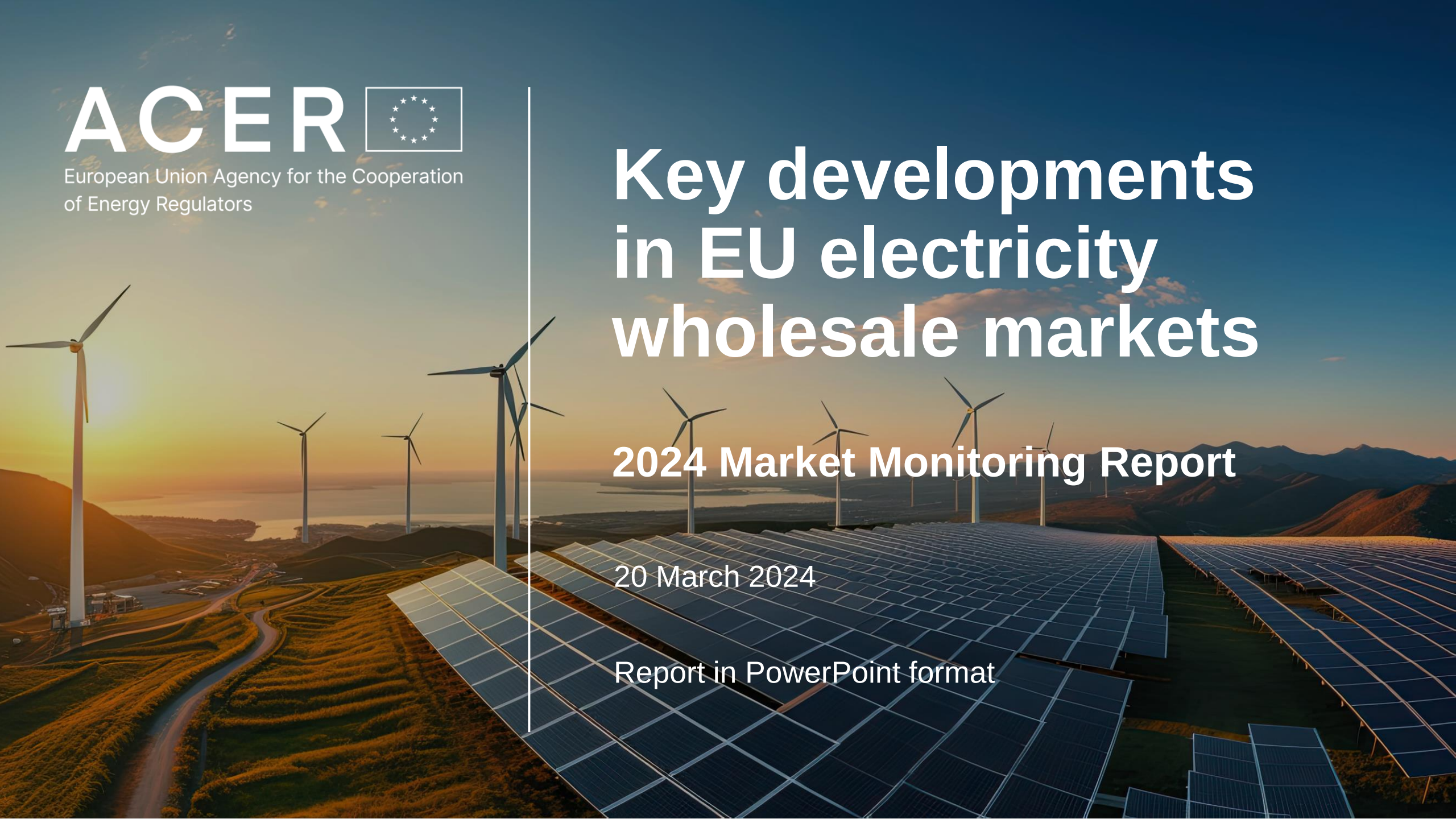

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# Key developments in EU electricity wholesale markets

## 2024 Market Monitoring Report

20 March 2024

Report in PowerPoint format

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# Energy prices receded after turbulent times

**In 2022, a gas crunch led to soaring energy prices,** but emergency measures shielded consumers. The EU's collaborative framework played a crucial role in effectively managing the crisis and ensuring security of energy supply.

**In 2023, low-carbon energy makes a comeback, reshaping energy markets' fundamentals.** This ACER overview first presents the key trends in EU wholesale electricity markets:

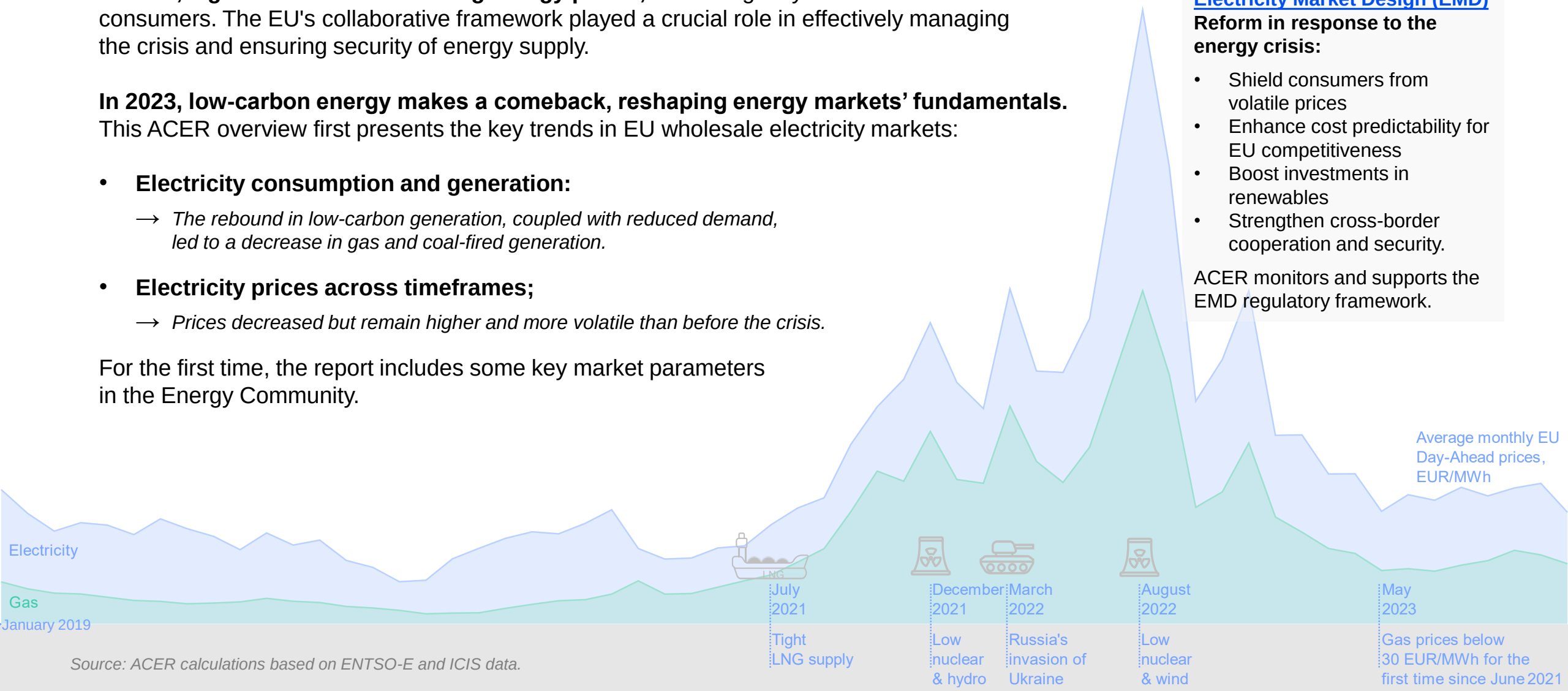
- **Electricity consumption and generation:**
  → *The rebound in low-carbon generation, coupled with reduced demand, led to a decrease in gas and coal-fired generation.*
- **Electricity prices across timeframes;**
  → *Prices decreased but remain higher and more volatile than before the crisis.*

For the first time, the report includes some key market parameters in the Energy Community.

**Electricity Market Design (EMD)**
**Reform in response to the energy crisis:**

- Shield consumers from volatile prices
- Enhance cost predictability for EU competitiveness
- Boost investments in renewables
- Strengthen cross-border cooperation and security.

ACER monitors and supports the EMD regulatory framework.




*Source: ACER calculations based on ENTSO-E and ICIS data.*

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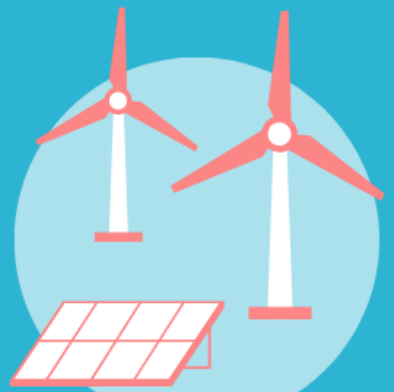
# EU wholesale electricity market: 2023 in numbers

## -3.4%

Decrease in electricity demand in 2023

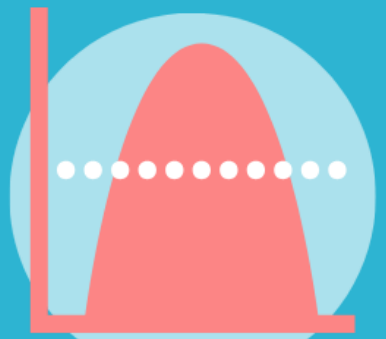
## +84 TWh

Additional wind and solar generation



## 93 €/MWh

Average EU Day-Ahead price



## 12-fold

Increase in occurrences of negative prices

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# Electricity demand and generation

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# In 2023, power prices drop and still demand dips

In **2022** the energy crisis led to a decrease in **electricity consumption**.

