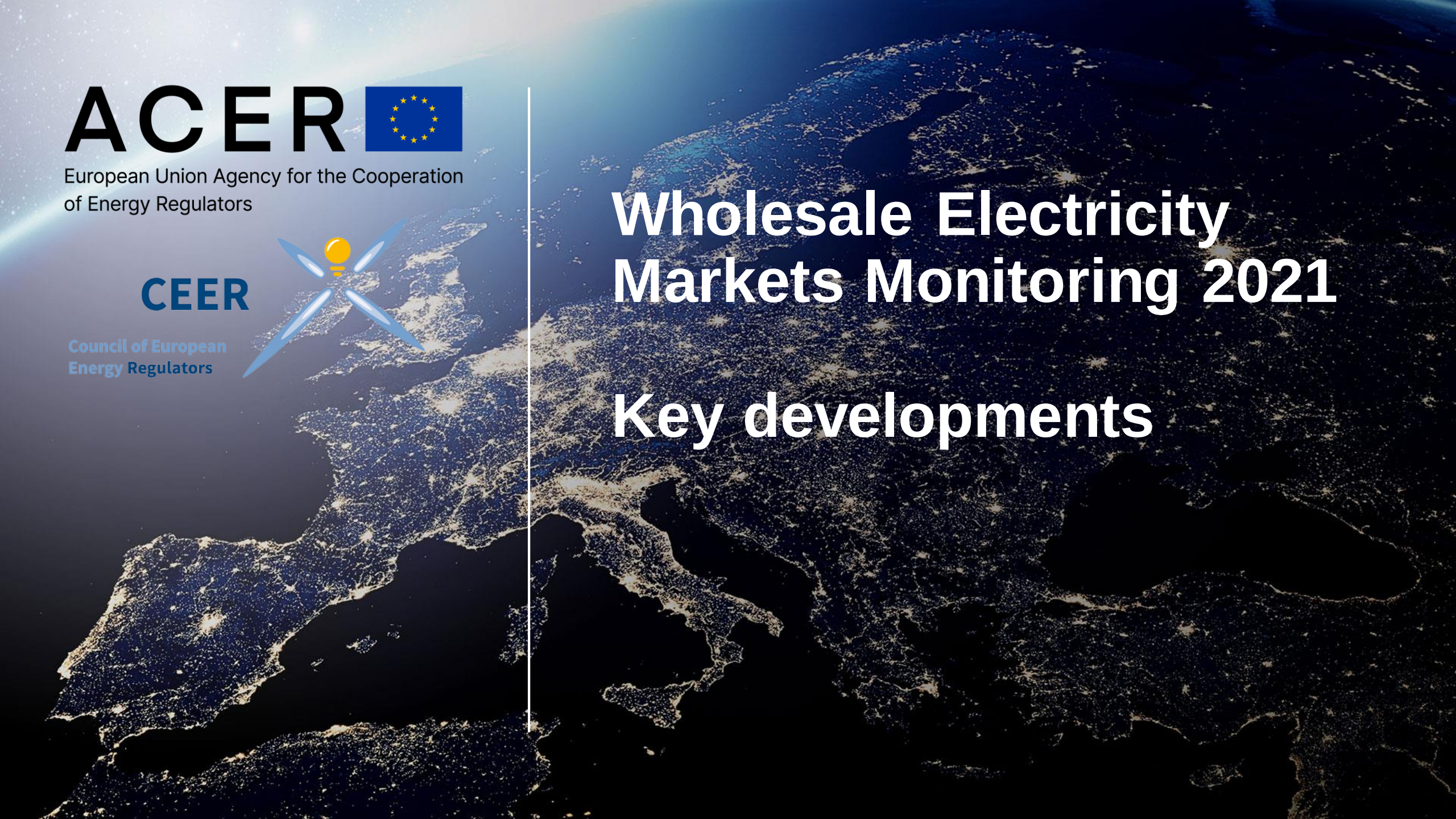
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Council of European Energy Regulators
Wholesale Electricity Markets Monitoring 2021
Key developments

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

ACER monitors internal markets for electricity and gas as mandated by the Third Energy Package. In doing so, ACER provides guidance and evidence on how energy markets can perform more efficiently, to the benefit of consumers. Benefits for the electricity will result from:

1. More electricity interconnection capacity being made available for cross-border trade,

40 %

of cross-zonal capacity is made available for cross-border trades, on average at EU borders, when the minimum of 70% is not met.

2. Further short-term markets (e.g. day-ahead and intraday) integration,

€ 1.5 billion

of additional yearly welfare gains from finalising the integration of short-term electricity markets.

3. Overall sustained and enhanced market integration.

€ 300 billion

of **potential welfare gains for the next decade** from keeping **market integration at pace,** including coordinated security of supply and increased cross-border capacity.

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2021 ACER monitoring report: what is new?

In 2021, unlike during previous years, ACER will not publish a single report gathering all aspects monitored but a series of brief and topical overviews.

