberian Peninsula**



Source: S&P Global Platts, OMEL, DGEG

**Figure 38 – Daily average electricity prices on the day-ahead market in the Iberian Peninsula**



Source: S&P Global Platts, OMEL, DGEG

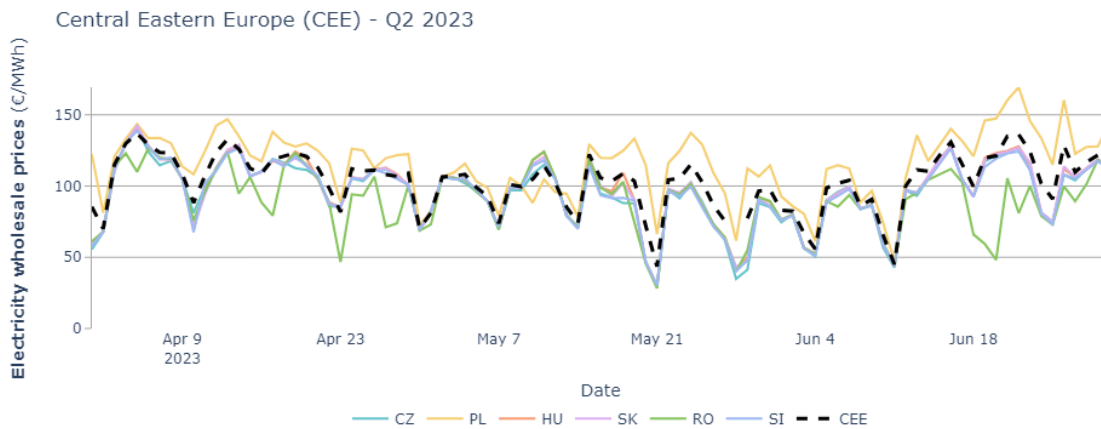
4.6 Central Eastern Europe (Czechia, Hungary, Poland, Romania, Slovakia, Slovenia)

**Figure 39 – 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 40 – Daily average power prices on the day-ahead market in the CEE region**



Source: Regional power exchanges

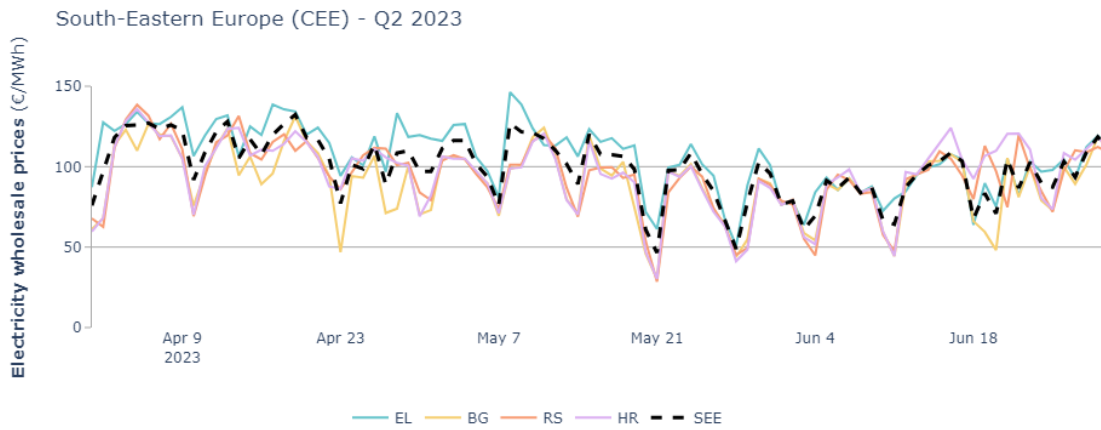
#### 4.7 South-Eastern Europe (Bulgaria, Croatia, Greece and Serbia)

**Figure 41 – Monthly traded volumes and baseload prices in South-Eastern Europe (SEE)**



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

**Figure 42 – 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.