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Wholesale Electricity Market Monitoring 2022

Key Developments

Publication date: 28 February 2023

Report in PowerPoint format

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ACER monitors EU energy markets to help Europe reach its energy goals

ACER monitors internal markets for electricity as mandated by the Clean Energy Package. In doing so, ACER provides guidance and evidence on how electricity markets can perform more efficiently, to the benefit of consumers.

In 2023, ACER will publish a series of topical overviews of the 2022 market situation.

- February: *key developments;*
- March: *list of emergency measures;*
- July: *evolution of cross-border capacity;*
  analysis of emergency measures;
- September: *security of supply analysis;*
- October: *market integration report;*
- November: *barriers to demand response;*
  synthesis and recommendations for 2023.

This document is the first of these publications.

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2023 ACER monitoring report: what is new?

The document provides an overview of EU wholesale electricity markets trends in 2022. It assesses these trends against the current EU goals. Specifically, the document addresses:

Electricity consumption and generation;

→ *Year-on-year evolutions of demand, renewable generation and installed capacity, capacity factors for gas and fuel…*

The evolution of electricity prices across timeframes;

→ *Evolution of prices for forward, day-ahead, intraday and balancing timeframes in 2022*

Greenhouse gas emission intensity of electricity generation;

→ *Evolution of CO_2 emissions across member states and through years*

The European reaction to the energy crisis.

→ *Key targets set to face the crisis*

To deepen and personalise the analysis of the main trends in 2022, access here dynamic charts on market trends.

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Key EU energy goals are more renewables & increased efficiency

As part of the European Green Deal, the Commission proposed in September 2020 to raise the 2030 greenhouse gas emission reduction target to at least 55% compared to 1990.

To achieve higher climate goals, as part of the REPowerEU* plan, the Commission is proposing to increase the current targets for renewable energy and energy efficiency (32% and 32.5% respectively by 2030):

- A share of **renewables of 45%** in the EU energy mix **;**
- An increase of the binding EU **energy efficiency target** from 9% to **13% when compared to the 2020 Reference Scenario**.

*Note: * The REPowerEU Plan is the response of the European Commission to the hardships and global energy market disruption caused by Russia's invasion of Ukraine.*

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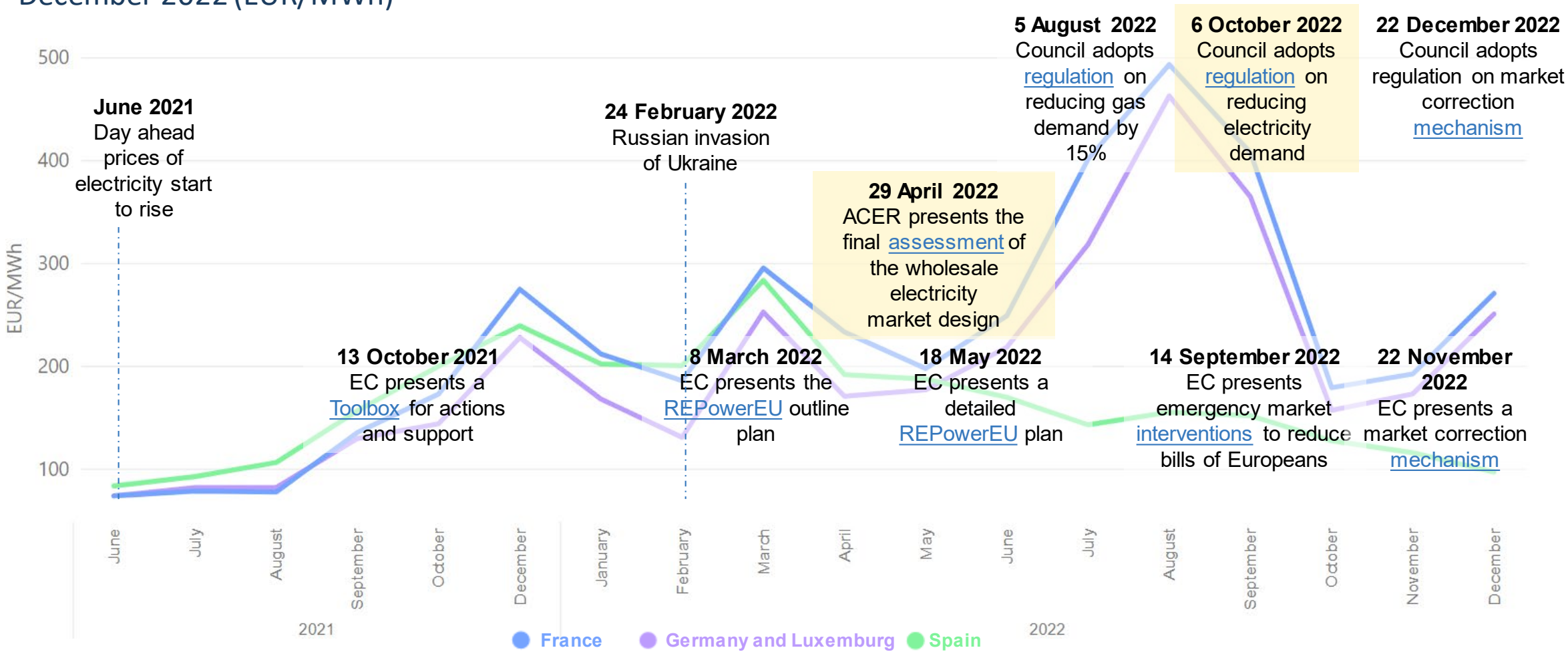
Crises and responses paced 2022

Evolution of monthly average day-ahead electricity wholesale prices in France, Germany and Spain – June 2021 to December 2022 (EUR/MWh)



Source: ENTSO-E transparency platform.