This document is the first of these publications. The document provides an overview of EU wholesale electricity markets trends in 2021. It assesses these trends against the current EU goals. Namely, the document assesses:

1. How much electricity is needed and generated (e.g. renewables growth vs other fuels);
2. What is happening concerning day-ahead electricity prices; and
3. Greenhouse gas (GHG) emissions and the electricity sector's trajectory for net-zero.

In 2022, part of the monitoring findings will be included in ACER's upcoming document on market design, requested by the European Commission, to be released in April.

More data is posted on our website. To deepen your insights (e.g. by country of interest), access here dynamic charts on market trends.

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Key EU energy goals are more renewables, increased energy efficiency.

The **European Green Deal**[1] aims to make Europe climate neutral by 2050 and reduce Greenhouse Gas emissions by at least 55% by 2030. This requires **more renewables,** and **increasing energy efficiency.**

By 2030, the European Commission ambitions to achieve:

- a share in the EU energy mix of **renewables** of **40%** (current 2030 target is 32%);
- **a 36% energy efficiency** target for final and primary energy consumption.

→ *Europe met its 20% renewables target in 2020, with a 21.3% share of energy consumed from renewable sources in 2020.*

[1] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en.

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Electricity consumption and generation

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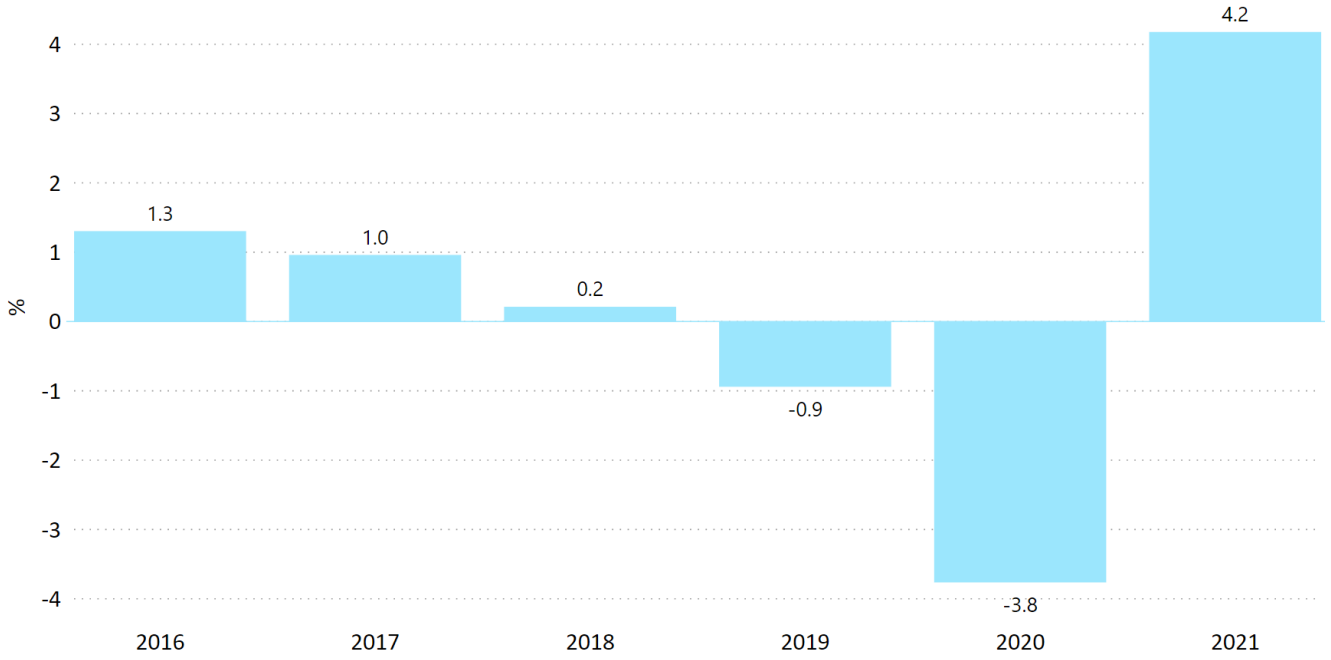
In 2021, electricity consumption rose with economic recovery.

In **2020** consumption dropped substantially (-3.8%) compared to 2019, due to a mild winter and subsequent COVID-19 containment measures.

In **2021** the economic recovery drove a **recovery of electricity consumption** (+4.2%).

% Year-on-year changes in electricity consumption in the EU-27/EEA(Norway)[2], Switzerland, 2016 - 2021



Source: ACER Calculations based on Eurostat data, completed with data by the European Network of Transmission System Operators for Electricity (ENTSO-E) – Transparency platform.
2. Through the European Economic Area ('EEA') agreement Norway implements most EU energy legislation and is a member of the internal energy market.