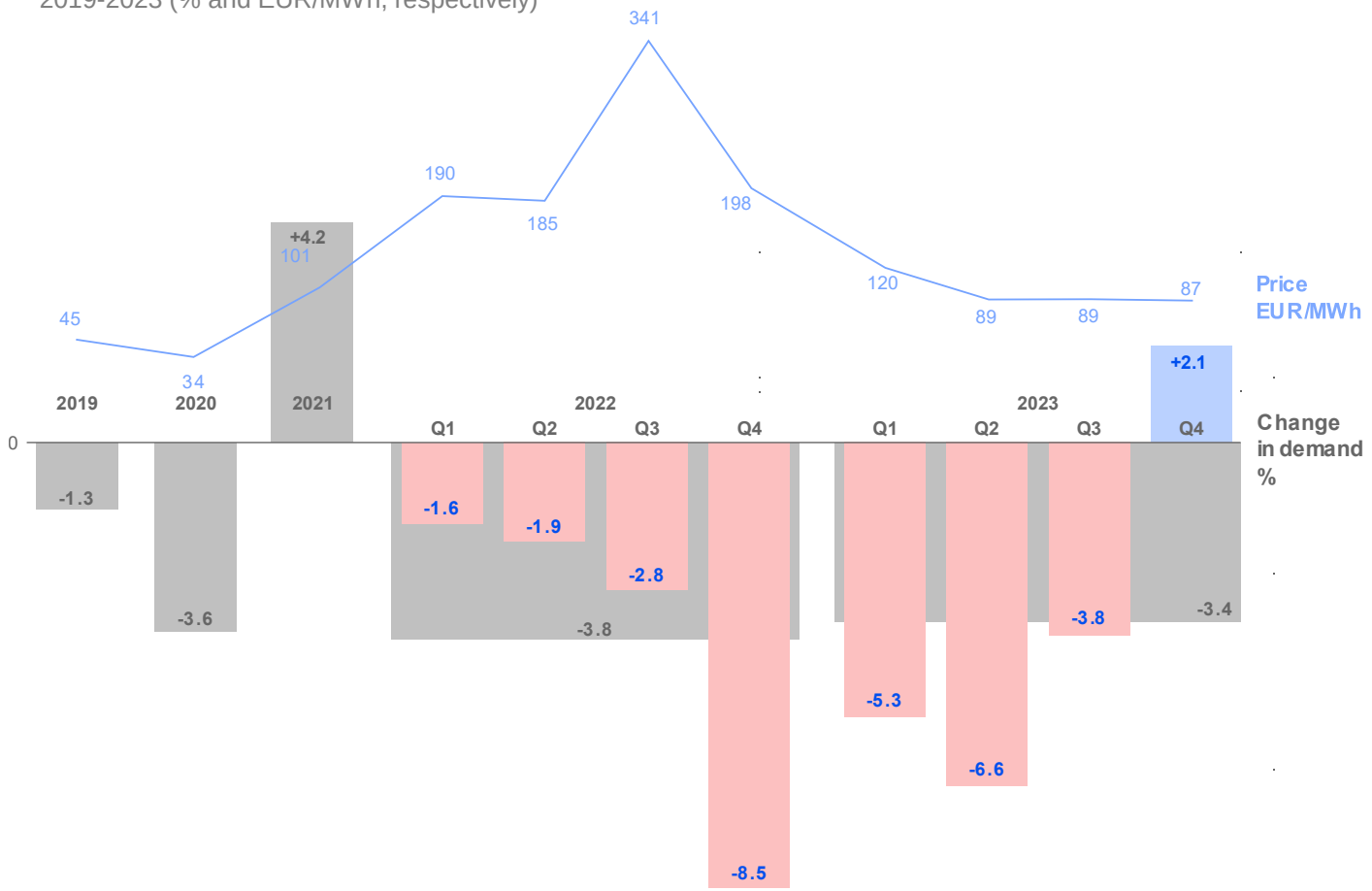
In **2023**, despite lower spot prices, **demand continues to fall**, influenced by delayed economic effects and the phasing out of support measures.

Gas and electricity prices did not return to pre-pandemic levels and continue to pose challenges for inflation and competitiveness in many EU countries.

Demand continued to decline until Q3 2023, playing a key role in cutting reliance on fossil fuel.

## Electricity demand: overall decrease in 2023, rebound at the last quarter

Changes in electricity consumption and average day-ahead prices in the EU-27/EEA(Norway)*, Switzerland, 2019-2023 (% and EUR/MWh, respectively)**




*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 2023, to the consumption for the same quarter of 2022.*

# Fossil phase out: low carbon replaces fossil fuels

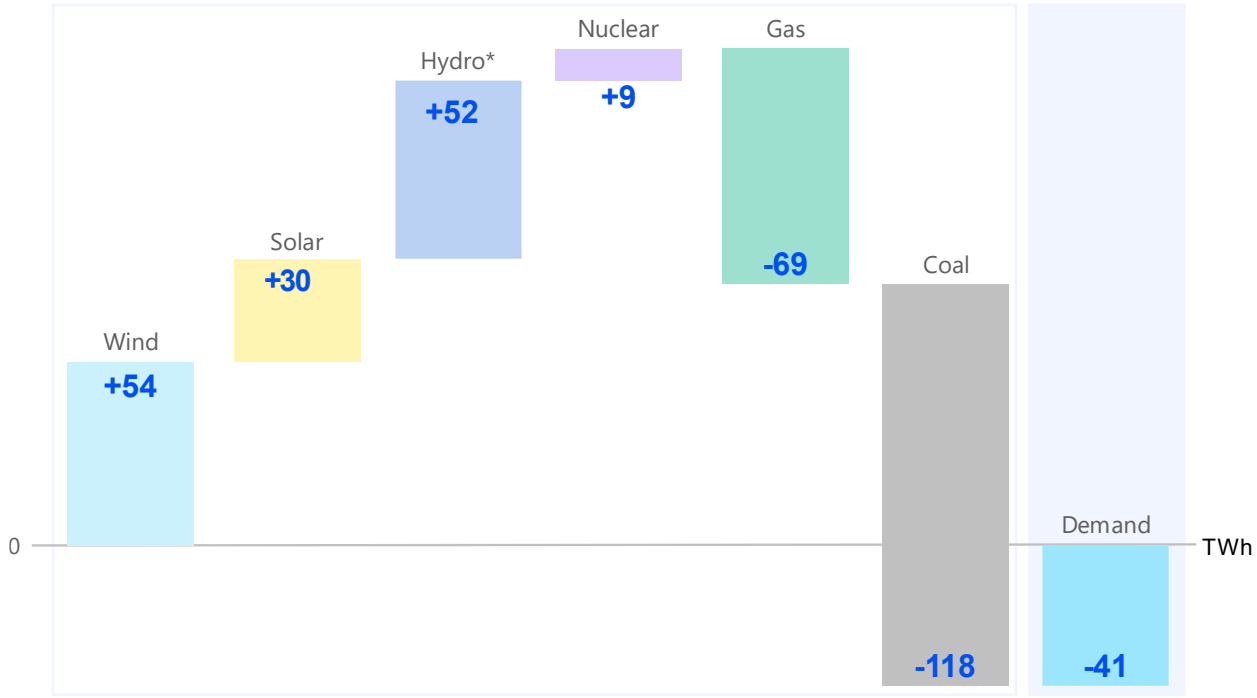
After low nuclear, wind and hydro generation contributing to price hikes in 2021-2022, **low carbon-energy generation increased (solar) or recovered (nuclear, hydro, wind).**

French nuclear output, although not back to historical level, increased. Concurrently, hydro and wind generation caught up, further supported by solar generation advancements.

**Low-carbon energy (renewables + nuclear) and demand reduction deliver 22% cuts in coal and gas.**

## Electricity generation in 2023: Renewables (wind, solar and hydro) replace gas and coal generation

Year-on-year change for the main generation technologies in the EU-27/EEA(Norway), Switzerland, 2023 (TWh)




*Source: ACER calculations based on ENTSO-E data.*
*Note: Hydro does not include hydro-pumped storage. Hydro-pumped storage, biomass and other generation sources were accounted for separately, with other generation sources for which the aggregated variation in generation for 2023 was zero.*

# Nuclear generation shifts import and export dynamics

**In 2023, France shifts from being a net importer to becoming the largest exporter,** driven by increased nuclear and hydroelectric output and with future growth expected.

**Germany becomes a net importer,** with its nuclear phase-out. Spain has lower net exports in 2023, despite the 'Iberian price cap'.

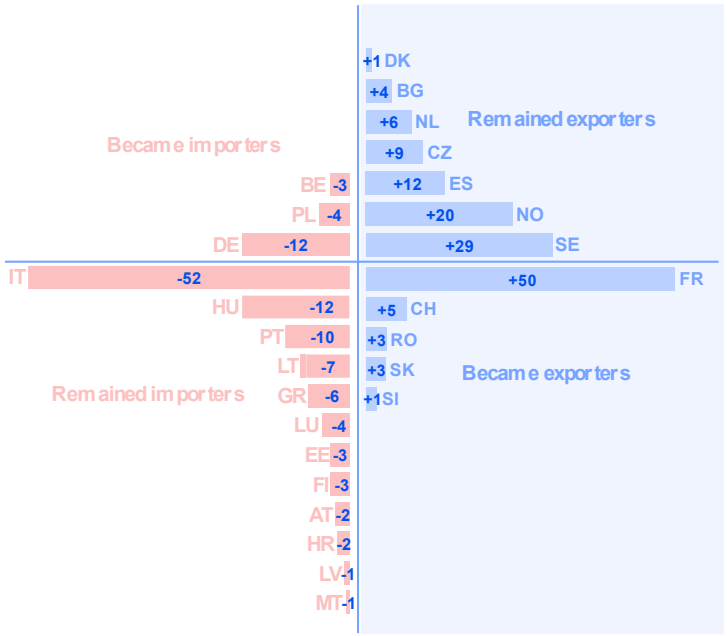
**Italy remains the biggest net importer in Europe**, while Italy, Lithuania and Luxemburg were net importers during nearly every hour of 2023.

In 2023 every Member State benefitted from imports at times, showing the importance of cross-border electricity capacity being available for trading with neighbours.

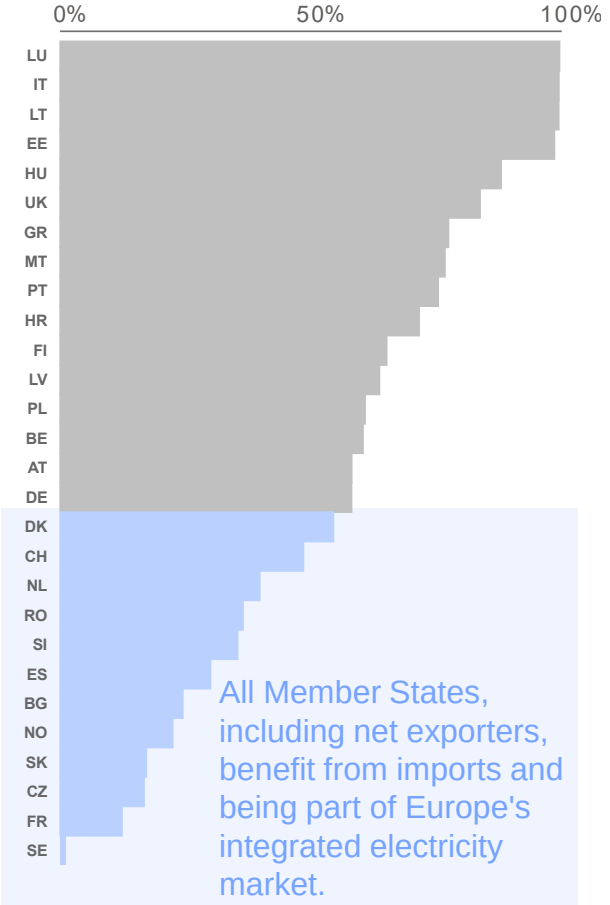
Net importers benefit from the efficiency gains of importing cheaper electricity from their neighbours.

