A Look back at EU Power Generation in 2023

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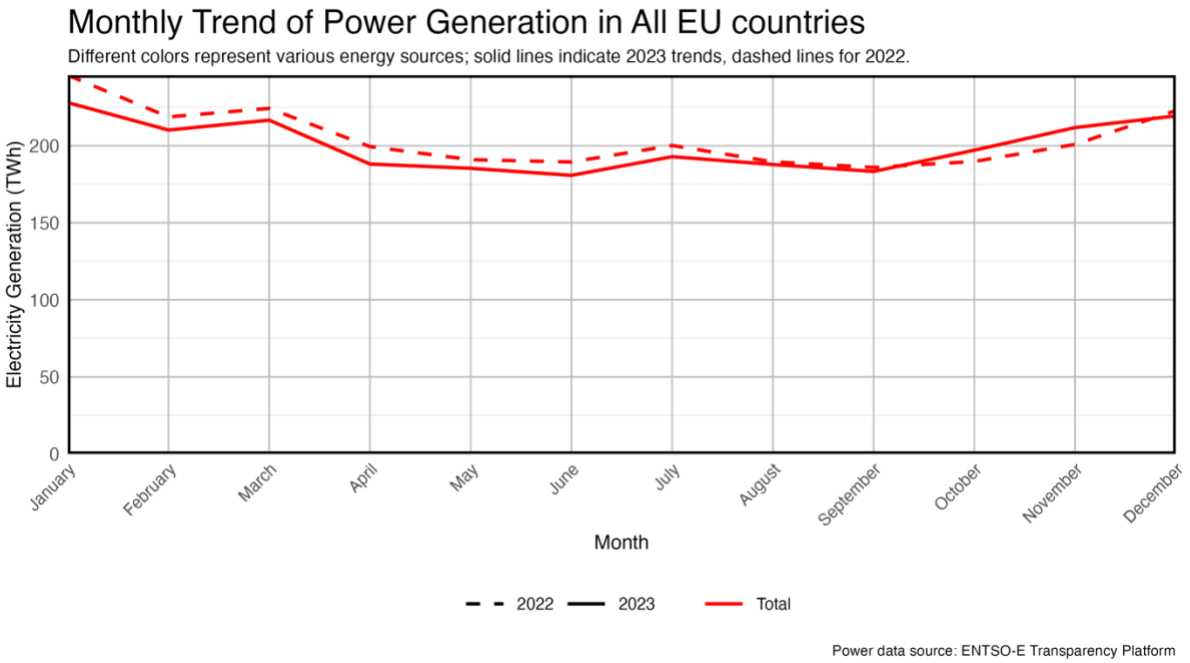
In 2022, EU nuclear and hydro generation dropped by 118 terawatt-hours (TWh) and 71 TWh, respectively, preventing gas-fired generation from dropping and contributing to aggravate the gas crisis. 2023 offers a total opposite picture: a drop in total generation as well as in coal- and gas-fired generation helped stabilize European gas spot prices, while clean sources of generation such as wind and solar continued to increase and nuclear and hydro recovered.

EU Generation Dropped by 2.3 Percent in 2023

At the transmission level, we observed a generation drop by 2.3 percent (-56.4 TWh), notably during January 2023 which experienced a 7.2 percent drop, as a result of policies boosting energy savings combined with a reaction to high power prices. Meanwhile, EU generation was showing a slight increase (+2.4 percent) during the last quarter. Countries where significant generation reduction happened in 2023 include Estonia, Bulgaria, and Belgium (see Table 1). However, some countries experienced significant power production increases in 2023.

Country	Change (%)	Change (TWh)
Estonia	-35.4%	-2.5
Bulgaria	-20.5%	-10.3
Belgium	-13.1%	-11.6
Czech Republic	-9.8%	-7.6
Germany	-9.3%	-44.6
Italy	-9.1%	-22.5
Poland	-5.8%	-9.4
Greece	-5.3%	-2.1
Spain	-4.8%	-12.3
Denmark	-3.9%	-1.3
Sweden	-3.9%	-6.3
All EU-25	-2.3%	-56.4
Netherlands	-2.1%	-2.3
Hungary	-1.6%	-0.5