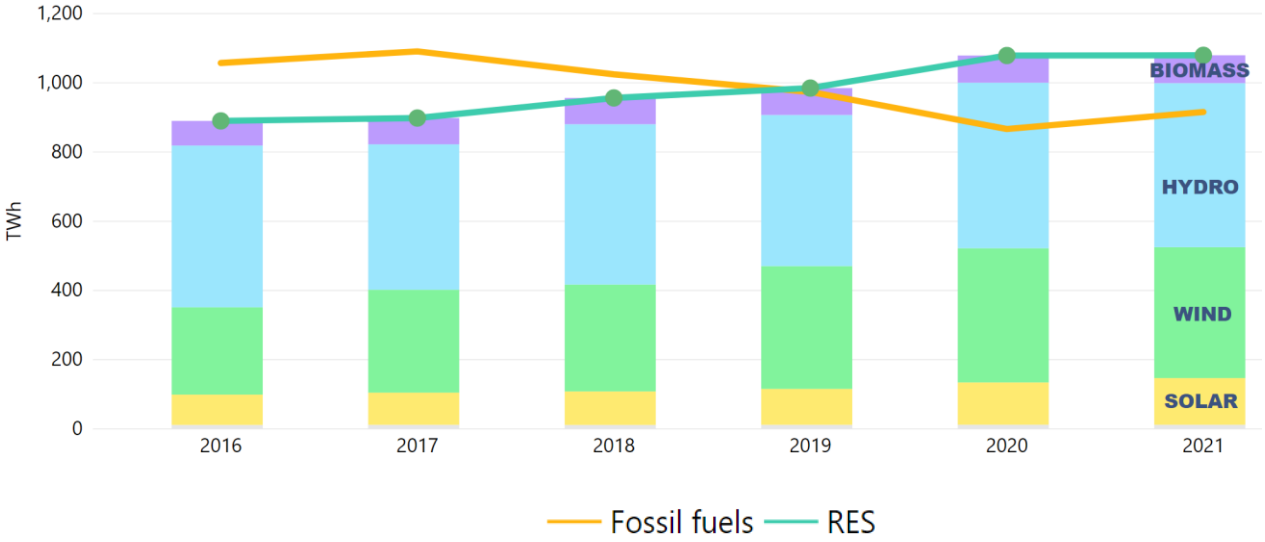
In 2021 renewables led electricity generation, despite a rebound in fossil fuel generation.

More electricity was generated **from renewables** than from **fossil fuels in 2021 (and 2020)**.

- However, growth in renewable stalled in 2021 (0%), in particular due to lower wind generation;
- As a result, in 2021 renewables were not growing fast enough for the rebound in electricity consumption. This triggered an increase in generation from fossil fuels.

→ ***In 2021, fossil fuels increased by +7%.***

Evolution of generation from renewables per type, compared to fossil fuels in the EU-27/EEA(Norway), Switzerland – 2021 (TWh)



Source: ENTSO-E Transparency platform.

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Record in EU installed renewable capacity in 2021.

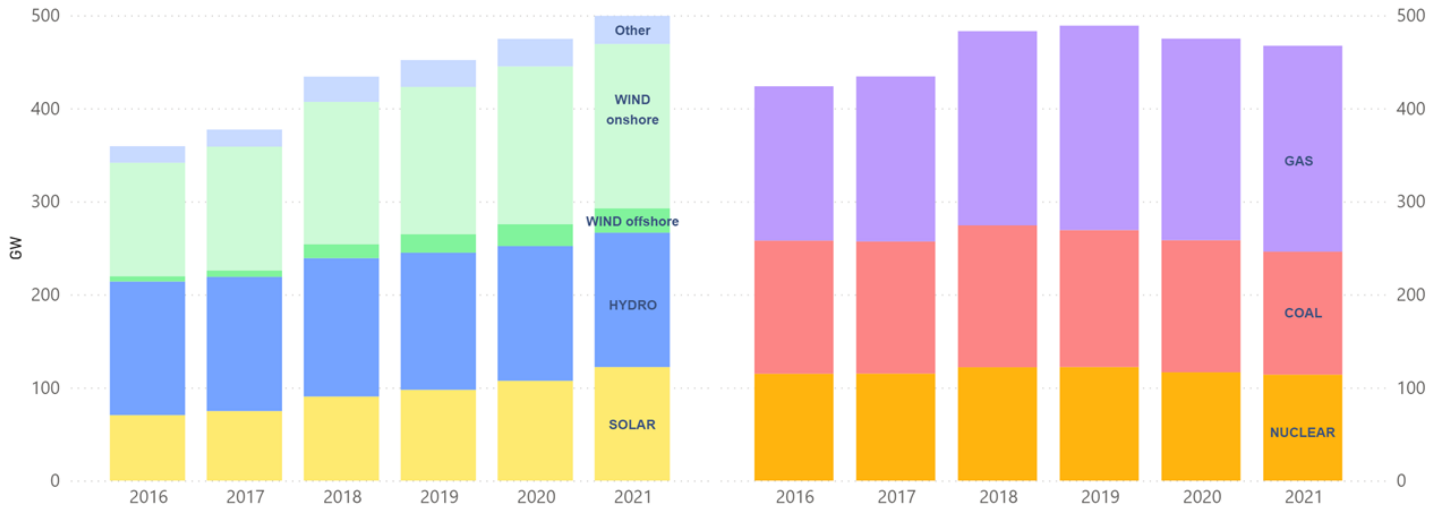
Installed capacity of renewables has been **growing steadily** in recent years.