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Electricity consumption and generation

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In 2022, electricity decrease in consumption cancels out previous year's increase

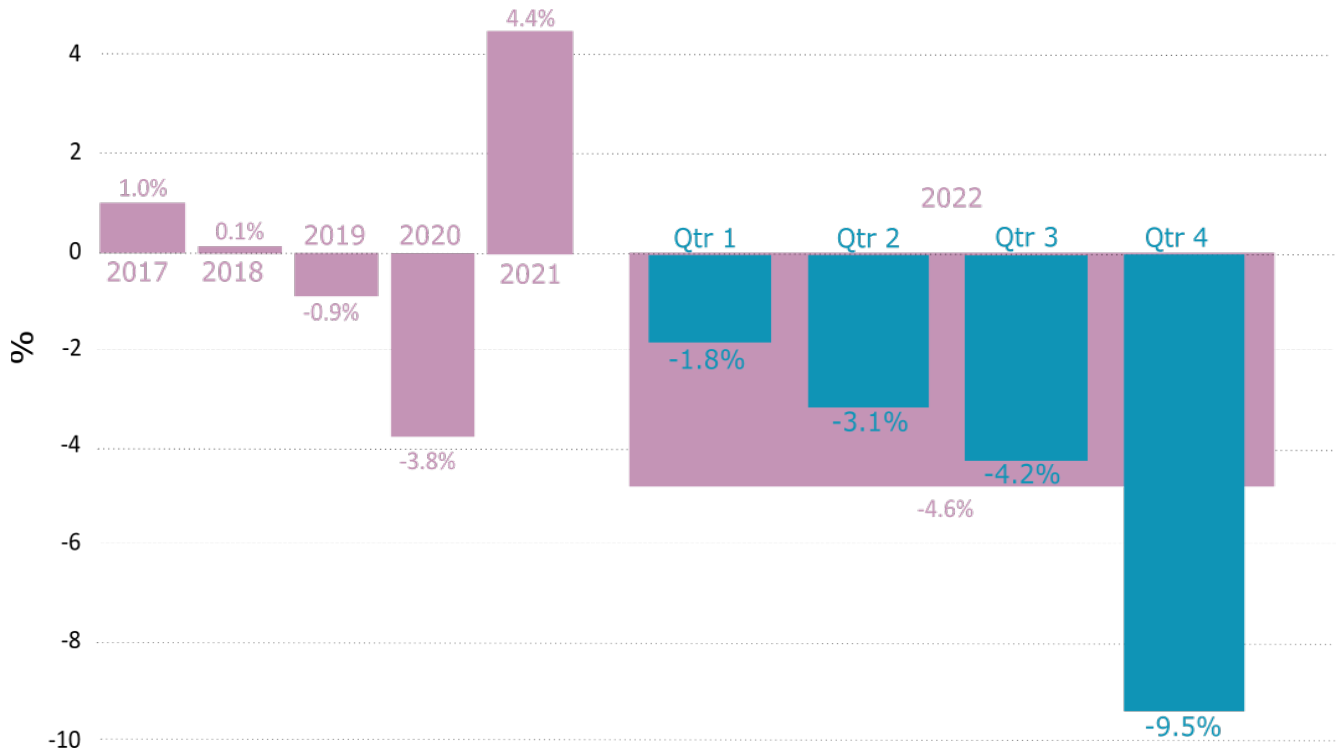
In **2021** the economic recovery drove a **recovery of electricity consumption** (+4.4%).

In **2022**, the energy crisis combined with a mild winter led to a **decrease in electricity consumption** (-4.6%).

Demand reduction increased throughout the year; it was five times more pronounced in the fourth quarter of the year 2022 as compared to the first quarter.

→ *The decrease in demand varied from -1.8% in the first quarter to -9.5% in the fourth quarter, comparatively to the same quarters in 2021.*

Changes in electricity consumption in the EU-27/EEA(Norway)*, Switzerland, 2017-2022 (%), and quarters 2022 (%)**



Source: ACER Calculations based on Eurostat data, completed with data by the European Network of Transmission System Operators for Electricity (ENTSO-E) – Transparency platform.

** Through the European Economic Area ('EEA') agreement Norway implements most EU energy legislation and is a member of the internal energy market.*

*** The figure compares electricity consumption for each quarter of 2022, to the consumption for the same quarter of 2021.*

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Generation: renewable energy remained above fossil despite lack of growth

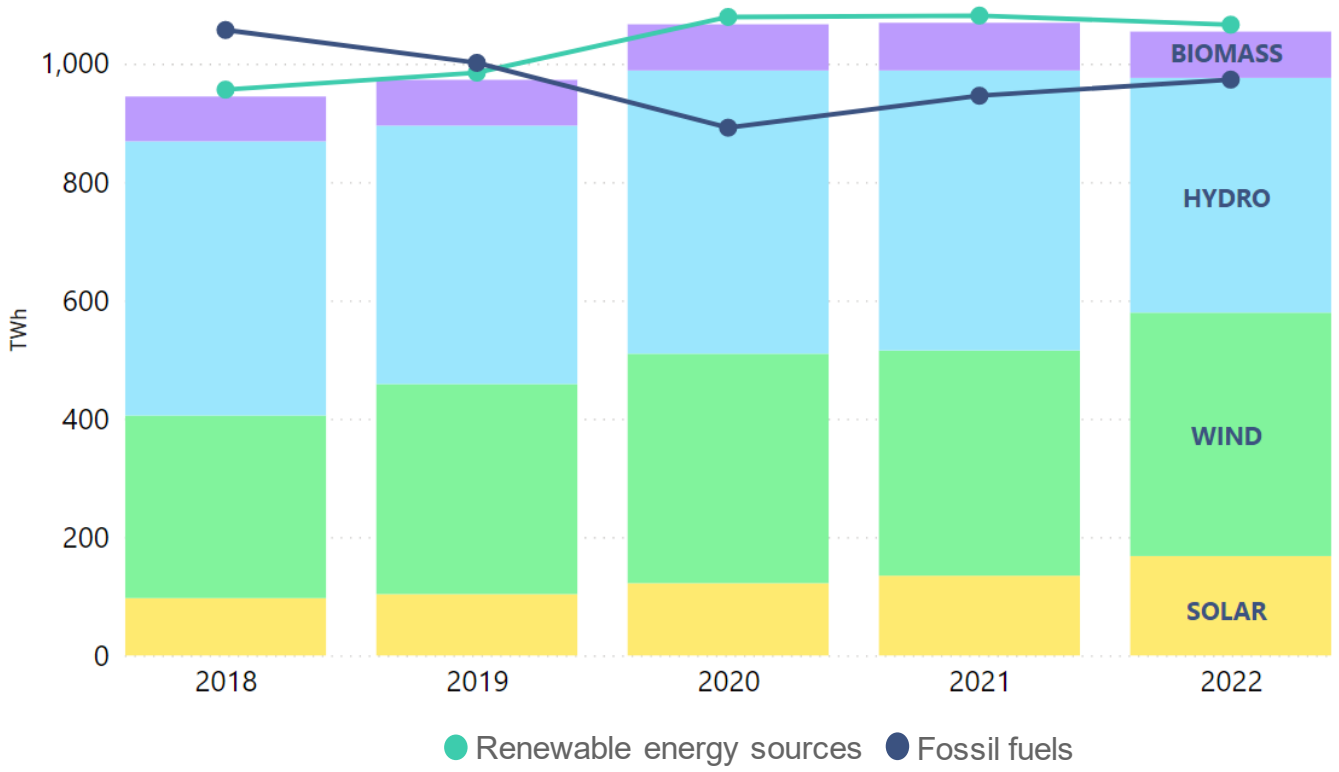
In 2022, the generation from renewable energy sources remained almost constant.