Country	Change (%)	Change (TWh)
Portugal	-1.3%	-0.5
Luxembourg	0.8%	0.01
Romania	2.3%	1.3
Austria	9.1%	4.7
France	11.1%	47.2
Slovakia	11.5%	3.0
Slovenia	15.6%	1.9
Finland	16.3%	10.4
Ireland	20.8%	3.6
Croatia	21.9%	2.8
Latvia	26.3%	1.2
Lithuania	43.5%	1.4
Cyprus	NA	NA
Malta	NA	NA

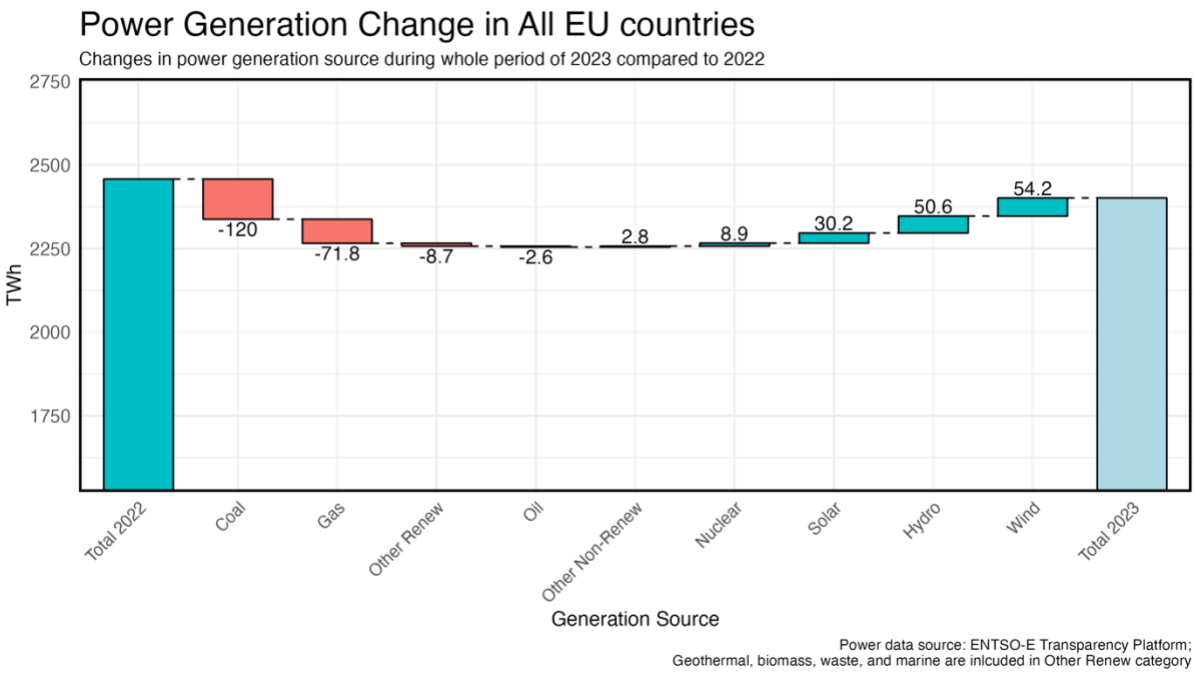


These generation changes at a country level could be due to changes in electricity trade as well as a reduction of demand at the transmission level. The drop at the EU level seems to come from various reactions to the 2022 energy crisis (energy efficiency, change in consumer behavior triggered by policies or high power prices) as well as increase in behind the meter (solar) generation which is not reported at the transmission level[1]. In Germany, power generation dropped by 11 percent, due to an estimated 3 to 4 percent drop in consumption and an increase in imports[2]. In France and Spain, weather-adjusted demand dropped by 3.5 percent and 2.1 percent in 2023, respectively[3].