→ ***Wind*** *and* ***solar*** *continue to be the ones contributing the most to the growth (65% of the installed capacity in 2021).*

Nuclear and **gas** remained stable, with **coal** slightly decreasing (-1.5%).

→ *To meet the* ***net zero target***[2]*, installed* ***coal*** *capacity will likely continue to* ***decrease****, while* ***wind and solar*** *will continue to play a major role.*

Evolution of installed capacity for renewable (left) and conventional (right) generation technologies, in the EU-27/EEA(Norway), Switzerland, and the UK – 2016-2021 (GW)



Source: ENTSO-E Transparency Platform.

[2] *https://ec.europa.eu/clima/eu-action/climate-strategies-targets/2050-long-term-strategy_en*

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In 2021, coal and solar generation of electricity increased the most.

In contrast to 2019 and 2020, **more electricity was produced from coal than gas in** 2021:

- Sharp increase of 18.6% in coal;
- Risks of pushing carbon dioxide emissions from the electricity sector to record levels next year.

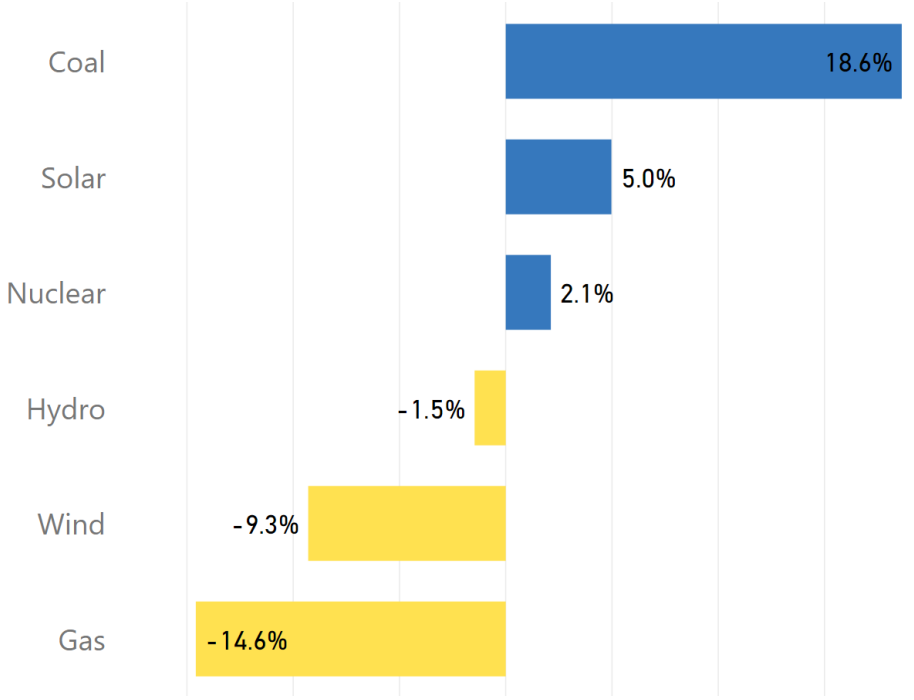
→ *This can be attributed to the **recovery of consumption** and **high gas prices**, that drove the shift to coal.*

Wind generation decreased (-9.3%) due to weather conditions in 2021.

Nuclear recovered from -11% of 2020.

→ *In 2021, the increase in nuclear generation (+2.1%) was driven by lower consumption and delays in construction and maintenance.*

% Year-on-year change for the main generation technologies in EU-27/EEA(Norway), Switzerland – 2021