→ *The decline of hydro-power (-16%) resulted in wind energy becoming the primary renewable source.*

→ *Solar and wind power generation increased by 25% and 8% compared to previous year respectively.*

Despite a more carbonised mix and an amount of fossil fuel production which remains below the amount of RES generation, the gap is unfortunately decreasing since 2020.

Evolution of generation from renewables per type, compared to fossil fuels in the EU-27 / EEA(Norway), Switzerland – 2018-2022 (TWh)



Source: ENTSO-E Transparency platform.

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Nuclear and Hydro experienced significant lower amounts of generation

Despite a lower total power generation in 2022, the significant decrease in nuclear and hydro power generation…

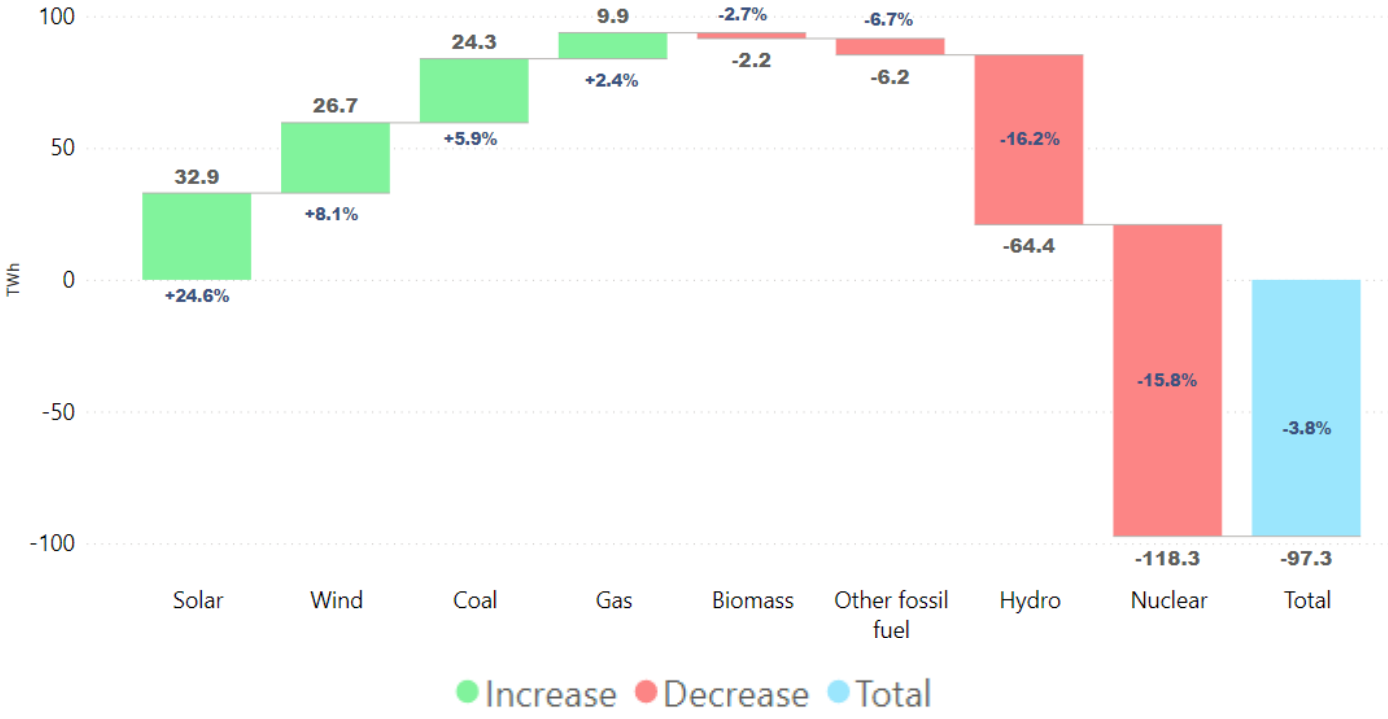
→ *In France, EDF shut down a record number of reactors for maintenance.*

→ *Heatwaves caused droughts and low reservoir levels in July.**

Was partly compensated by an increase in **solar** and **wind** power generation…

And an increase of coal and **gas** generation, impacting electricity prices and CO_2 emissions.

Year-on-year change for the main generation technologies in EU-27 / EEA(Norway), Switzerland – 2022 (TWh for absolute changes, % for relative changes)



Source: ACER calculations based on ENTSO-E data. Hydro pumped storage is not included.

** See JRC news, 18 July 2022 - Droughts in Europe in July 2022: almost half of the EU +UK territory at risk.*

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Coal-fired power plants were more active than gas-fired plants

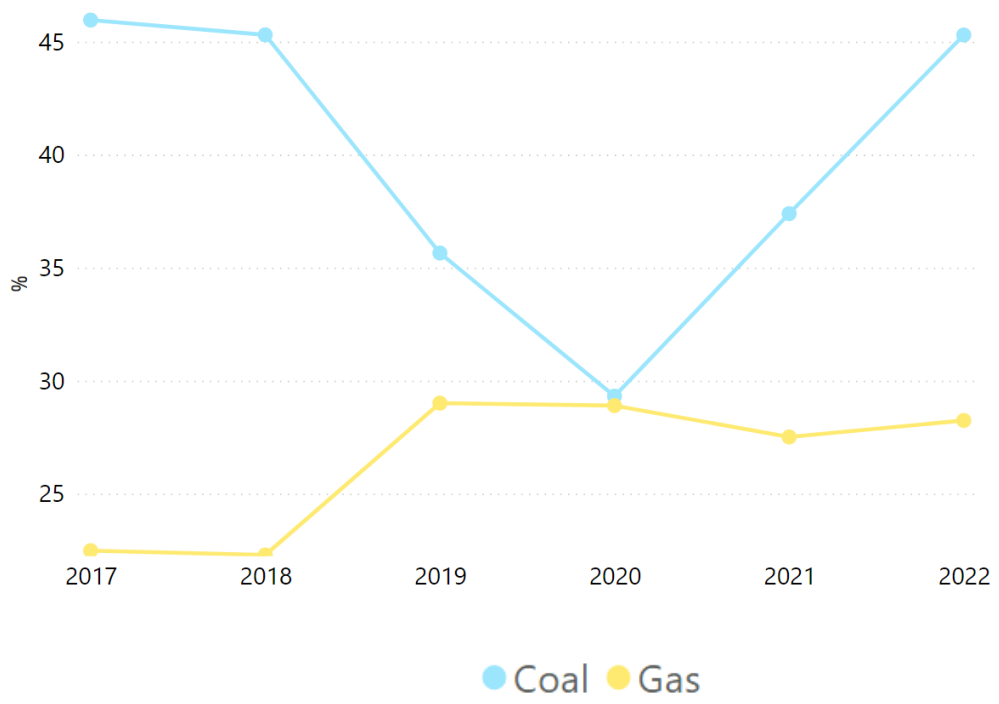
Capacity factors measure a power plant's **actual generation** compared to the **maximum amount** it could generate, without any interruption, in a given period.