## Electricity net imports : France, Germany swap places

Import-export swings and net positions from 2022 to 2023, EU-27 (TWh)




Percentage of electricity net import hours in the EU-27 /EEA(Norway), Switzerland, 2023




All Member States, including net exporters, benefit from imports and being part of Europe's integrated electricity market.

*Source: ACER calculations based on ENTSO-E data.*

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# Renewables accelerate the clean EU energy transition

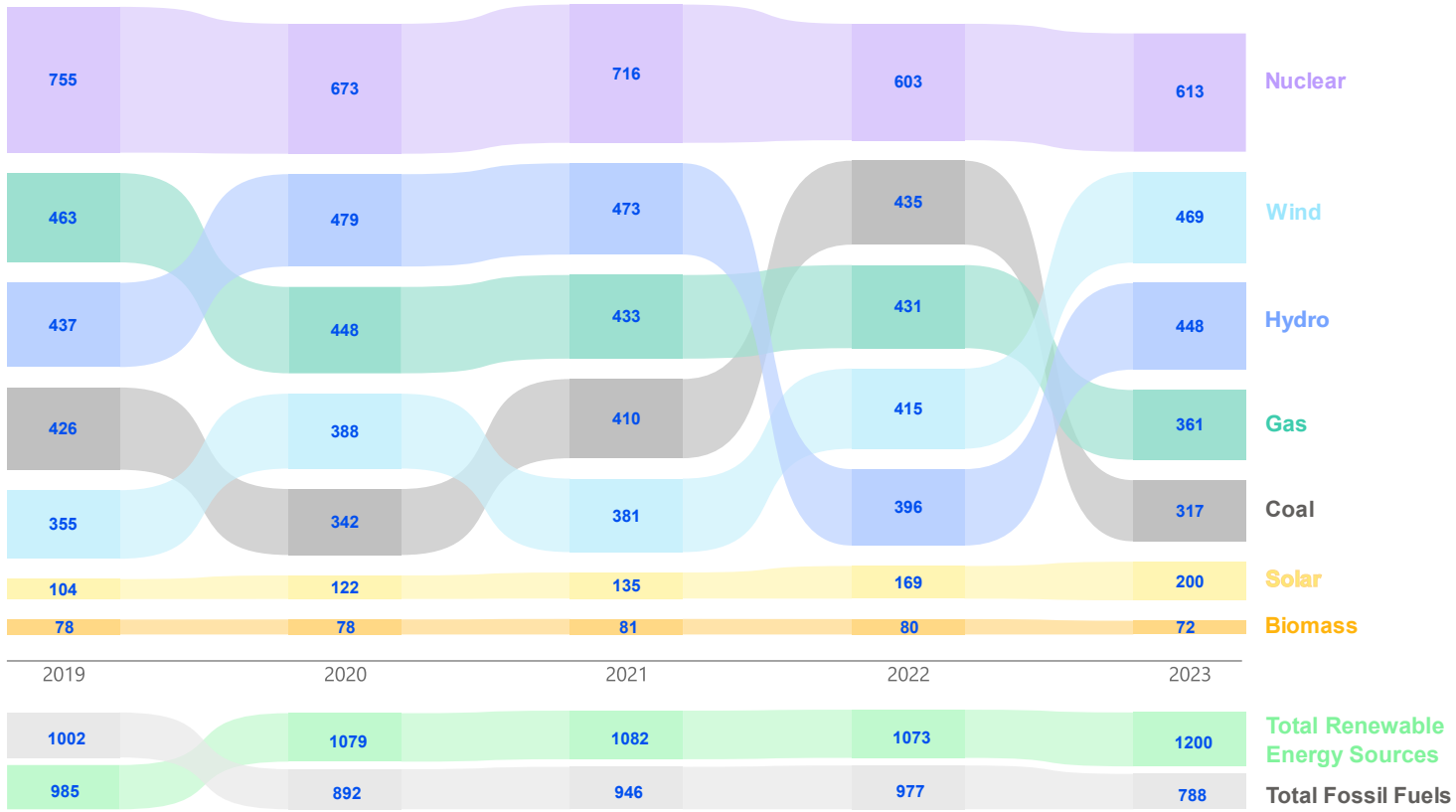
With the energy crisis, the transition to clean energy faced a setback in 2022. But, with the 2022 REPowerEU commitment to renewables and the new 2030 renewable energy target of 44.5% set, **in 2023 fossil fuel generation (788 TWh) was outstripped by renewable generation (1200 TWh).**

Renewables rose to a record 45% of overall electricity generation. Wind and solar are powering this growth, with a 18% surge in solar generation.

**Wind powered electricity for the first time surpassed gas and coal generation.**


## Electricity generation: in 2023, wind surpasses gas and coal

Evolution of generation per type in the EU-27 / EEA(Norway), Switzerland – 2019-2023 (TWh)




*Source: ENTSO-E Transparency platform.*

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# Big renewable capacity additions slash fossil reliance

With the energy crisis and Russia's invasion of Ukraine, the EU accelerated its shift to renewables. **Installed capacity of renewables increased sharply from 2022 to 2023.**

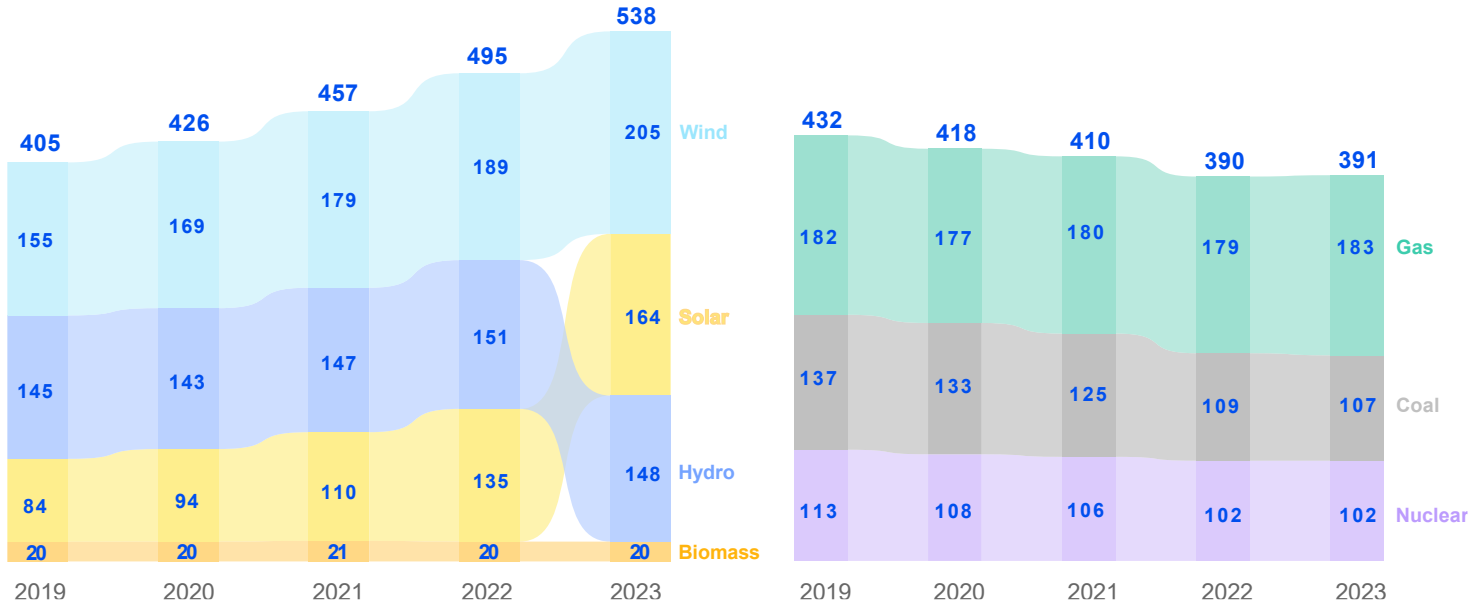
**Solar capacity grew by 20%, nearly doubling since 2019, while wind increased by 8%.** Solar benefits from EU demand-side measures, while the wind industry remains impacted by complex permitting procedures. Overall, the EU's additional renewable generation capacity reduced its need for gas in winter, improving its security of supply.

Conventional generation remains stable, with

- no change in nuclear capacity,
- a phased reduction of -2.8% in coal-fired plants, and
- a slight increase of +1.1% in gas power plant capacity.

## Installed electricity capacity: in 2023, solar overtakes hydro

Evolution of installed capacity for renewable (left) and conventional (right) generation technologies, in the EU-27 /EEA(Norway), Switzerland – 2019-2023 (GW)




*Source: ENTSO-E Transparency Platform.*

# EU reduces reliance on coal and gas power plants

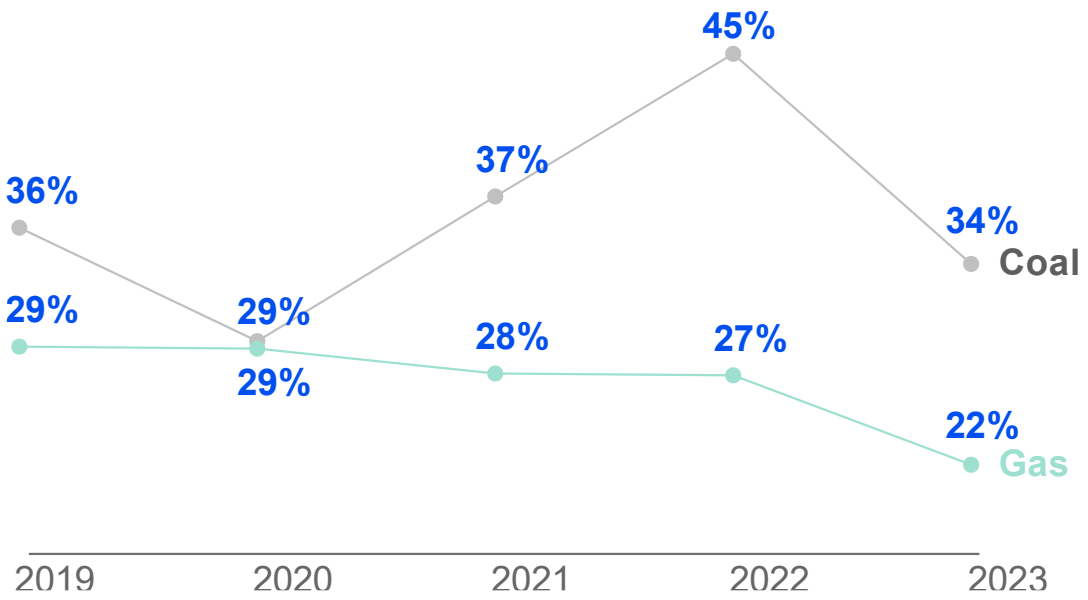
**In 2023, the large decrease in demand, combined with an increase in production of low-carbon electricity, reduced reliance on coal and gas-fired power plants.**

Whereas coal replaced gas during the energy crisis, in 2023, there was a significant fall in the use of coal generation power plants. The capacity factors (which measure a power plant's actual generation compared to the maximum amount it could generate, without any interruption, for a given period) have declined by -11% in 2023, for coal fired power plants.