Source: ACER calculations based on ENTSO-E data

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

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

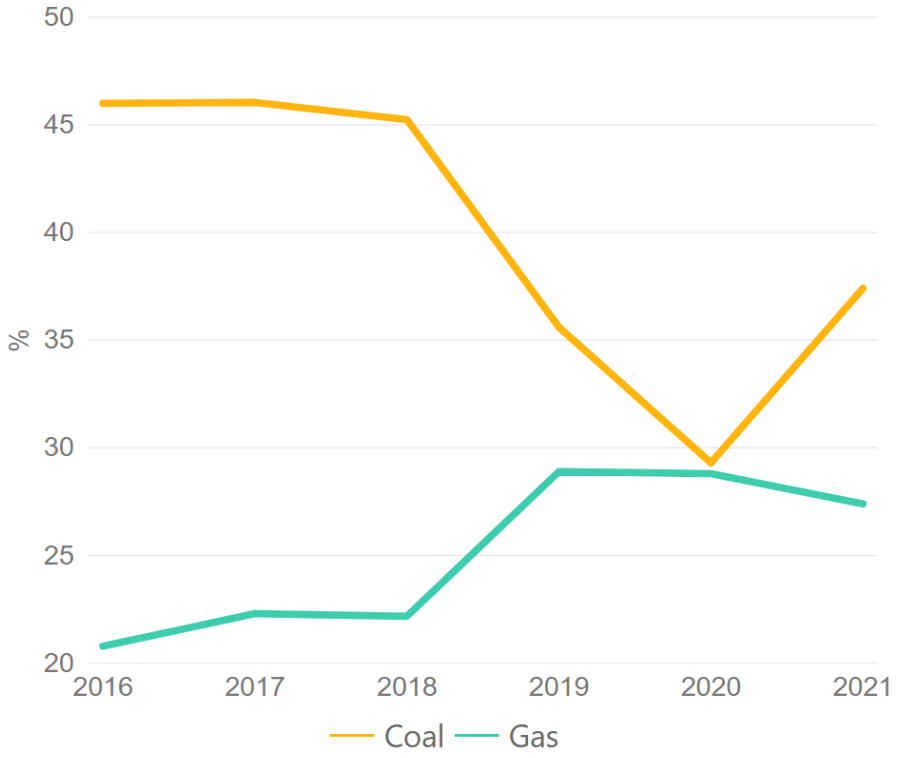
Utilisation of **coal-fired power plants** has been **decreasing** since 2018. In 2021 the trend reversed.

→ *The increase in usage of coal-fired power plants in 2021 contradicts the objective of gradually phasing coal out to favour the energy transition.*

Conversely, the use of **gas-fired power plants,** stable until last year, **decreased** in 2021 and this led to a decrease of the capacity factor.

→ *The decrease in usage of gas-fired power plants was due to high gas prices, making them less competitive than the coal ones.*

Capacity factors of EU-27 coal and gas-fired power plants – 2021 (%)



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

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Day-ahead electricity prices

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

In 2021, a sharp increase in electricity prices was observed in all EU markets[3], due to record high gas prices:

- **highest average prices** were registered in Greece (95 euros/MWh), Iberia (92 euros/MWh) and Italy North (100 euros/MWh);
- **Lowest average prices** were registered in the Nordic (55 euros/MWh) and Baltic region (70 euros/MWh).

Evolution of annual day-ahead electricity prices in some European markets - 2021 (euros/MWh)

Source: ACER calculations based on ENTSO-E data.

[3] See ACER Note on High Energy Prices available at https://documents.acer.europa.eu/en/The_agency/Organisation/Documents/Energy%20Prices_Final.pdf

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Electricity prices increased differently across Europe, in part due to local reliance on gas.

In 2020, day ahead prices **dropped by 32%** on average across the European Union, compared to 2019, due to a mild winter and COVID-19 containment measures.

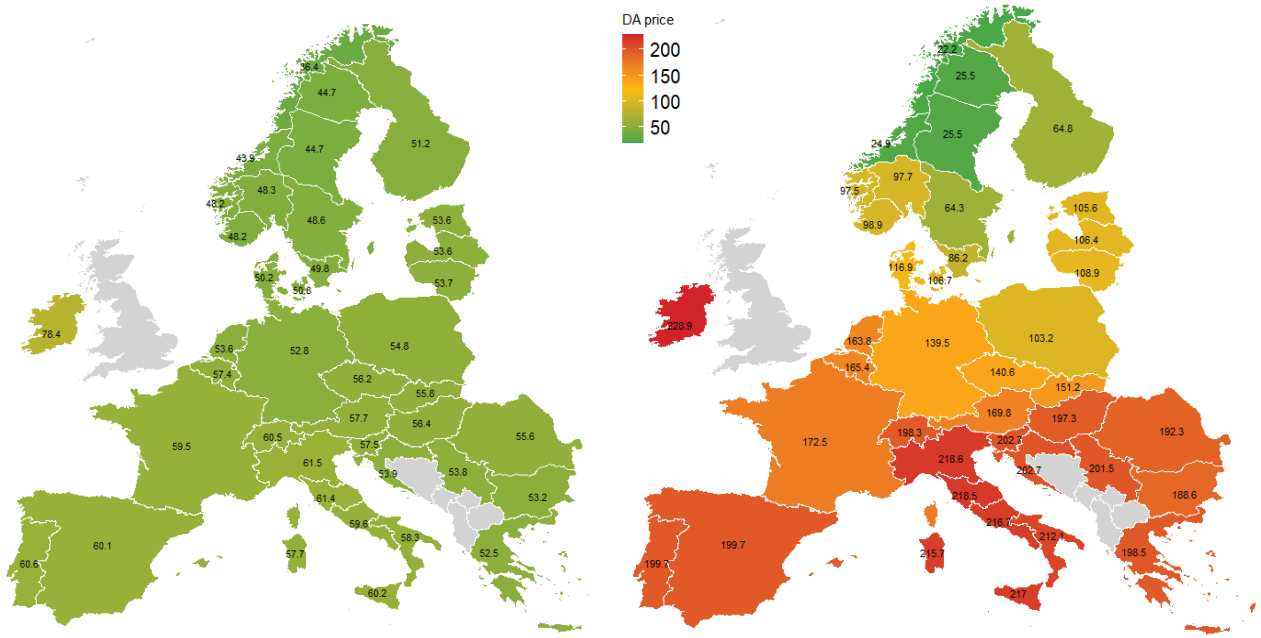
In 2021 **day-ahead prices increased sharply everywhere since September.**