The decrease in production from nuclear and hydroelectric plants led to increased capacity factors of both coal and gas-fired power plants.

Particularly, the utilisation of **coal-fired power plants** has experienced a significant increase in 2021 and 2022.

→ *A lower installed capacity of coal-fired power plants and high natural gas prices caused an increase in coal-fired power plants capacity factor (+8%). Coal prices, including the cost of emission rights, were lower than natural gas prices.*

Capacity factors of coal and gas-fired power plants EU-27 /EEA(Norway), Switzerland – 2022 (%)



Source: ACER calculations based on ENTSO-E data.
Note: Gas data include open and combined cycle gas turbine.

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Record in EU installed renewable capacity in 2022

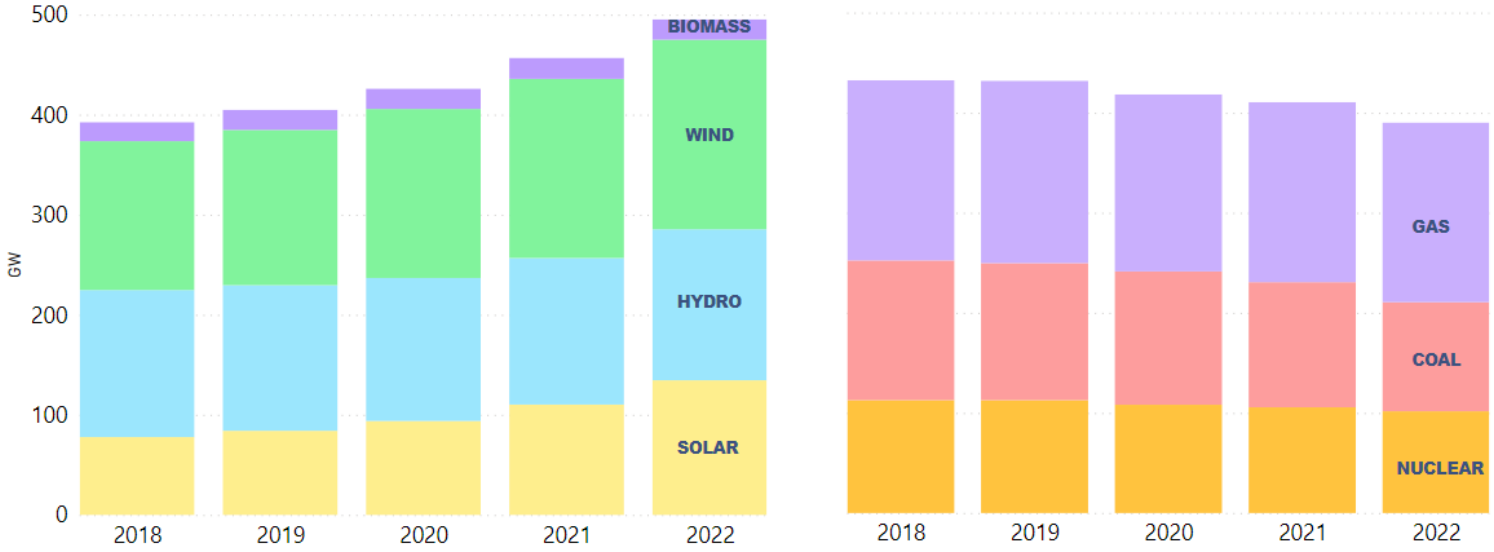
Installed capacity of renewables has been **growing steadily** in recent years.

→ **Wind** and **solar** continue to be contributing most to the growth

Installed fossil fuel capacity has experienced the largest reduction in recent years, with the decommissioning of power plants.

→ **Nuclear** and **gas** capacity remained stable, with **coal** decreasing by 13%

Evolution of installed capacity for renewable (left) and conventional (right) generation technologies, in the EU-27 /EEA(Norway), Switzerland – 2018-2022 (GW)



Source: ENTSO-E Transparency Platform.

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Electricity prices

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Record high gas prices drove day-ahead electricity price increases in Europe

In 2022, a sharp increase in electricity prices was observed in all EU markets, due to record high gas prices.

→ *Highest average prices were registered in Italy North (306.15 EUR/MWh) while lowest average prices were registered in the Nordic region (136.26 EUR/MWh).*

On 4 April 2022 a French price spike led to day-ahead price cap increase.

→ *That day the price in France peaked at 2987 EUR/MWh, triggering a price cap increase in the day-ahead market from 3000 EUR/MWh to 4000 EUR/MWh.*

On 17 August 2022 Baltic a price spike reached maximum clearing price

→ *That day the price in the Baltic region reached the maximum clearing price of 4000 EUR/MWh for one hour, even after activation of Lithuanian Peak Load Reserves.*

Evolution of average annual day-ahead electricity prices in some European markets - 2022 (EUR/MWh)

Source: ACER calculations based on ENTSO-E data.
Note: The figure includes only a selection of the largest markets. The day-ahead prices for the regions 'Nordic', 'Baltic', and 'Iberia' are the average of prices of the included bidding zones.