Electricity produced from gas-fired plants declined resulting in a 2023 capacity factor of just 22%.

## Utilisation of coal-fired plants in 2023 falls below 2019 levels

Capacity factors of coal and gas-fired power plants EU-27/EEA(Norway), Switzerland – 2019-2023 (%)




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

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# Electricity prices

# Day-ahead electricity prices dive yet variability persists

**In 2023, energy prices stabilised after a volatile 2022, yet remain significantly higher than 2021.** Europe reduced reliance on Russian gas. Lower gas prices, in turn, contributed to lowering day-ahead prices throughout 2023, complemented with a mild winter and energy-saving efforts.

→ *In 2023, the average day-ahead price was 93 EUR/MWh, i.e. less than half of the average price of 219 EUR/MWh in 2022.*

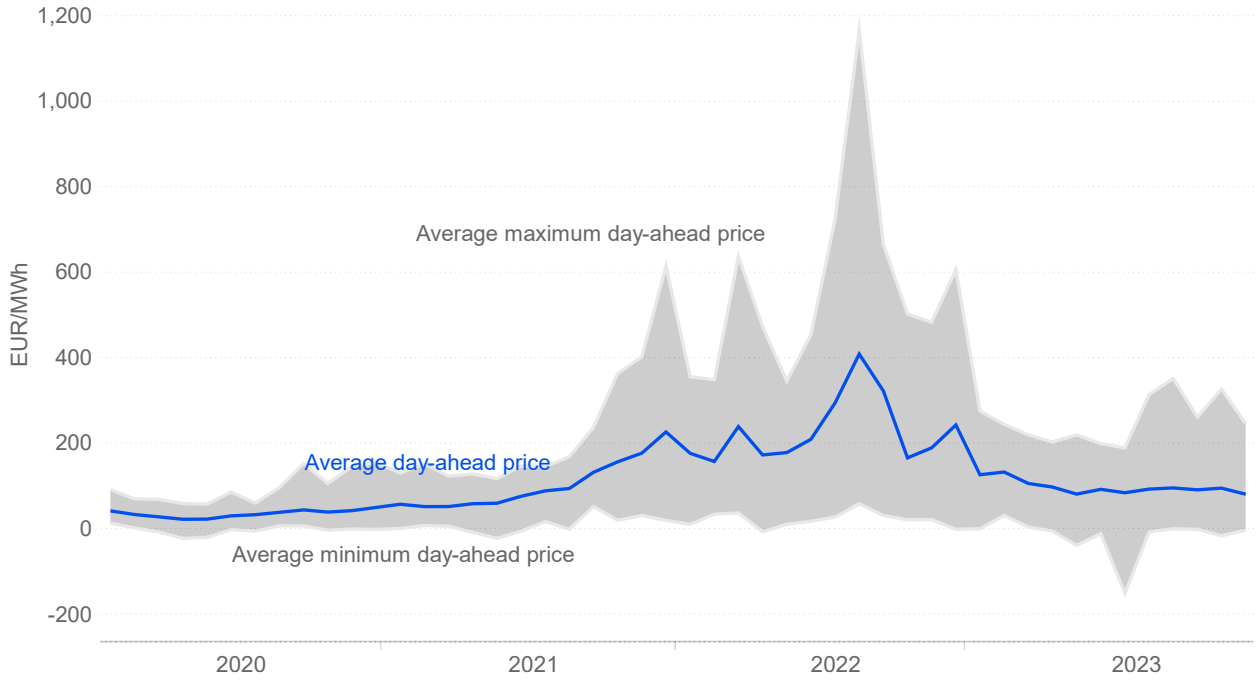
→ *However, the average day-ahead price is still more than double the average day-ahead price in 2019.*

→ *Similarly, the variability of prices is still higher than pre-crisis.*

**Despite falling wholesale prices, energy remains costly due to supplier risk and market volatility.** Energy suppliers continuously buy to meet future demand, facing potential losses in volatile markets. Efficient risk-hedging solutions are now crucial.

## Day-ahead prices and variability remain higher than pre-crisis

Evolution of the average of the minimum, average and maximum day-ahead electricity prices per month and Member State in the EU-27 /EEA(Norway), Switzerland – 2019 - 2023 (EUR/MWh)




*Source: ACER calculations based on ENTSO-E data.*

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# Gas reliance influences electricity prices

In 2022, Europe's high energy prices resulted from the global surge in gas prices. In 2023, the EU's reduced reliance on fossil fuels, contributed to the decline in electricity prices in all EU countries. However, local variations persist, and countries relying more on gas in their energy mix experience higher prices.

**From between 150 and 300 EUR/MWh in 2022, average prices in each Member State decreased below 130 EUR/MWh in 2023, remaining above the 80 EUR/MWh observed in 2021.**

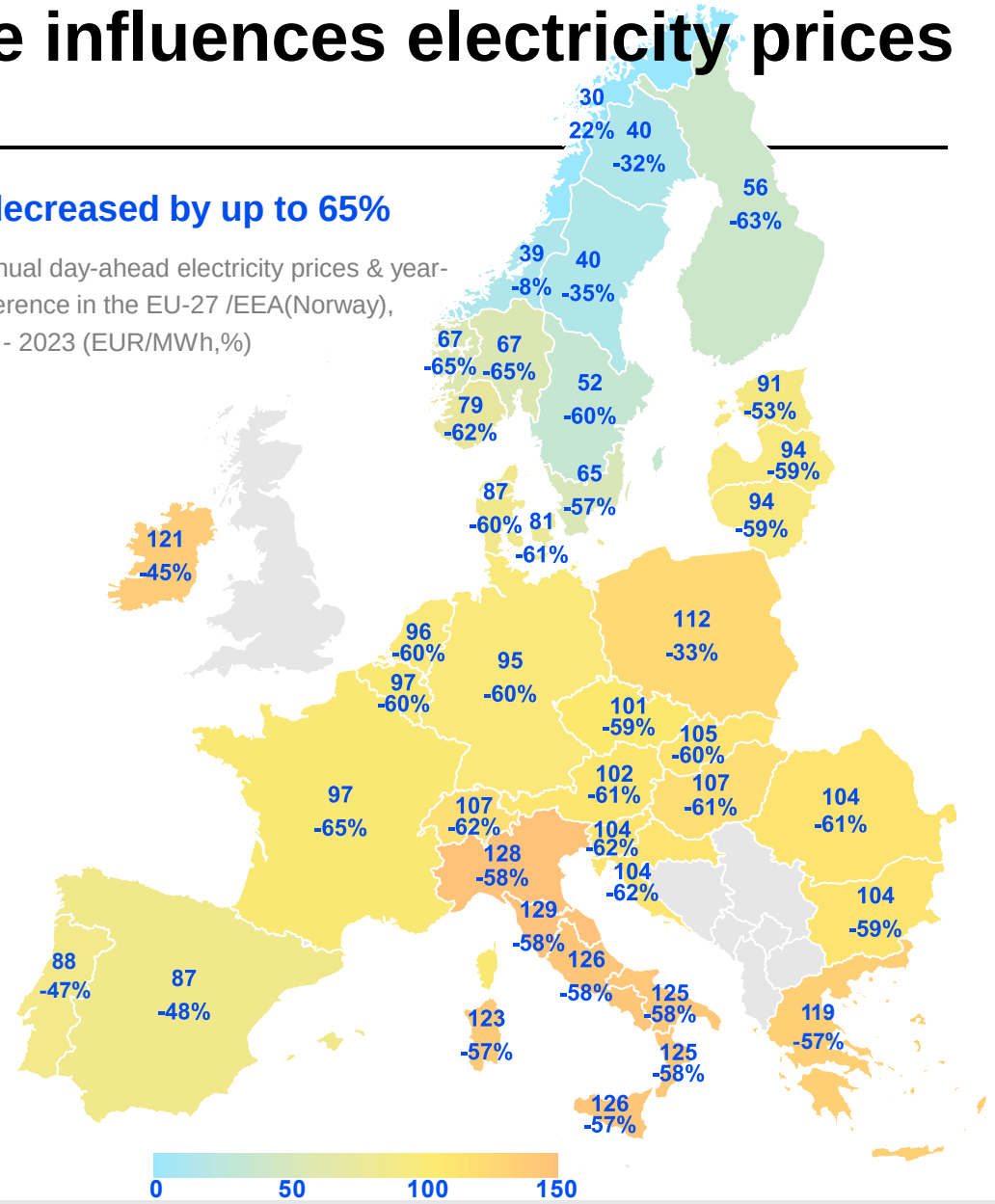
→ *The **highest prices** were registered in Ireland and Italy*

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

**24 November 2023: Finnish human error**
A faulty conversion from kWh to MWh, led to a 5 GWh oversell, plunging prices to -500 EUR/MWh for 10 hours.

## Prices decreased by up to 65%

Average annual day-ahead electricity prices & year-on-year difference in the EU-27 /EEA(Norway), Switzerland - 2023 (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.*

# Liquefied natural gas imports eased EU gas balance

Increased liquefied natural gas (LNG) imports and infrastructure investments, sufficient storage stocks and lower demand eased the EU gas balance, contributing to lower prices.