More hydro, nuclear and renewables in 2023

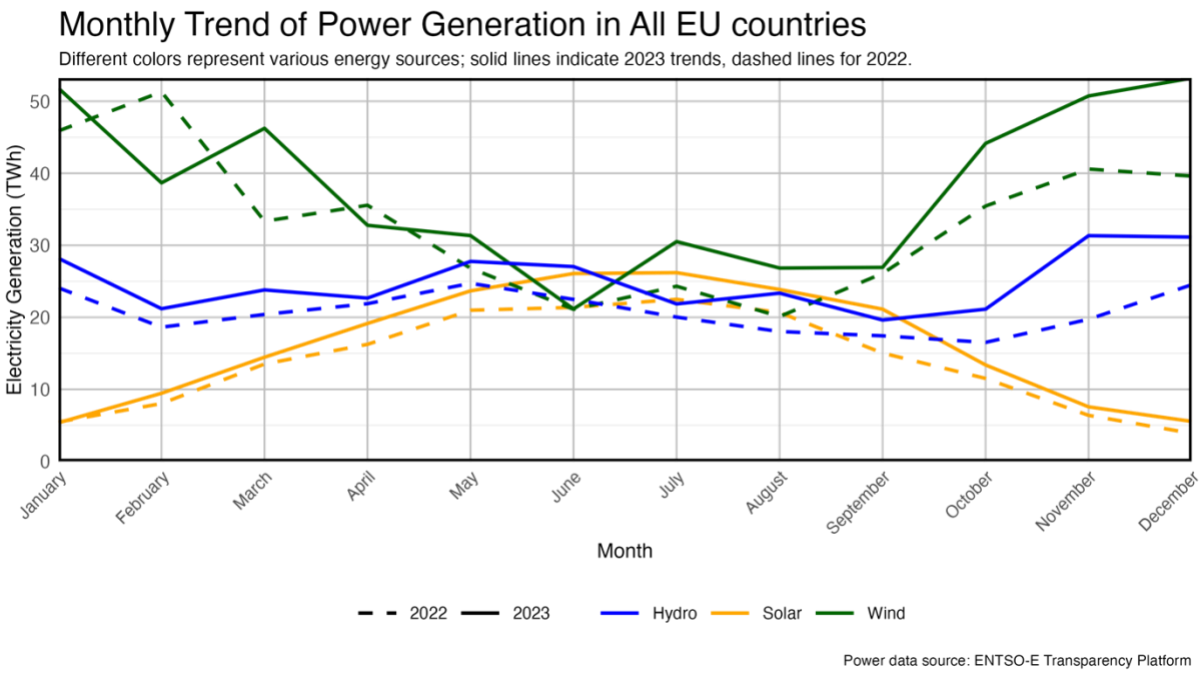
In 2023, EU **hydro** generation recovered by 50.6 TWh, but still remained below 2021 levels. All monthly hydro levels increased year-on-year, due to wetter conditions than in 2022, except in southern Europe which experienced a particular hot and dry summer[4]. The highest relative gain was nevertheless experienced by Portugal which almost doubled hydro generation to reach 2021's level. In absolute terms, Italy, and France experienced the highest increases (9.9 TWh and 9.2 TWh), but hydro levels in 2023 remain below 2021 levels. In contrast, Sweden, the region's largest hydro producer, experienced a similar drop as in 2022 (around 4 TWh).

In aggregate, **nuclear** generation increased by a modest 8.9 TWh, still significantly below 2021 level (697.8 TWh). Germany lost 26.1 TWh (-79.5 percent from last year or -90% from 2021 figure) as the last three nuclear power plants were decommissioned in April. Belgium also disconnected two nuclear plants (Doel 3 in September 2022 and Tihange 2 in January 2023) following its 2003 legislation to phase out nuclear by 2025 which resulted in a decrease of 10.4 TWh in 2023 vs 2022 period[5]. On the other hand, French nuclear rebounded from 2022 levels to 320 TWh as EDF successfully managed the production of the plants affected by corrosion issues[6].



Additionally, **wind and sola**r increased by 54.2 TWh and 30.2 TWh, respectively. A whooping 56 GW of solar capacity was installed in Europe in 2023, 40 percent more than in 2022[7]. (This includes rooftop solar which is not included in the transmission data). In particular, Germany installed an additional 14.1 GW, followed by Spain (8.2 GW), Italy (4.8 GW), Poland (4.6 GW), and the Netherlands (4.1 GW). The total EU solar PV fleet now amounts to 263 GW, up 27 percent from the 207 GW in 2022. Germany continues to be the largest PV capacity holder with 82 GW, followed by Spain (36 GW) and Italy (29.5 GW)[8].