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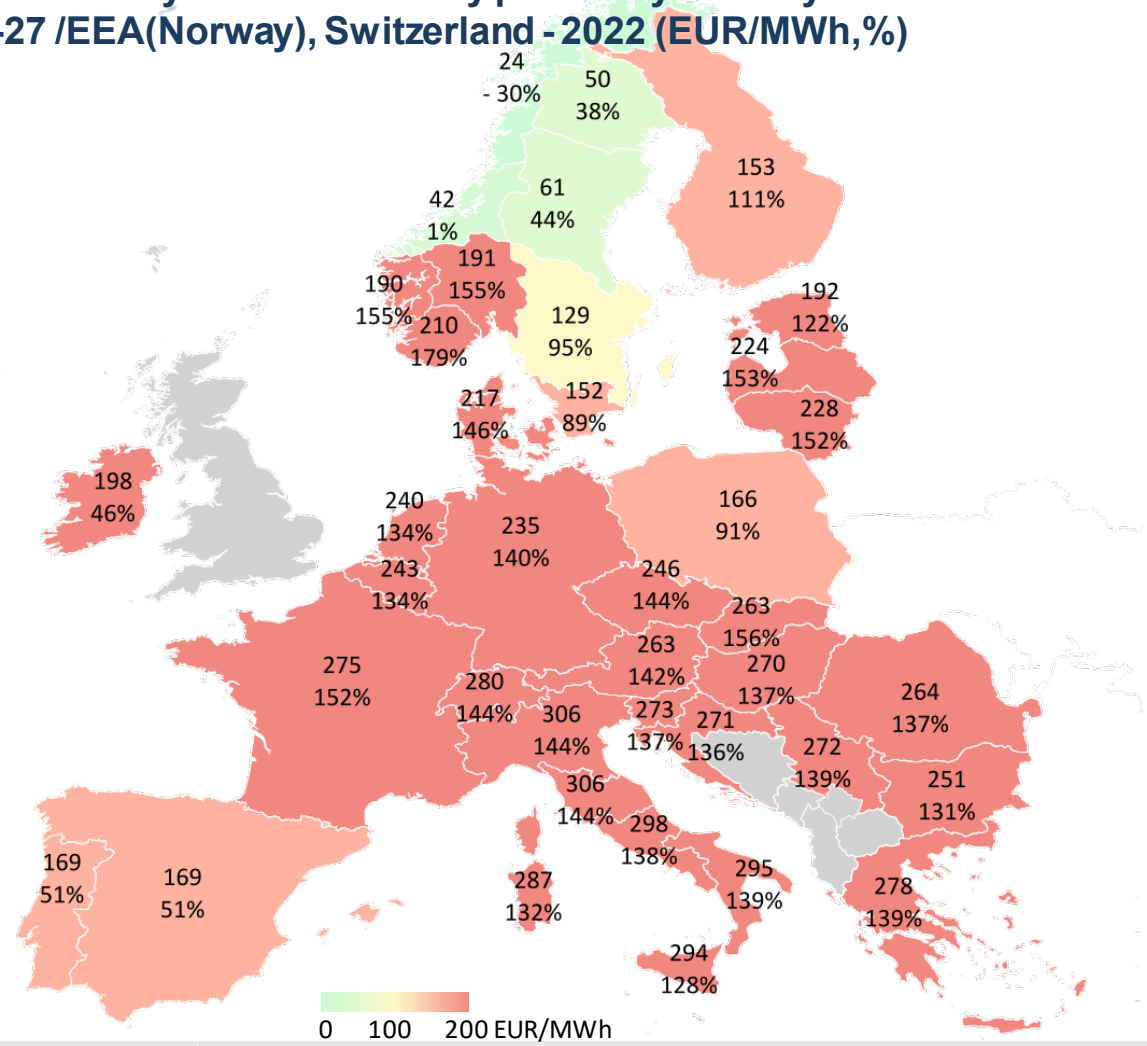
In 2022, day-ahead prices increased sharply everywhere

From around 35 EUR/MWh in 2020, average prices reached 80 EUR/MWh in 2021, **and between 150 and 300 EUR/MWh in 2022.**

→ *The **highest prices** were registered in Central Europe, Italy, Greece and France*

→ *The **lowest prices** were registered in the Nordic area, one reason being **hydro reservoirs.***

Average annual day-ahead electricity prices & year-on-year difference in the EU-27 /EEA(Norway), Switzerland - 2022 (EUR/MWh,%)



Source: ACER calculations based on ENTSO-E transparency platform.
Note: While not part of the EU, Norway and Switzerland also provide data to the ENTSO-E's Transparency Platform.

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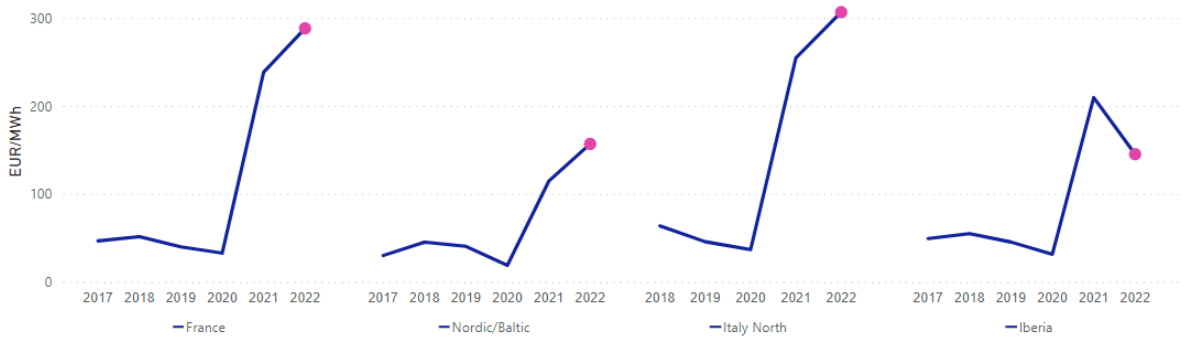
Imbalance and intraday prices followed similar upward trends

In 2022, imbalance prices and intraday prices reached similar heights as day-ahead prices did.

On 6 January 2023, ACER has approved changes in the methodologies for automatically increasing the maximum price limit in case of price spikes, to allow a more gradual increase of the day ahead and intraday price limits than with the previous rules.