- Average price in 2020 between 30 and 40€/MWh, and in 2021 around 80€/MWh;
- EC requested ACER in October to conduct an in-depth analysis[4] of the price increase.

→ *The **highest prices** in October were registered in **markets dependent on gas** for a large portion of their electricity generation (Ireland, Italy, Croatia, Hungary, Greece and Spain).*

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

Average annual day-ahead electricity prices January 2021 (left) and October 2021 (right) (euros/MWh)



Source: ACER calculations based on ENTSO-E data.

[4] https://documents.acer.europa.eu/en/The_agency/Organisation/Documents/Energy%20Prices_Final.pdf

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Day-ahead price convergence increased within most regions, partly alleviating price increases.

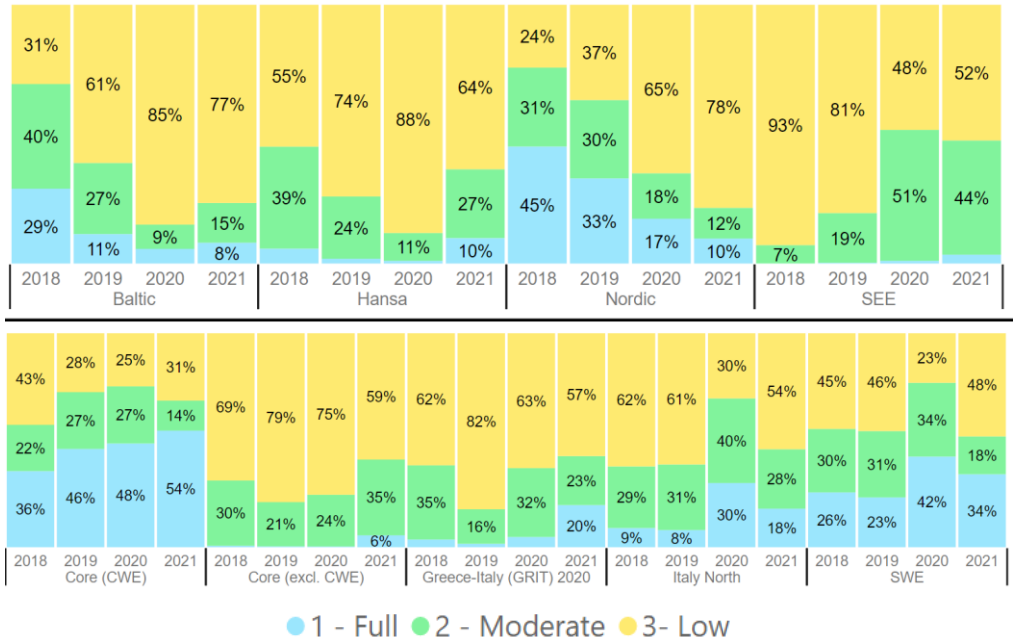
Price convergence provides an indication of electricity markets integration in Europe :

- Expected to increase;
  - → *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.*

Price convergence is boosted when market coupling takes place:

- Stable price convergence in South East Europe;
  - → *Greece, Bulgaria joined the Single Day-Ahead Market Coupling in December 2020 and May 2021. 4M Market Coupling and the Multi-Regional Coupling regions are coupled as of June 2021.*
- Decrease in full price convergence in Nordic (-7%), Italy North (-12%), South West Europe (-8%).
  - → *Nordics decrease may result from a combination of entry into force of new interconnectors[5] and possible structural congestions in the Swedish network[6].*

Day-ahead price convergence in Europe by region - 2021 (% of hours)



Source: ACER calculations based on ENTSO-E data.
Note: Full price convergence: <1 euros/MWh difference. Moderate price convergence: 1-10 euros/MWh difference. Low price convergence: >10 euros/MWh difference. The number of bidding zones varies among CCRs; full price convergence is more complex to achieve in CCRs with a higher number of zones. [5]New NO-DE, NO-UK interconnectors. [6]See SE derogation request from the 70% requirement.

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Negative prices increased compared to 2019, possibly incentivising storage and demand side flexibility.