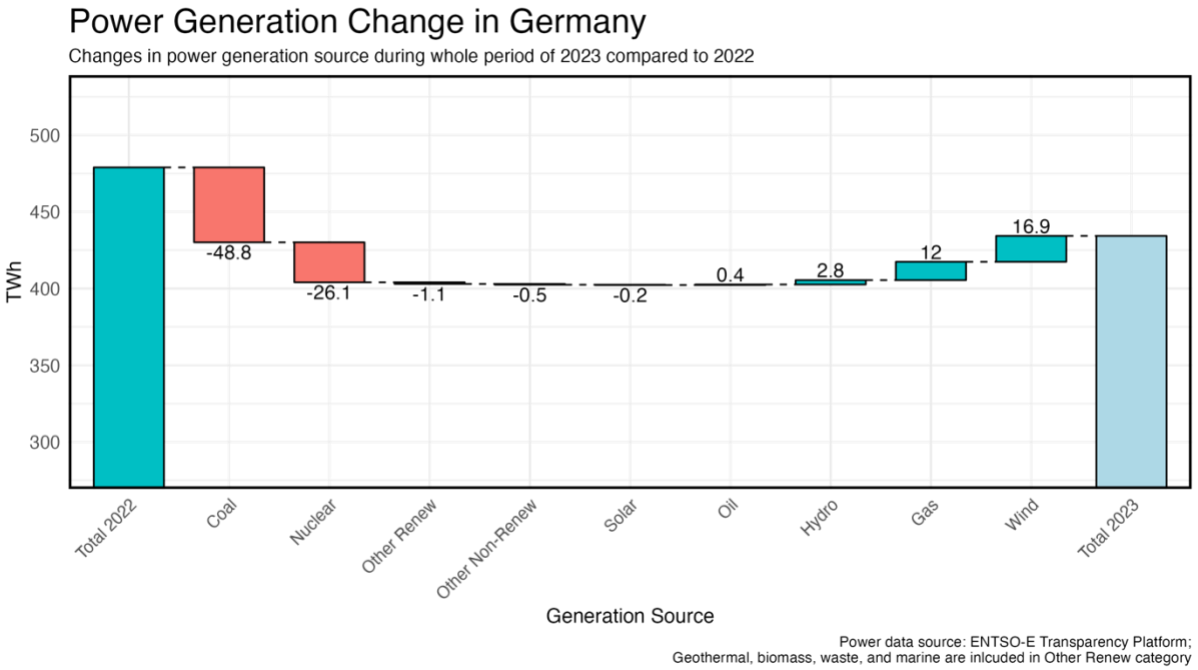
According to the IEA Renewable Energy Progress Tracker[9], EU added between 16.2 and 17.1 GW of wind capacity, notably in Northern Europe: 2.7 GW in the Netherlands, 2.5 GW in Sweden, and 1.5 GW in Poland. The increase in wind generation was particularly strong during the second half of 2023. Many European countries set peak record wind generation in December 2023, with generation reaching 53.2 TWh, up 34.3 percent year-on-year. Strong wind conditions even resulted in an increase in negative hourly power pricing.



A Major Decline in Fossil Fuel Generation

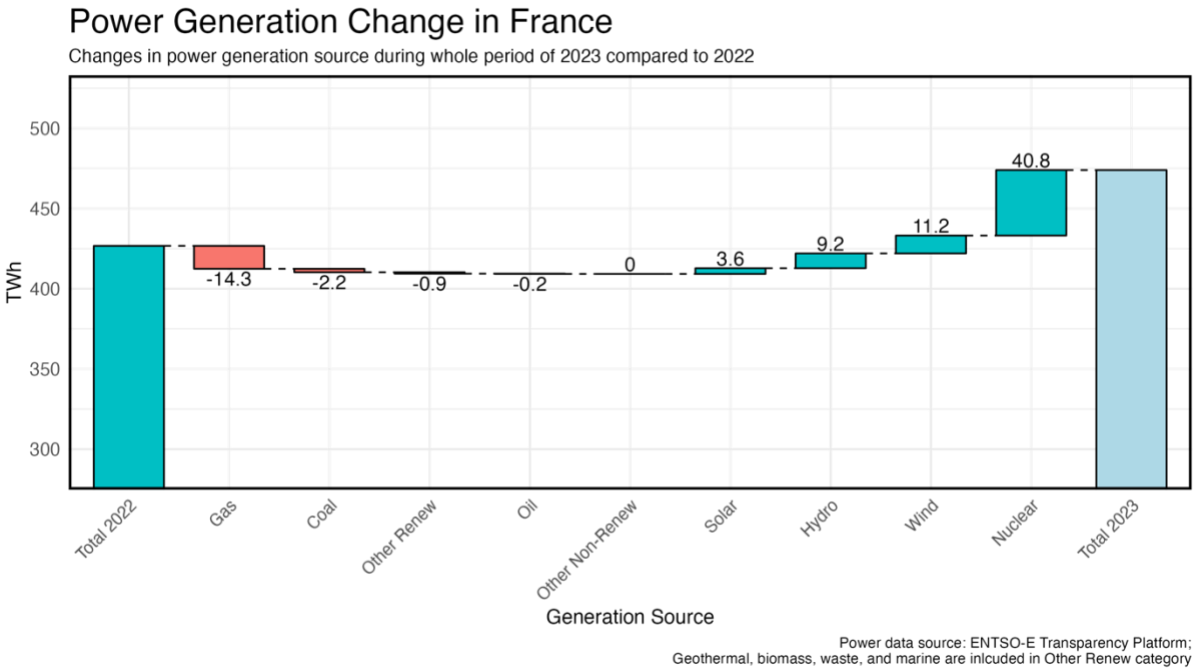
The combination of the drop in generation and the increase in wind, solar, nuclear and hydro resulted in a significant decline in fossil fuel generation: -120 TWh drop in coal and -71.8 TWh in gas. This is roughly equivalent to a 13 bcm drop in EU gas demand, which contributed to improve the overall EU supply/demand balance and stabilize European gas prices in 2023. The significant drop in coal generation by 120 TWh marks a reversal of the rebound started in 2021 (+68.7 TWh) that extended in 2022 (+24.5 TWh), and brings coal-fired generation levels below those in 2020.