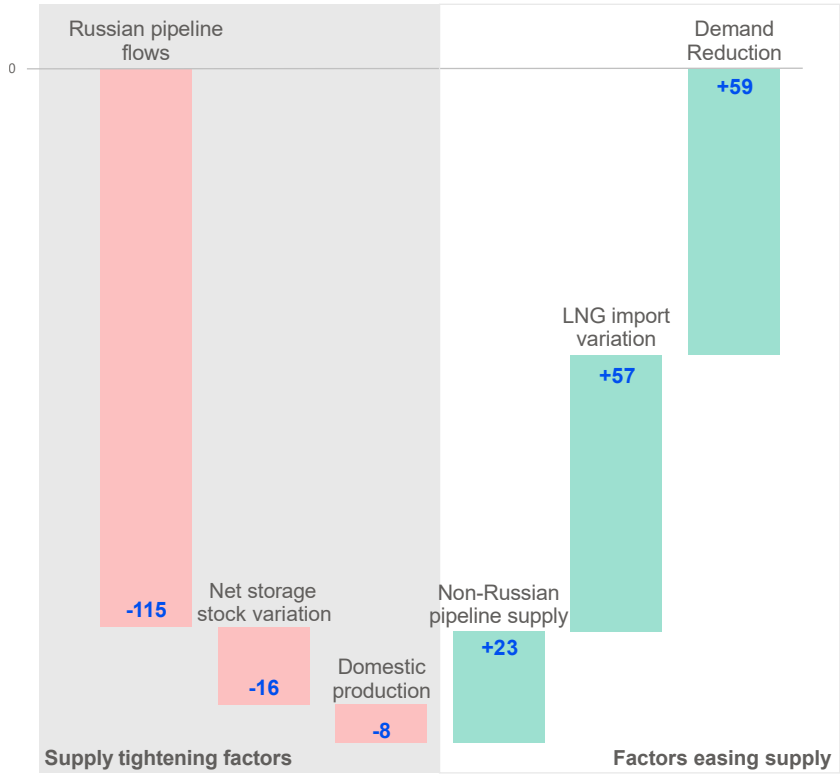
While hub price convergence is on the rise, market fragmentation risks from measures such as the German neutrality charge persist.

Despite gas futures being 25% above recent averages, they are trending downward.

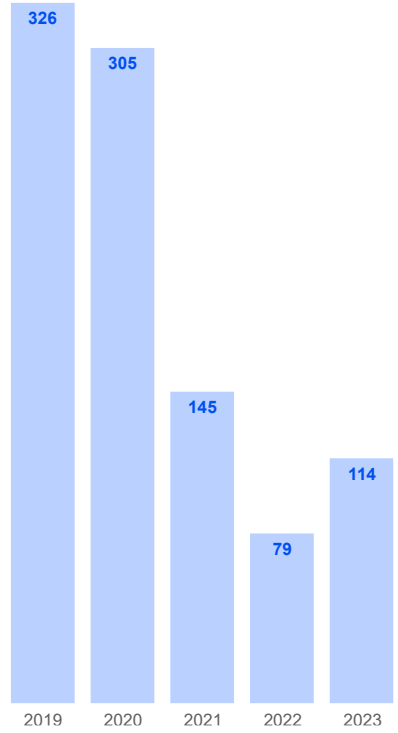
**Explore 2023 EU gas market trends with ACER's 2023 Report on key gas wholesale developments**

## LNG and demand reduction 'to the rescue' … but gas remains as source of flexibility

Estimated EU gas supply and demand differences in 2023 in comparison to 2021 (bcm)




Number of days when electricity day-ahead prices were above costs of producing electricity from gas in the EU-27 – 2019-2023




*Source: ACER calculations based on ENTSOG transparency platform, THE, Enagas, GIE and Platts.*
*Note: this figure combines preliminary and estimated data for 2023. Coal and carbon price evolution is relevant for gas price formation, as both combined influence power sector switching and hence gas demand for power generation and consequently gas prices. See: ACER's European Gas Markets Monitoring report, October 2023.*

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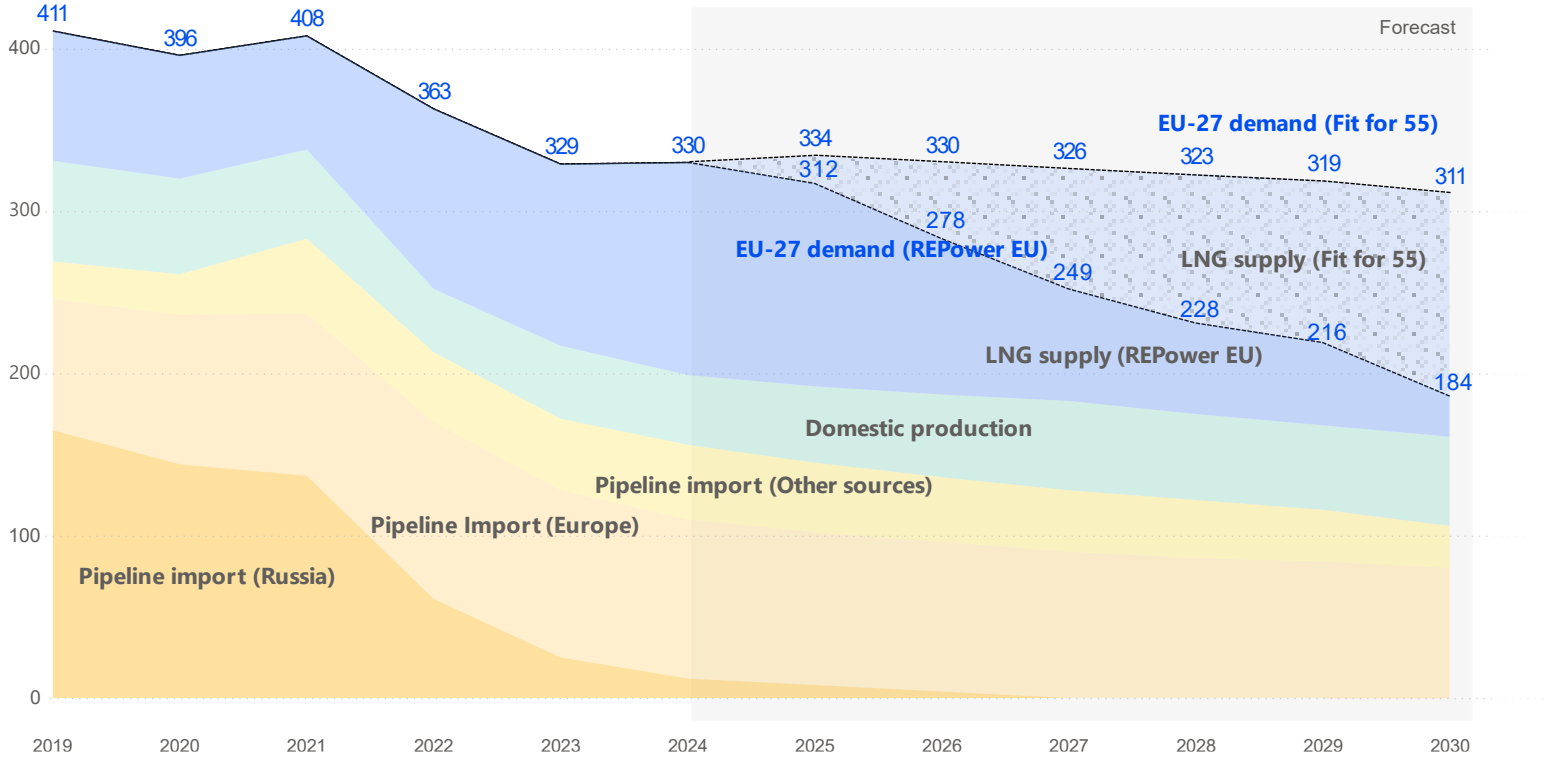
# Global supply competition shapes energy prices

The necessary adjustment of liquefied natural gas supply to EU demand reduction by 2030 varies with demand reduction targets. This uncertainty influences decisions between long-term and spot liquefied natural gas contracting strategies.

Overcoming challenges in the gas sector, such as ensuring storage safety and managing global liquefied natural gas market exposure, affects both gas and electricity users.

## Liquefied natural gas supply will adapt to declining EU gas demand

EU gas supply outlook relative to Fit For 55 and REPowerEU demand scenarios – 2019-2030 (bcm)




*Source: ACER calculations based on REPowerEU (annex I).*

# EU competitiveness amid rising LNG reliance

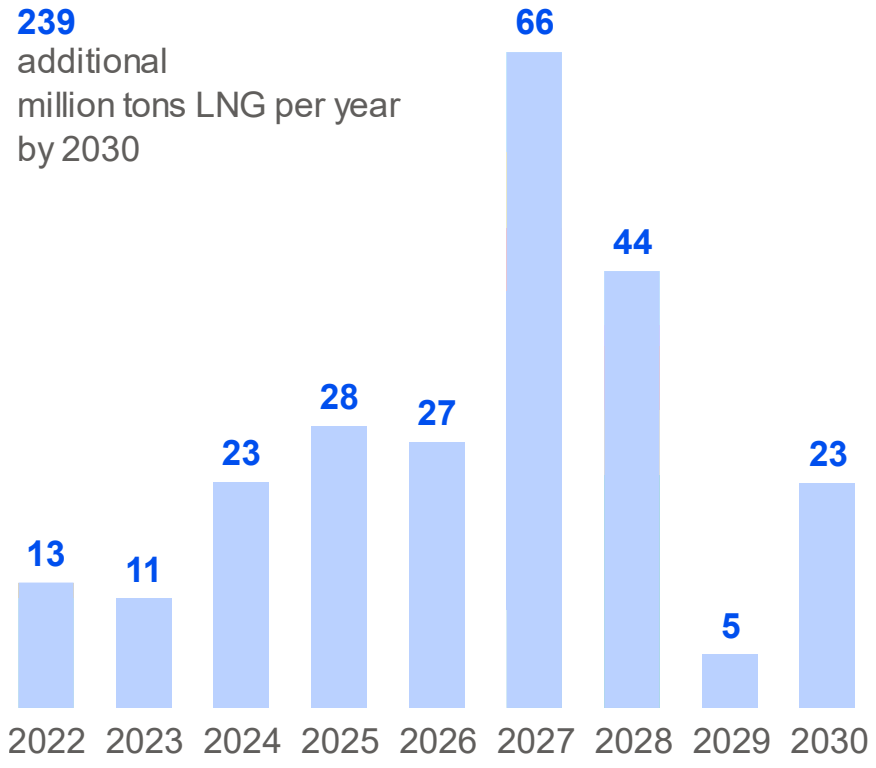
EU's LNG reliance does not imply high gas prices, with new production facilities emerging from 2024 onward.

Yet, notably compared to North America, the EU currently faces fundamental competitiveness challenges.