Evolution of average annual intraday prices in some European markets - 2022 (EUR/MWh)

Evolution of average annual imbalance prices* in some European markets - 2022 (EUR/MWh)



Source: ACER calculations based on ENTSO-E data
** Prices for Positive and Negative Imbalances are averaged together*

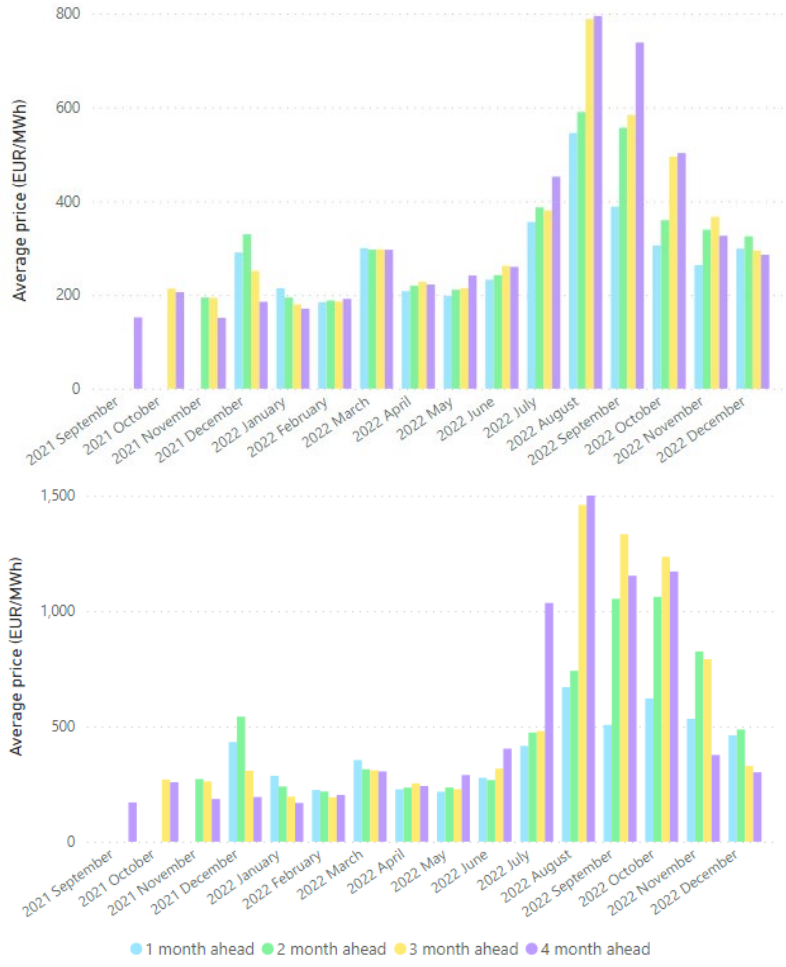
Forward markets also reached high price levels

The prices for various monthly forward products experienced an upward trend, especially when products for delivery in autumn and winter months started to be considered.

→ *In August, forward prices for monthly products reached levels of up to 1500 EUR/MWh in France.*

Variations in forward prices correlate with those of day-ahead prices. However, day-ahead prices in France never reached the levels forecasted by the forward prices.

Evolution of forward prices for monthly products* - 2022 (EUR/MWh) – Above for Germany, below for France



Source: ICIS data.
** x-axis is the month of trading, the legend refers to the month of delivery. Example: For 2022 January, 1 month ahead bar refers to trades happening in January that consider delivery in February*

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Market coupling supported day-ahead price convergence, partly alleviating price spikes

Price convergence provides an indication of electricity markets integration in Europe :

Increases in the past were driven by the following:

→ *Market coupling, network expansion, or other actions leading to an increase in commercial cross-zonal capacity.*

Full price convergence is **not an objective** in itself.

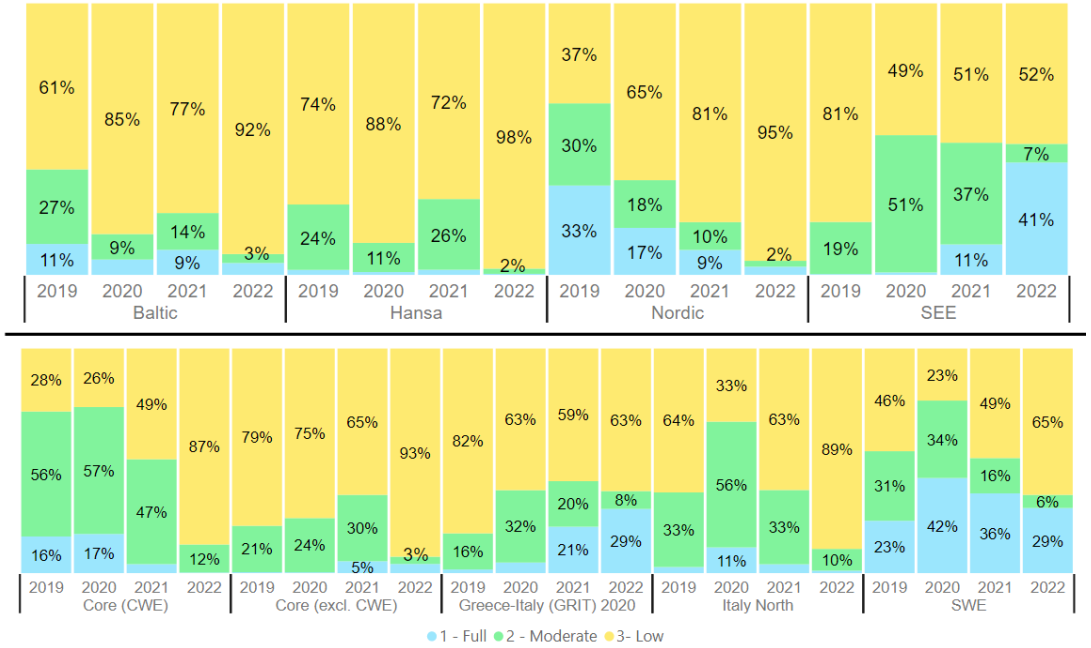
→ *It would require **overinvestment** in network infrastructure.*

June 2022 was a decisive milestone in the pan-European day-ahead market integration, with the go-live of the Core Flow-Based Market Coupling Project, required by regulation.

This go-live also marked the inclusion of the Croatian – Hungarian border in the day-ahead market coupling.

The energy crisis caused significant disparities in energy prices across regions in 2022, leading to decreases in absolute price convergence. Although available transmission capacity did not prevent decreasing price convergence, it did shield against more extreme price spikes.

Day-ahead price convergence in Europe by region - 2022 (% of hours)



Full price convergence: <1 EUR/MWh difference. Moderate price convergence: 1-10 EUR/MWh difference. Low price convergence: >10 EUR/MWh difference. The number of bidding zones varies among regions (Capacity Calculation Regions); full price convergence is more complex to achieve in regions with a higher number of zones.