How Germany, France, Italy and Spain Fared in 2023

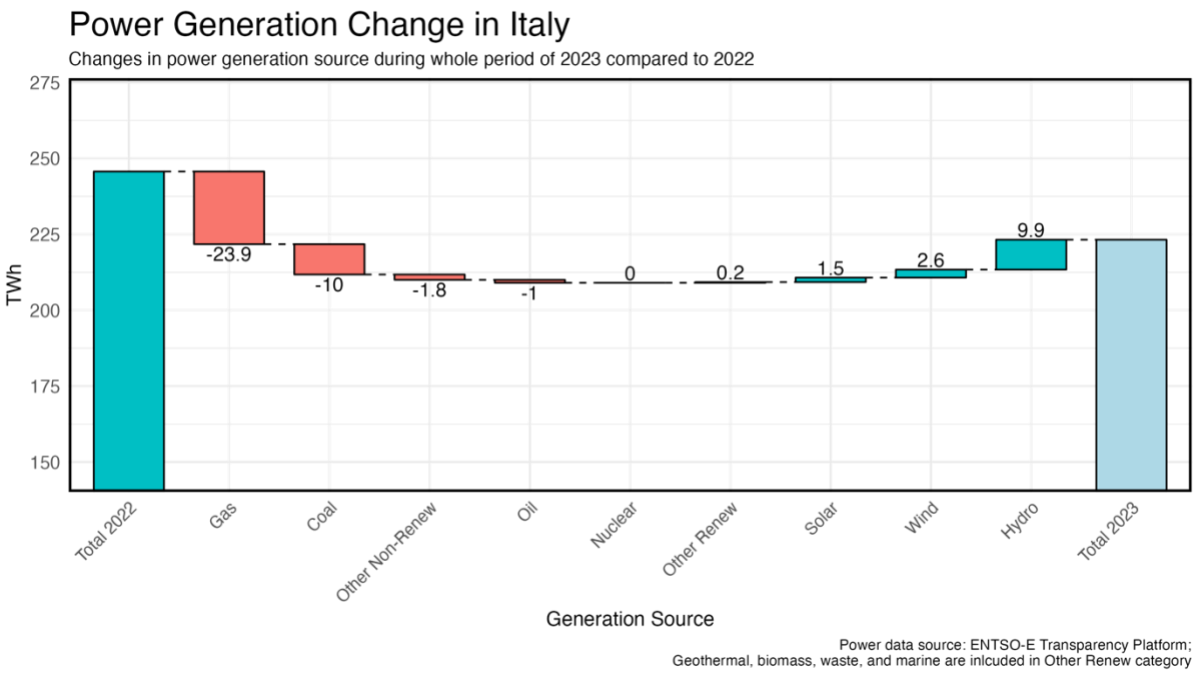


Not only has Germany lost a significant amount of generation at the transmission level due to reduced power consumption and increased imports (Germany has become a net power importer for the first time since 2002[10], but the country has also experienced a net increase in gas-fired generation – one of the few EU countries in that case. Since April 16, 2023, there is no more nuclear generation in Germany for the first time since 1960. Despite the significant drop in coal-fired generation contributing to 40 percent of the EU drop, Germany remains the largest country in terms of coal-fired generation, slightly ahead of Poland. The absence of increase of solar generation despite the significant increase in capacity may be partially explained by the fact that around half of the capacity increase happened at the residential level[11].