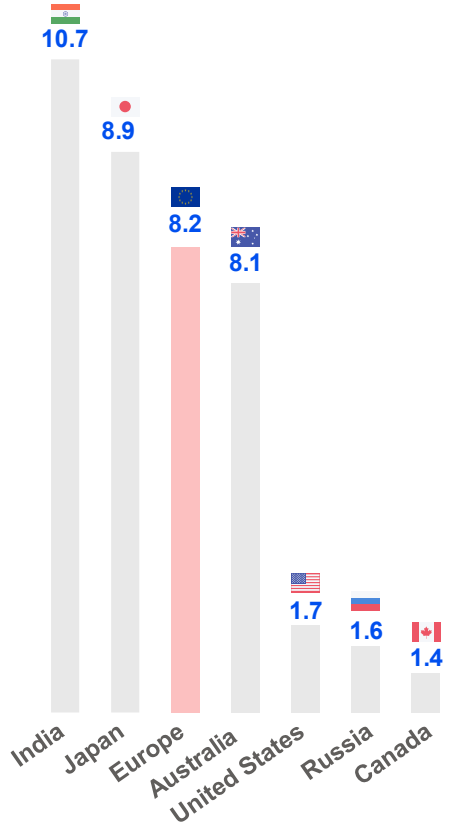
In the short-term, the EU must focus on enhancing competitive strengths such as enhanced market integration and resource sharing. Subsidising energy input may pose fiscal challenges while enhancing security of supply and meeting decarbonisation goals.

## Liquefied natural gas production will ramp up, and for now importers pay the price

LNG production projects under construction - January 2024 (million tons per year)




Natural gas price international benchmarks - February 2024 (dollars/mmbtu )




*Source: Left – ACER based on Platts ; Right: European Gas Hub.*

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# Explosion of negative electricity wholesale prices

**2023 saw an explosion in negative prices in the EU.** Although the rapid expansion of renewable production played a part, other factors specific to 2023 might have influenced this increase in negative prices.

27 out of 50 bidding zones faced the highest amount of negative prices since 2017.

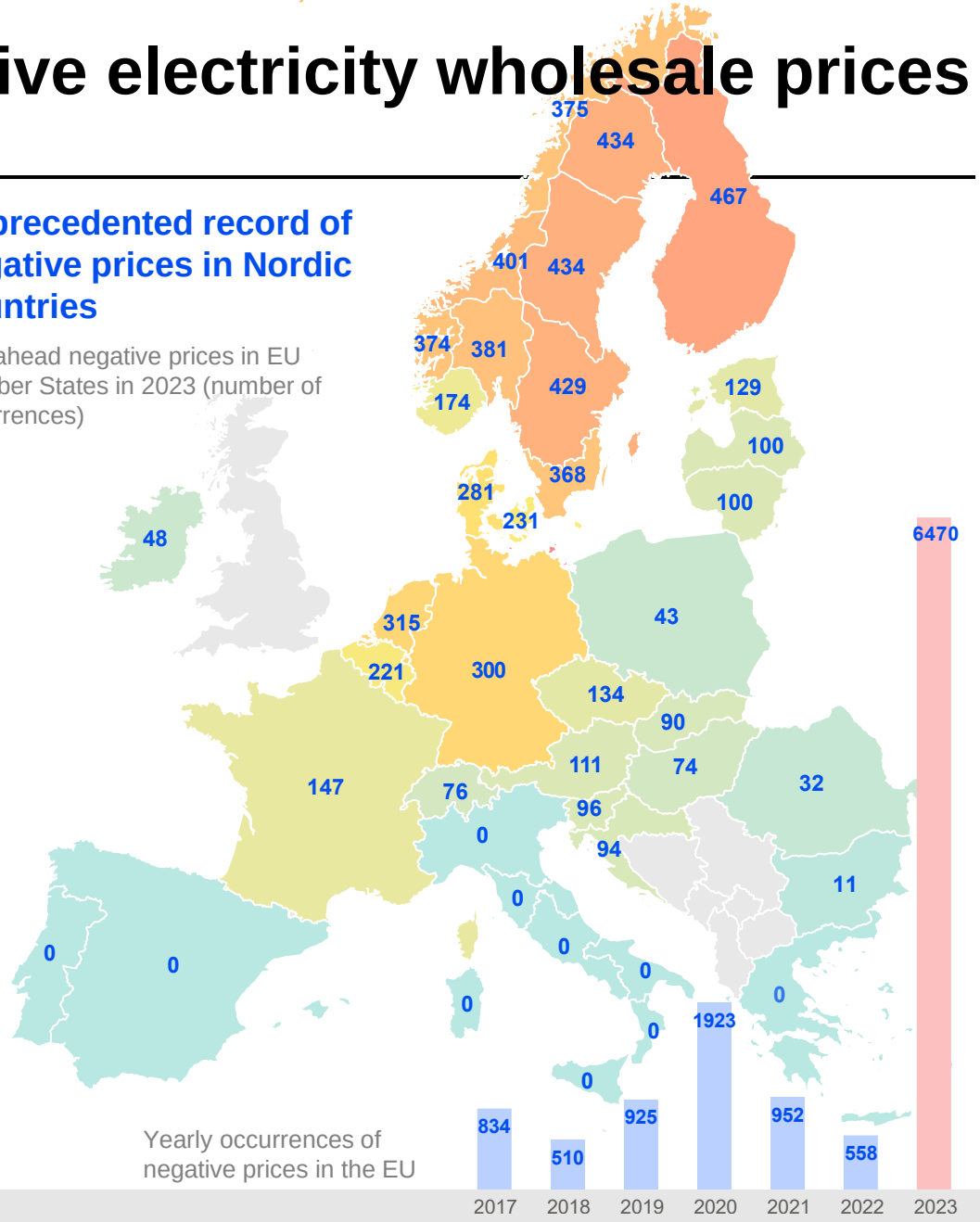
- most Nordic bidding zones have seen the highest occurrence of negative prices (>380).
- Only SEM saw a dramatic decrease, far below the record of 374 occurrences observed in 2022.

**Negative prices result from the increase in renewables' penetration and call for continued market integration and access to flexibility**, such as from demand response. Barriers to the development of demand-side response have been compiled by ACER in a dedicated report published in December 2023.

Upcoming ACER reports on cross-zonal capacity (June) and market integration (October) will investigate further underlying drivers for the surge in negative prices.

## Unprecedented record of negative prices in Nordic countries

Day-ahead negative prices in EU Member States in 2023 (number of occurrences)




*Source: ACER calculations based on ENTSO-E data.*
*Note: One occurrence corresponds to one hour during which prices are negative.*

# Energy crisis points to key role of forward markets

**Forward markets allow market participants to stabilise and hedge their future cash flows and thereby secure their businesses against the risks of future price changes.**

**Markets have gradually recovered from the energy crisis, as illustrated by the decrease in forward prices**.

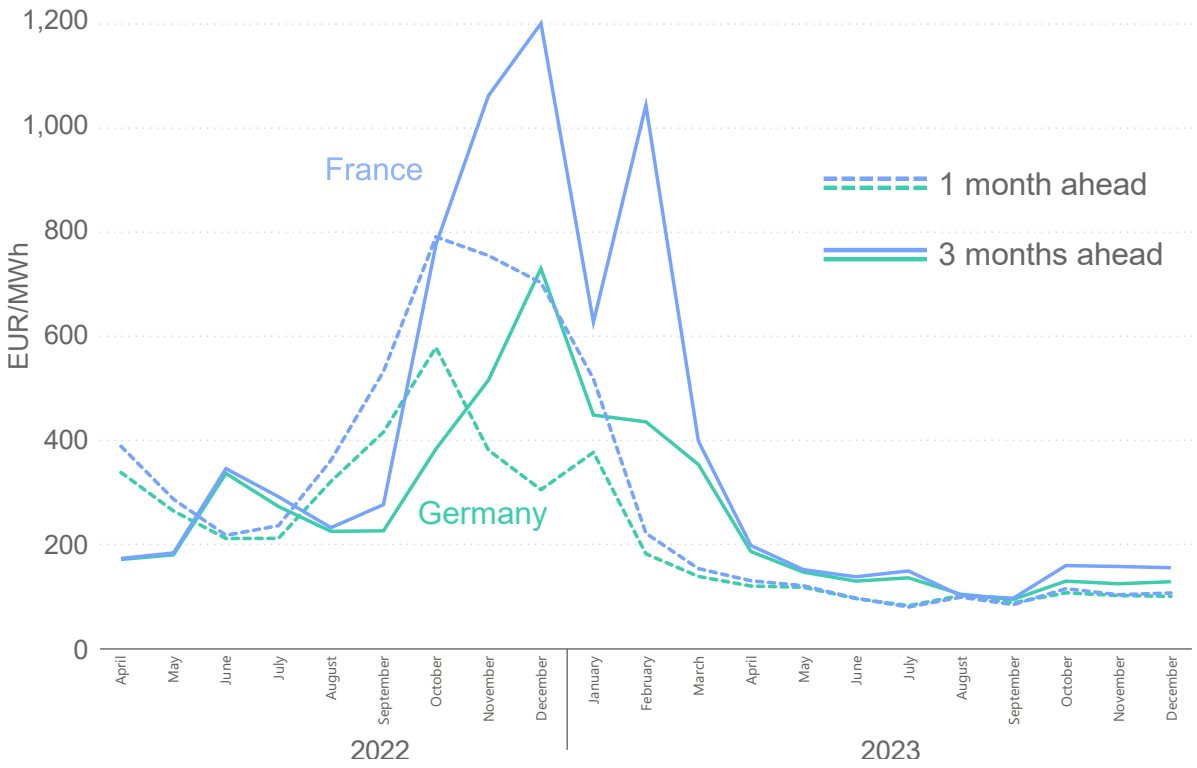
→ *The uncertainty surrounding French nuclear power led to a price increase during the summer of 2023.*

The crisis emphasized the importance of forward markets, as low forward-market liquidity made coping with extreme day-ahead prices more challenging.

In this context, in February 2023, ACER initiated a discussion on the further development of electricity forward market. Further, enhanced consumer protection through forward market hedging has been the target of the Electricity market design reform.

## 2023 witnessed a progressive drop in forward market prices

Evolution of forward prices for monthly products* - 2023 (EUR/MWh) – for France and Germany




*Source: ICIS data.*
**x-axis is the month of delivery. Example: For January 2023, the '1 month ahead' value refers to trades happening in December 2022 that consider delivery in January 2023.*

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# Market integration is a key enabler of the clean transition

**The integration of EU electricity markets** guarantees the most efficient functioning of the power system and enables the growing penetration of renewable energy.