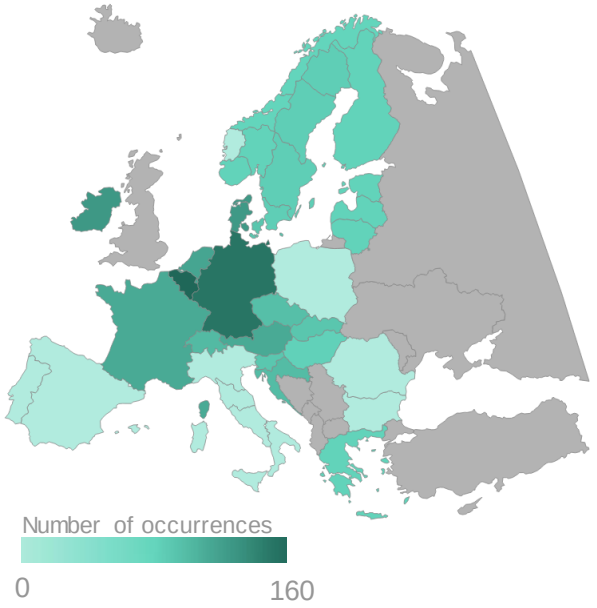
Negative prices usually appear at times of **high production from renewables** in combination with **low demand.**

In 2021, the occurrences of negative prices continued to increase. 2020 was exceptional due to very low demand during the lockdown; negative prices in 2021 were more frequent than in pre-Covid years.

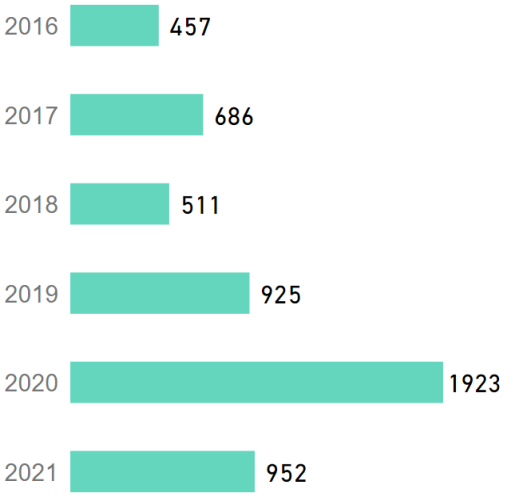
→ *The **German/Luxembourgish** bidding zone and **Belgium** have seen the highest amount of negative prices (139 and 159 respectively).*

With **increasing amounts of intermittent RES**, the number of negative prices is expected to increase. Well managed, this may bring opportunities such as incentivising **demand-response** and **efficient energy storage**.

Day Ahead negative prices in EU Member States in 2021 (number of occurrences)



Evolution of negative prices in the EU 2016 – 2021 (number of occurrences)



Source: ACER calculations based on ENTSO-E data.

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Greenhouse gas emission of electricity generation

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Emission intensity of electricity generation increased slightly in 2021…

Electricity generation contributes substantially to total greenhouse gas emissions.

→ *The total emission intensity decreases with demand and as **less carbon-intensive** generation technologies take over those with a higher carbon footprint.*

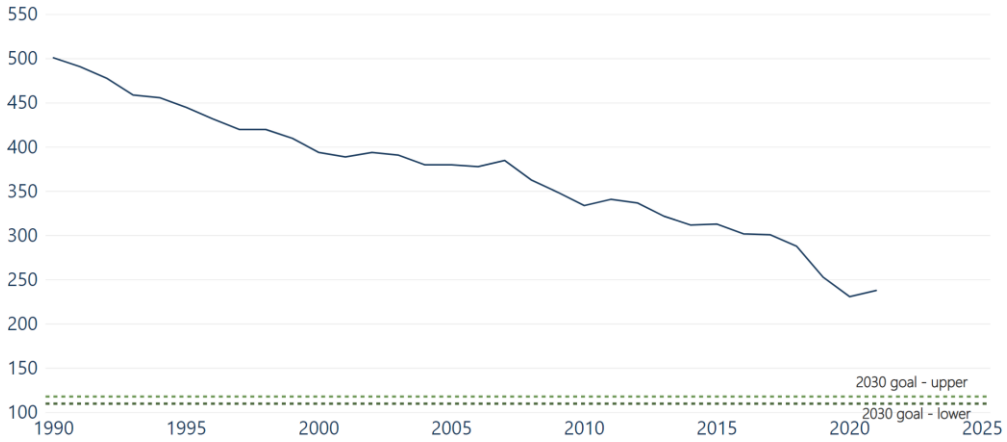
It has been **continuously decreasing** over the last 3 decades, in line with EU climate objectives.

→ ***Policies** on industrial emissions, towards less carbon intensive energy sources and energy efficiency played a key role[7].*

In 2021, the rebound in fossil fuel generation led to an **increase in emission intensity of electricity generation** compared to 2020.