Source: ACER calculations based on ENTSO-E data.
Note: Ex-post changes in the ENTSO-E Transparency Platform have influenced previous years' convergence factors of the regions: Italy North & Core (CWE)

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Despite increasing renewable energy source capacities, 2022 had few negative prices

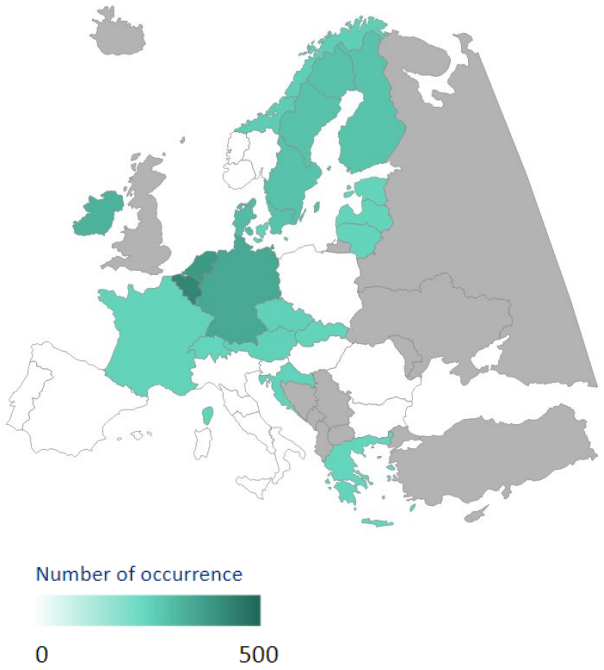
Negative prices usually appear at times of **high generation from renewables** in combination with **low demand.**

In 2022, the occurrences of negative prices reached pre-2019 levels (2020 was exceptional due to very low demand during the lockdown)

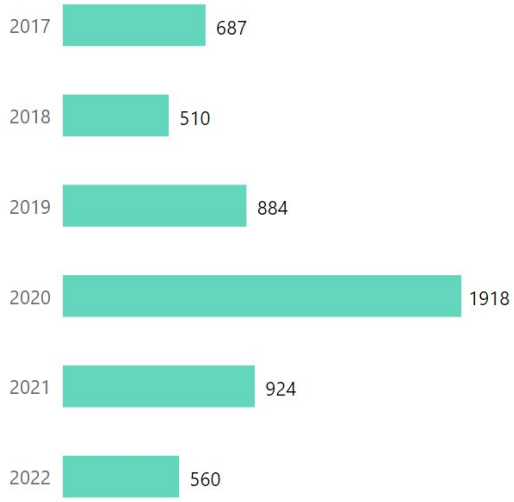
→ *The **Belgian** and **Dutch** bidding zones have seen the highest occurrence of negative prices (113 and 86 respectively).*

Negative prices are usually driven by mild weather conditions. In 2022, they seem to be also correlated with demand reduction, as half of the negative prices were observed during the last quarter of the year, and 20% in December alone.

Day Ahead negative prices in EU Member States in 2022 (number of occurrences)



Evolution of negative prices in the EU 2017–2022 (number of occurrences)



Source: ACER calculations based on ENTSO-E data.

Note: One occurrence corresponds to one hour during which prices are negative.

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Greenhouse gas emission of electricity generation

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Emission intensity of electricity generation: downward trend broken for the last two years

Electricity generation represents around 20% of total greenhouse gas emissions in Europe.

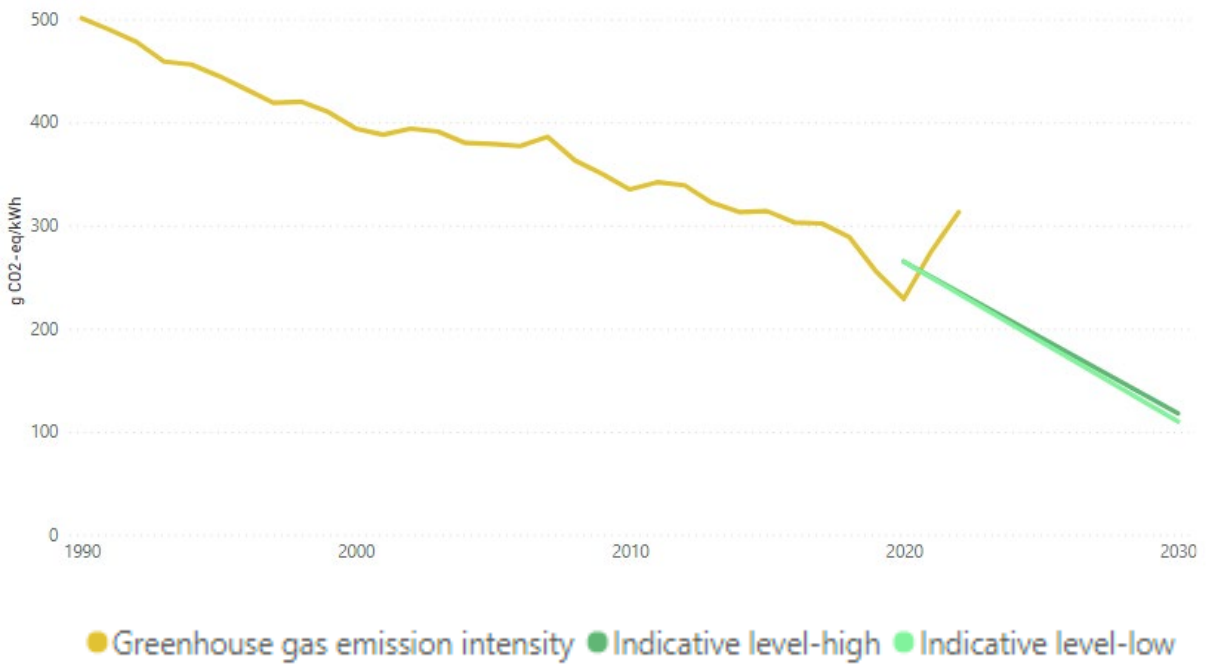
Greenhouse gas emission intensity of electricity generation has been **continuously decreasing** over the last 3 decades. However, **in the last two years the trend has changed.**

→ *The economic recovery after the pandemic in 2021 and the energy crisis in 2022 have moved us away from the trajectory set to achieve the emissions reduction objectives.*

→ *2022 is the second consecutive year in which emissions intensity of electricity generation has increased.*

→ *Overall electricity generation GHG emissions are expected to increase in 2022 around 2.6% compared to 2021 while emission intensity is expected to increase around 12%.*

Greenhouse gas emission intensity* of electricity generation, EU-27 average – 1990-2030 (g CO2-eq/kWh)



Source: EEA. Note: Greenhouse gas emission intensity is calculated by taking the total emissions from electricity production (in carbon dioxide equivalent or CO2-eq), and dividing it by the gross electricity production. Data for 2022 is calculated.