**Price convergence is an indicator of market integration:** Now all EU borders are part of the day-ahead and intraday market coupling, further progress can be achieved by ensuring maximum availability of cross-zonal capacities:

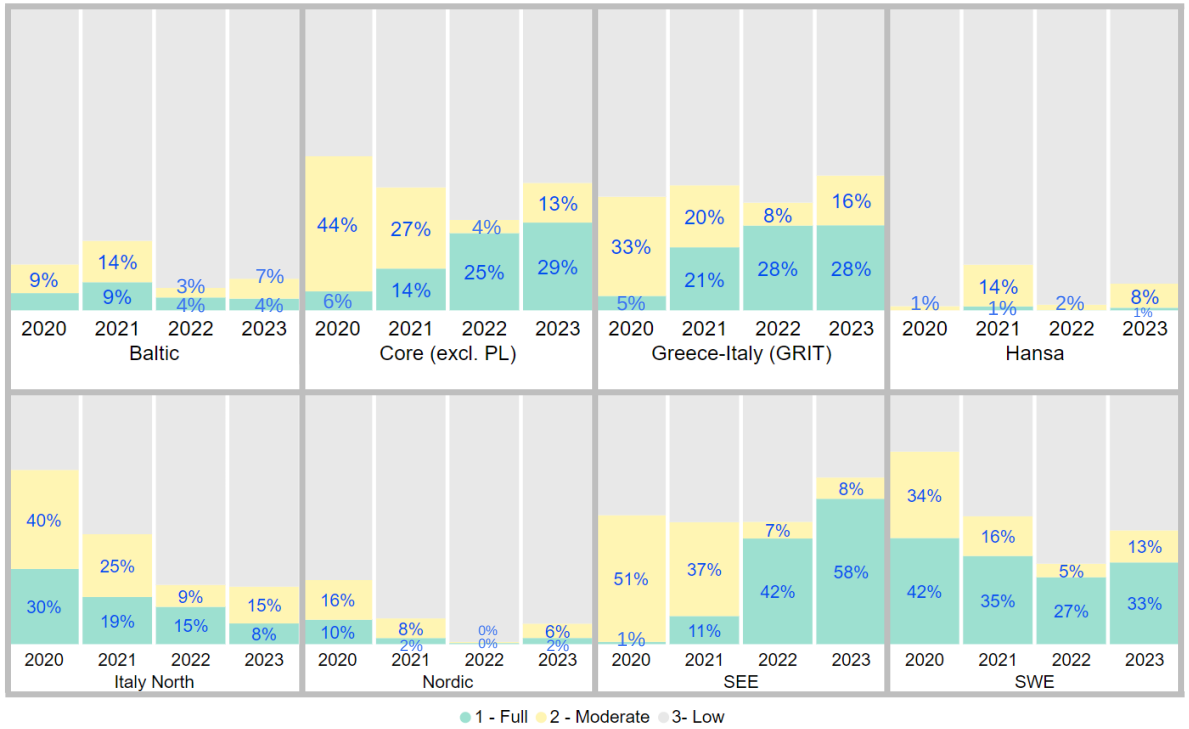
- Implementing regional capacity calculation methodologies.
- Progressing towards the minimum 70% requirement.

**Interconnectivity across the EU is still lacking:**

- Barriers to cross-zonal trade need to be further tackled.
- The targeted reinforcement of the EU grid will be a decisive factor in the success of the green transition.

## Visible progress on capacity calculation and allocation in some regions, yet much room for improvement

Day-ahead price convergence in Europe by capacity calculation region – 2020-2023 (% of hours)




*Price convergence indications calculated as the difference between the highest and lowest day-ahead price of a given capacity calculation region: Full: <1 EUR/MWh. Moderate: 1-10 EUR/MWh. Low: >10 EUR/MWh.*

*Source: ACER calculations based on ENTSO-E data.*
*Note: Allocation constraints in Poland have significantly affected the possibilities for trade in the Core CCR, their impact has been removed from this figure.*

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# Energy Community

# Crisis and war affected demand across the region

The Energy Community experienced a drop in demand (consistent with that of the EU), except for Ukraine which faced a more severe decrease in 2022 due to the war.

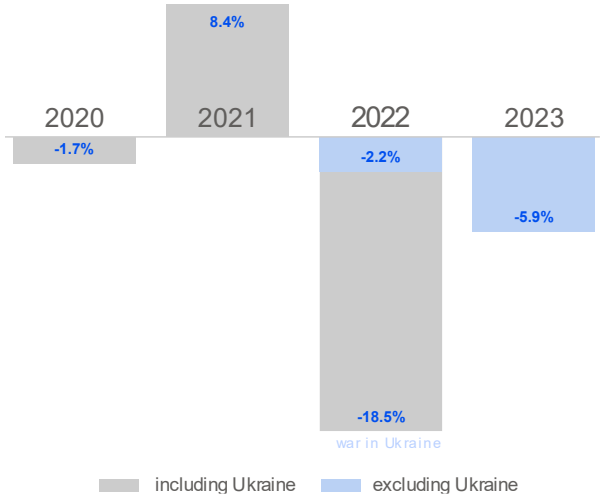
This drop in demand was followed by a decline in fossil fuel generation, while hydropower saw a significant increase.

**-5.9%**

Decrease in electricity demand in 2023 (excluding Ukraine)

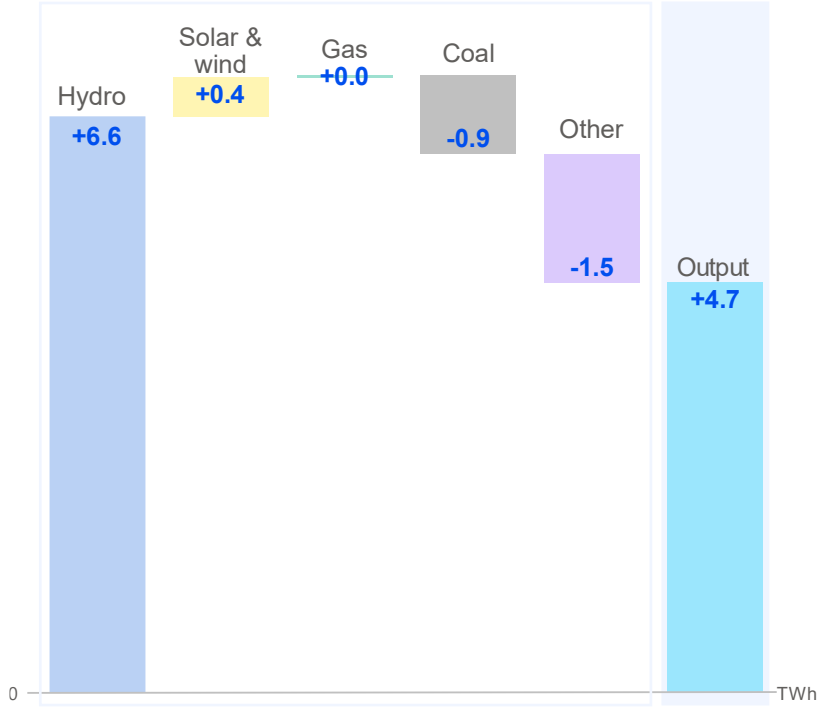
## Demand dropped in 2022 and 2023, driven by the crisis and the war in Ukraine

Changes in electricity consumption in the Energy Community, 2020-2023* (%)




Most of the figures do not include data for Ukraine for the year 2023, following a martial law ban on data sharing. As shown here in 2022 (variations with and without Ukraine) this exclusion has a significant impact on aggregated Energy Community data.

Year-on-year change for the main generation technologies in in the Energy Community (excluding Ukraine), 2023 (TWh)




*Source: Energy Community national regulatory authorities, ENTSO-E.*
*Note: Variations exclude net import and export of the Energy Community.*

# Hydropower is the main renewable source in the region

With the generation mix still dominated by fossil fuels and nuclear generation, hydro is the largest renewable energy source, while solar and wind generation remain relatively small.

Gas-fired electricity generation dropped by 44% since 2020.The decrease in nuclear generation is attributable only to Ukraine due to the occupation of the Zaporizhya nuclear power plant in 2022.

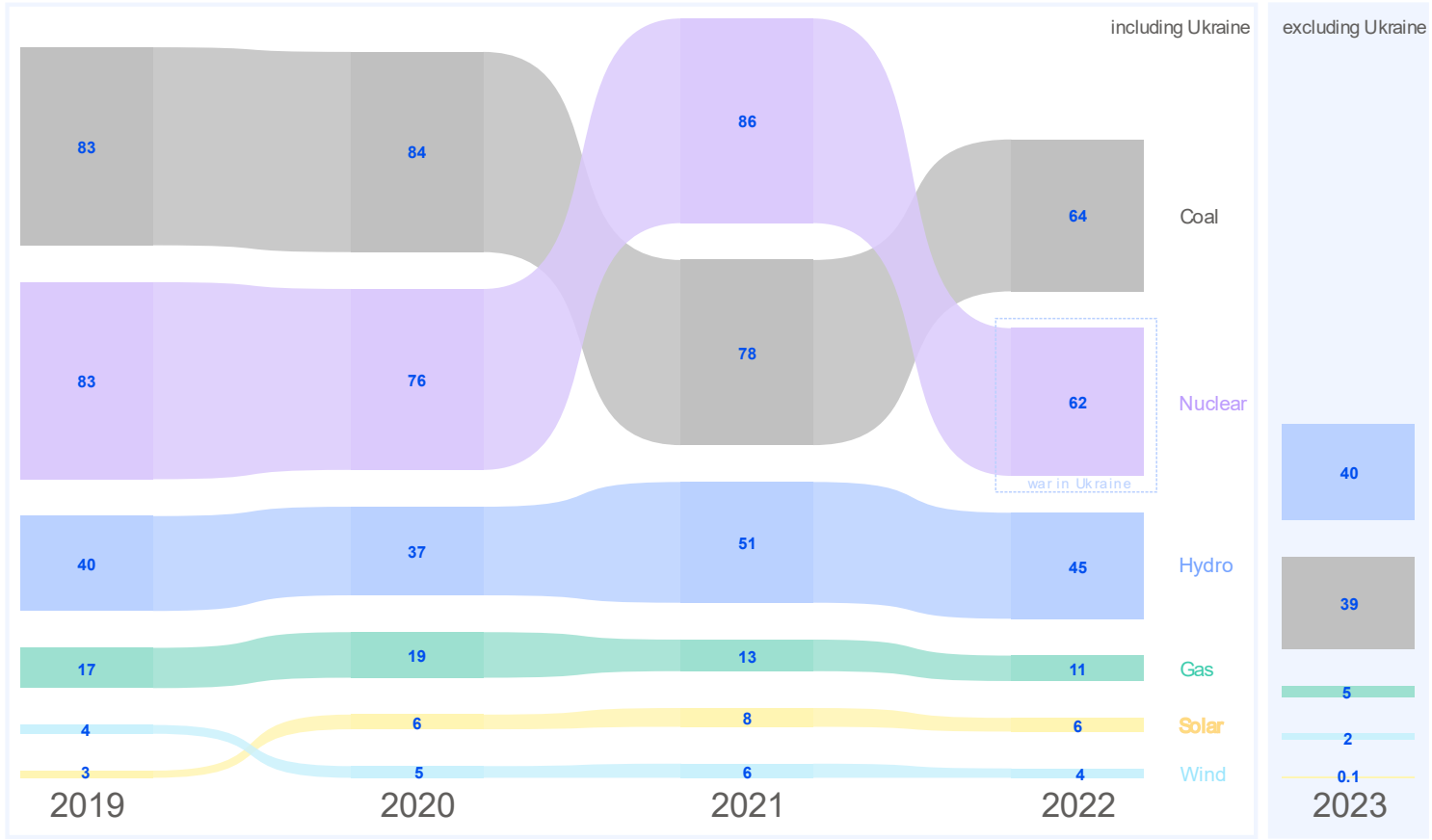
In 2023, renewable energy generation matched that of coal.