To reach net zero, we need to further **decarbonise the electricity sector.**

Greenhouse gas emission intensity of electricity generation, EU-27 average – 1990-2021 (g CO2e/kWh)



Source: EEA and IEA.
Note: Greenhouse gas emission intensity is calculated by taking the total emissions from electricity production (in CO2e), and dividing it by the gross electricity production. Data for 2021 is estimated.
[7] https://www.eea.europa.eu/ims/greenhouse-gas-emission-intensity-of-1

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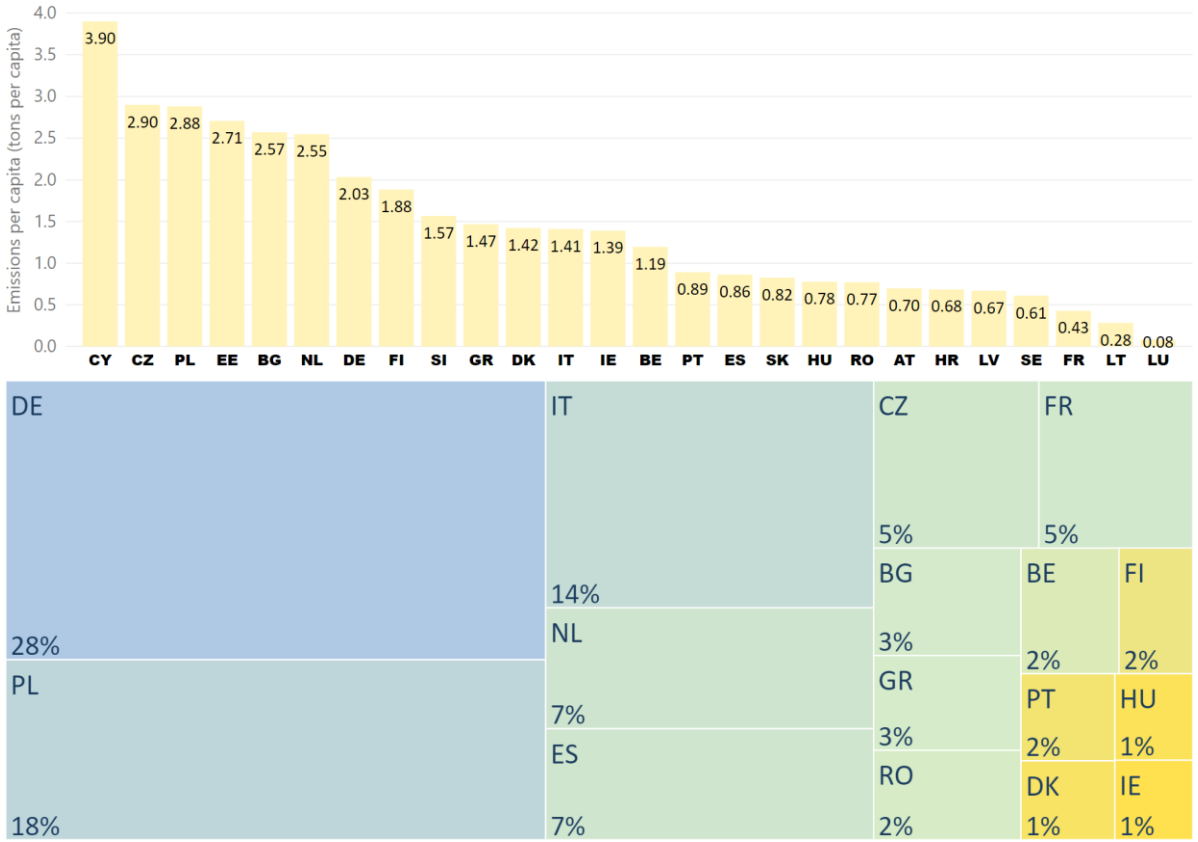
…and emissions shares remained stable in 2021.

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 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.**

→ *In 2021, the situation was almost identical as the 2020 scenario, with Germany (28%), Poland (18%) and Italy (14%) in the lead.*

Total emissions of electricity generation per Member State and per capita (above) and share per Member State (below, areas of rectangles correspond to each MS) - 2021 (tons per capita and % of grand total, respectively)



Source: ACER calculations based on ENTSO-E and the International Panel on Climate Change (IPCC) data.

Note: only emission shares superior or equal to 1% are reported.

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Conclusion

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2021: year of the energy transition or transition year ?

Progress…

More electricity was generated **from renewables** than from **fossil fuels in 2020 and 2021.**

Installed EU renewable capacity reached record levels in 2021. **Despite a growth of renewables, the use of coal-fired power plants led to an increase in emission intensity** of electricity generation in 2021.

Day-ahead price convergence and **market integration increased** within almost all regions, with more welfare gains for EU citizens.

… and setbacks.

In **2021** the economic recovery drove an **increase of electricity demand**.

Insufficient renewables and high gas prices drove a strong increase in generation from fossil fuels, and a shift to coal. There are **risks of pushing carbon dioxide emissions from the electricity sector to high levels next year**.

Electricity prices increased sharply, although differently depending on the local reliance on gas to generate electricity.

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