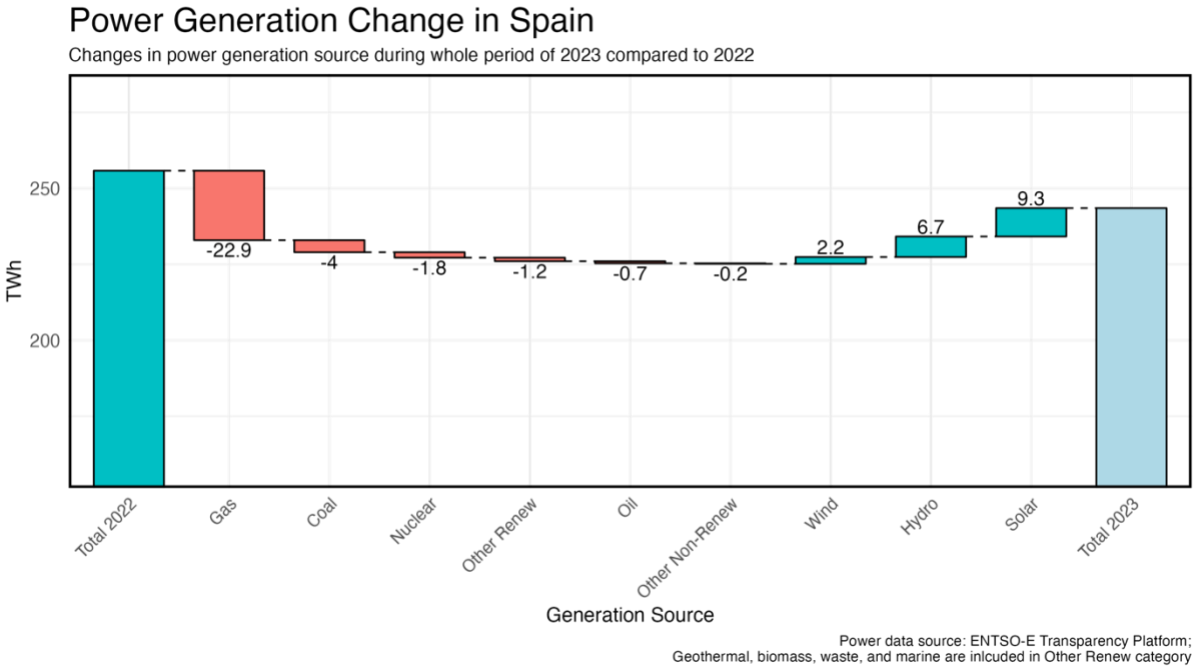
In contrast to Germany, French total generation recovered significantly from the disastrous situation in 2022. While nuclear generation still remains lower than pre-2020 levels, it is about 40 TWh higher than 2022's record low levels. EDF expects a continuous improvement of nuclear generation over the coming years, notably due to Flamanville coming online mid-2024. As of January 2024, France had 47 nuclear power plants representing 50 GW available. The increase in all clean power sources by around 65 TWh led to an increase in power exports as well as a reduction in gas-fired and coal-fired generation.



Italy's reduction in power generation seems to originate from both the lower domestic demand but also from higher power imports, notably from France[12]. The quite significant drop in gas-fired generation (-23.9 TWh) is consistent with gas transmission company Snam reporting a 3.5 bcm drop in gas demand from the power sector over the first 9 months of 2023[13]. Meanwhile, coal-fired generation dropped after the 2022 surge, as the government was in a position to restrict its use to a minimum as emergency measures implemented during the 2022 energy crisis were scaled back in 2023[14], while the country plans to decommission coal-fired plants by 2025 (except in Sardinia).



Spain also witnessed a strong increase in clean power sources – with the exception of nuclear and a substantial drop in gas-fired generation, which is consistent with the 42 TWh of gas demand drop reported by gas transmission company Enagas[15].



Source: ENTSOE, Transparency Platform, accessed on January 11, 2024, https://transparency.entsoe.eu.

Notes

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[3] https://analysesetdonnees.rte-france.com/consommation/synthese; https://www.ree.es/en/press-office/press-release/news/press-release/2023/12/Renewable-energy-breaks-records-and-accounts-for-more-than-50-per-cent-of-electricity-generation-Spain-2023
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