**-24 TWh**

In nuclear generation following the war in Ukraine

## Electricity generation: in 2023, lower demand and higher generation

Evolution of generation per type from main sources in Energy Community – 2019-2023 (TWh)




*Source: Energy Community national regulatory authorities, ENTSO-E.*

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# The energy transition had begun

In 2022, installed coal-fired generation capacity was akin to the total amount of wind, solar and hydro generation capacity.

The renewable energy sources development potential in the Energy Community is high. Renewable energy capacities have grown steadily since 2019, with a record increase of 16% in 2022.

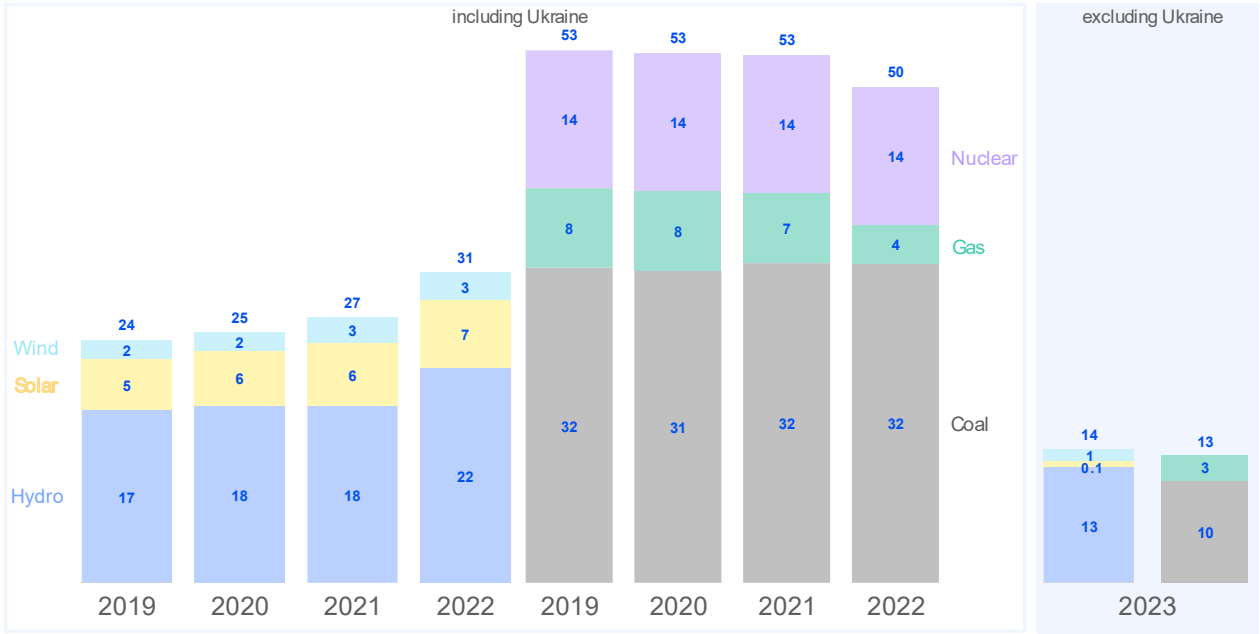
Binding targets for 2030 on greenhouse gas emission reduction, renewable energy share in final energy consumption, and energy efficiency were adopted for all Contracting Parties in December 2022.

A legislative basis for compliant renewable energy support schemes has been in place since 2018 in North Macedonia, 2021 in Serbia and as of 2023 in Albania, Bosnia and Herzegovina, Georgia, Moldova, and Ukraine.

Inaugural renewable energy auctions were launched in Albania, Georgia, North Macedonia, Kosovo* and Serbia.

## Installed electricity capacity: a high potential for renewables

Evolution of installed capacity for renewable (left) and conventional (right) generation technologies, in the Energy Community – 2019-2023 (GW)




*Source: Energy Community national regulatory authorities, ENTSO-E.*
*Note: * Data for the years marked with an asterisk does not include Ukraine, following the martial law ban.*

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# Further integration with EU markets to come

The crisis has a more fragmented impact on Energy Community electricity wholesale prices than in the EU.

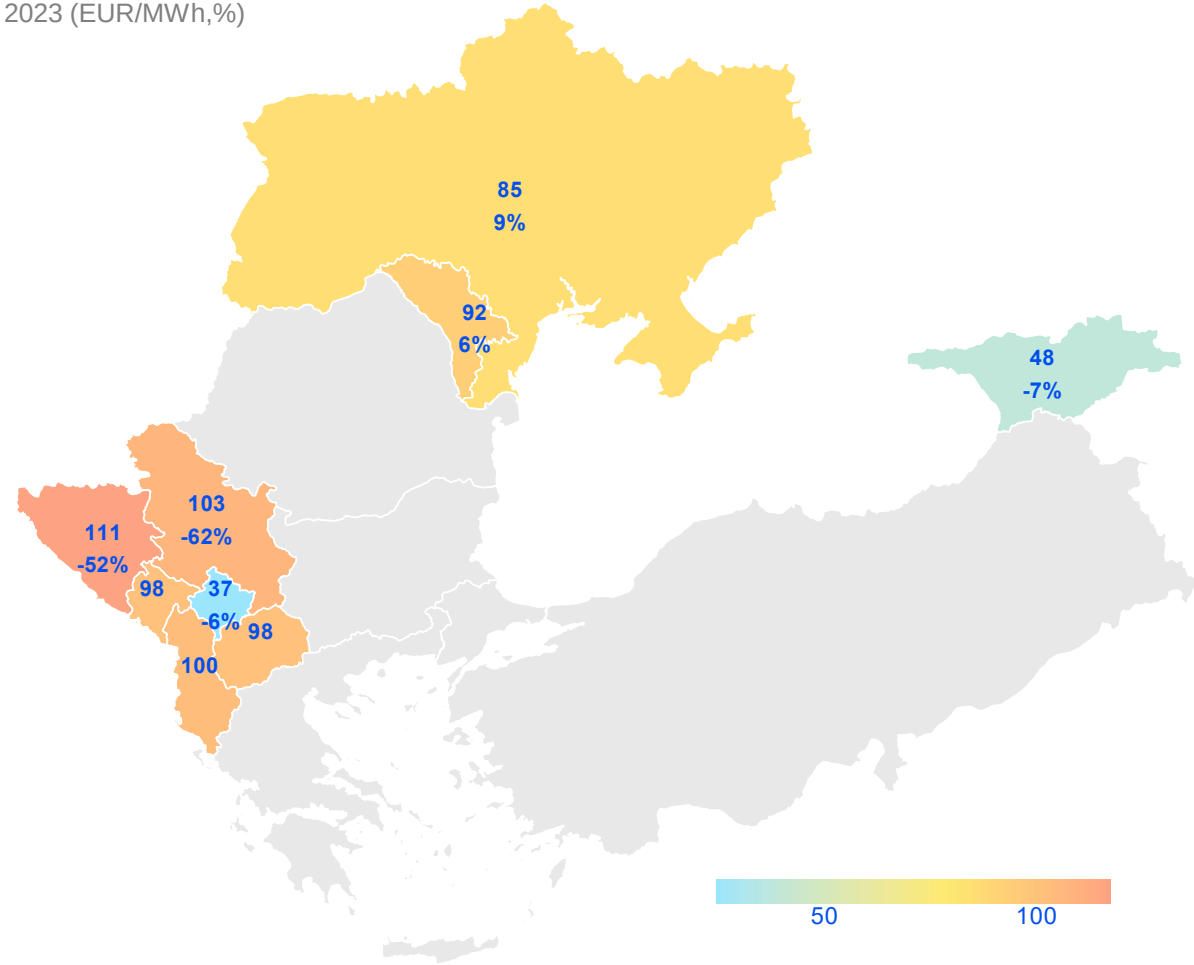
In 2023, Albania, Montenegro, North Macedonia, as Serbia in 2016 and Ukraine in 2019, launched day-ahead electricity markets.

As in the EU, measures were reported in the region to shield end-users from market fluctuations. Overall, the most interconnected countries experienced prices comparable to the EU.

**1 February 2024:** ALPEX launched the first day-ahead auction for Kosovo*, initiating market coupling with Albania.

## Price levels reflect market development

Average annual wholesale electricity prices & year-on-year difference in the Energy Community, 2023 (EUR/MWh,%)




*Source: Energy Community national regulatory authorities, ENTSO-E. Note: Prices for Albania, Montenegro, North Macedonia cover the 2023 period since the launching of their respective day-ahead markets. The price for Bosnia and Herzegovina, Georgia and Moldova price is an average of bilateral contracts. The Energy Community Secretariat clarifies that throughout this text the designation "Kosovo*" "XK*" is without prejudice to positions on status and is in line with UNSCR 1244 and the ICJ Advisory Opinion on the Kosovo declaration of independence.*

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# Conclusion

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# Renewables, resilience and integration

Quarterly gas reports

Electricity markets dashboards

March: Analysis of the European LNG market

March: Key gas wholesale developments

**In 2023, the electricity system underwent notable changes** with a rapid increase in intermittent renewable generation like solar photovoltaic (PV), accompanied by a significant decrease in coal and gas generation.

However, **these changes bring new challenges, including increased volatility**, which must be managed. **Harnessing regional renewables advantage will reduce the need for expensive backup capacity, resulting in less fossil fuel being burned.** The recent electricity market reforms emphasize the **need for effective market integration, system flexibility and responsiveness**, in the view of the increase in renewable energy sources.

Additionally, as **the European Union (EU) integrates more with global liquefied natural gas (LNG) markets, complexities in the electricity-gas interplay emerge**, requiring careful management. **Looking ahead, priorities for energy markets include network investments, locational incentives, and enhancing market frameworks.** While further competitive advantage is possible, the current risk of market fragmentation is evident as the rollercoaster ride subsides.

**ACER plans to provide detailed overviews of EU energy market performance in 2023 and 2024, highlighting the need for resilience and interconnectivity in navigating future challenges.**

June: Cross-zonal capacities and the margin available for cross-zonal electricity trade

October: Infrastructure monitoring

October: Security of electricity supply report

October: Progress of EU electricity wholesale market integration


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