* https://www.eea.europa.eu/ims/greenhouse-gas-emission-intensity-of-1

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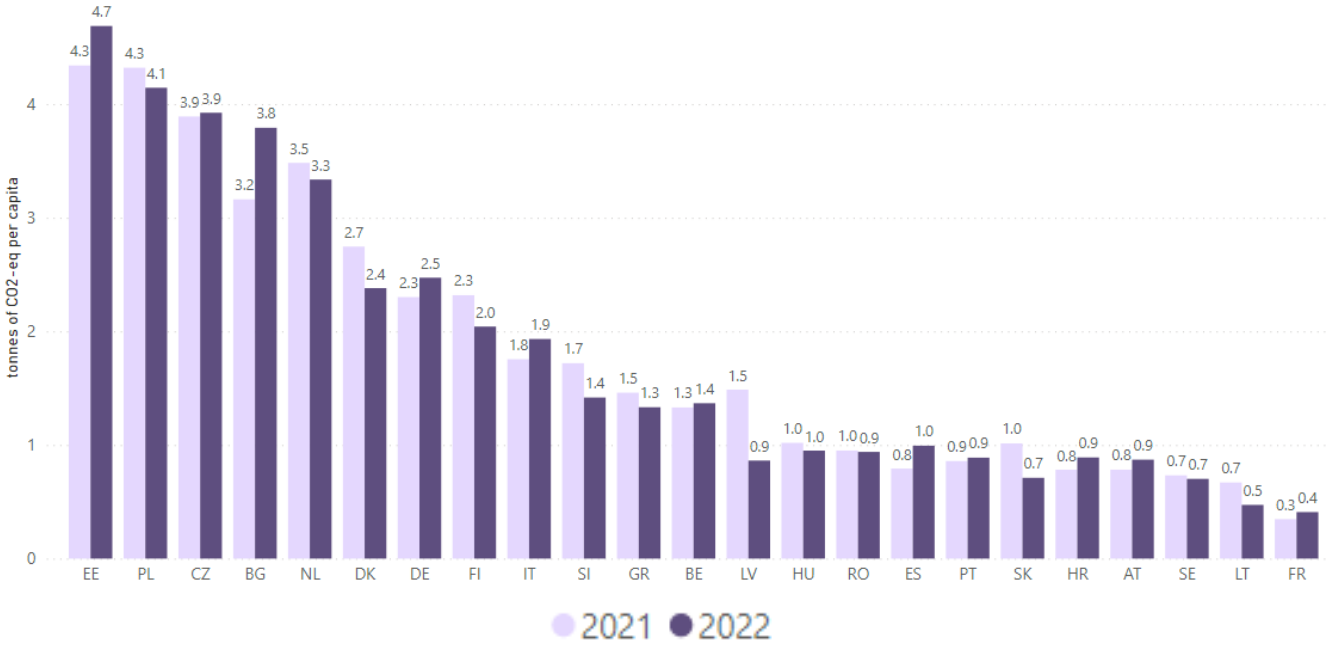
Nearly all Member States have increased emissions from electricity generation in 2022

Total emissions of a Member State are the product of the **volumes of electricity production** and the **emission intensity**. Emission intensity depends on a Member State's specific electricity generation mix.

Electricity production within a Member State depends, inter alia, on **population**, **quantity of industrial production**, and on whether the Member State is a net electricity **importer or exporter.**

→ *Countries with the highest per capita emissions from electricity generation maintain the trend from the previous year.*

Total Greenhouse gas emissions from electricity generation per capita and country – 2021, 2022 (tonnes of CO2-eq per capita)



Source: ACER calculations based on EEA, ENTSO-E and Eurostat.

Note: Cyprus, Ireland, Luxembourg and Malta are not included in the analysis due to the lack of information. This indicator has been calculated as the ratio of CO2e emissions from public electricity and heat production related to electricity production, and total population. CO2e emissions have been calculated following IPCC guidelines for National Greenhouse Gas Inventories..

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EU reaction to the crisis

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EU set key targets to face energy crisis

In order to tackle the energy crisis, the European Commission has set out a number of objectives that have been approved by the European Council, including:

Reducing electricity use, targeting most expensive hours.

→ *Member States will strive to reduce overall electricity use by 10% by the end of March 2023; they must reduce consumption during peak hours by at least 5%.*

Capping revenues of electricity producers, to curb the profit of electricity producers that do not use gas to generate electricity.

→ *The cap is set at 180 EUR/MWh for generators with low operating costs, such as renewables, hydro*, nuclear.*

Securing a solidarity contribution from fossil fuel businesses, to ensure that the exceptional profits of fossil fuel-powered generators contribute to the general effort.

→ *The contribution targets companies' profits that have grown by over 20% compared to the average profits of the previous four years.*

Developing a market correction mechanism to limit excessive gas spikes, to limit episodes of extraordinarily high gas prices in the EU and thus reduce the impact of price hikes on citizens and the economy.

→ *The mechanism will be activated under certain conditions: the month-ahead price on the Title Transfer Facility (TTF) exceeds 180 EUR/MWh for three working days; and the month-ahead TTF price is 35 EUR higher than a reference price for LNG on global markets for the same three working days.*

Member States reacted to the crisis with ad-hoc measures. ACER will publish a complete list of measures in March 2023 and a review of the high-level impacts of the measures by July 2023.

Source: ACER compilation of public sources and contributions from National Regulatory Authorities.

* *Hydropower installations without reservoir.*

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Conclusion

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2022: crises that could lead to positive changes

Challenges…

In 2022, Russia's invasion of Ukraine led to high electricity prices, with demand destruction and increased CO_2 emissions.

Electricity prices sharply increased, with varied impact based on local importance of gas in the generation portfolio, reaching 150-300 EUR/MWh in 2022.

High electricity prices were associated with a decline in demand throughout the year, with the most significant drop seen in the last quarter of 2022.

Despite a decrease in demand, increased coal and gas power generation led to **increased CO_2 emissions from the electricity sector for the second consecutive year.**

… and opportunities.

In 2022, EU collectively tackles energy issues, accelerates transition to renewables amid crisis.

Despite a lack of growth and a decline in hydro power, **renewable energy generation remained higher than fossil fuel generation.**

The need for more renewable sources is clear. In 2022, there was a **significant decrease in installed fossil fuel capacity and a significant increase in installed renewable capacity.** The impact of emergency measures on investments remains to be assessed.

The EU has demonstrated unity and solidarity by implementing measures to address high prices, windfall profits, and solidarity mechanisms.

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