EUROPEAN
COMMISSION

Brussels, 22.3.2024
COM(2024) 136 final

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Report on energy prices and costs in Europe

1. INTRODUCTION

Since 2020, European and global energy markets have been going through a severe crisis. This was the result of multiple factors, starting with a COVID-induced recession followed in 2021 by strong post-COVID global economic recovery, unfavourable weather conditions for renewable generators, and outages at France's nuclear power fleet. Following Russia's full-scale invasion of Ukraine in February 2022, the crisis entered a new dimension, comparable to the oil crises in the 1970s, with an unprecedented disruption in Europe's natural gas supply, leading to historically high gas and electricity prices.

The EU reacted to this crisis with unity, determination and solidarity. Increased liquefied natural gas (LNG) imports reduced Russian leverage over European gas supplies. Rapid EU joint emergency measures addressed the need to save gas, fill gas storages, jointly purchase gas, strengthen solidarity rules for gas emergencies, lower electricity and gas prices and mitigate the impact of high prices on consumers. Gas prices remained very high until the end of 2022, after which they gradually decreased to more manageable levels due to regulatory actions, reduced demand and improvements in other market fundamentals.

Nevertheless, the case for a transition towards a decarbonised European energy system, one less dependent on energy imports, has never been stronger or clearer. A successful energy transition, increasing renewable energy production and energy efficiency would not only reduce carbon emissions, but also protect European households and businesses against price volatility, reduce our dependence on imported and expensive fossil fuels and strengthen Europe's strategic autonomy. Energy should remain affordable for households and businesses, with regulatory conditions enabling investments in the technologies needed for further decarbonisation.

This report aims to provide comprehensive information to understand the development of energy prices and costs in the EU from 2010 to 2022 and, where data are available, up to mid-2023[1]. It analyses **energy price trends** for electricity, natural gas and petroleum products, looking in detail at their **market and regulatory drivers** and providing international comparisons. It also assesses the importance and impact of energy costs for European businesses and households. It analyses the development of the **EU's energy import bill,** the energy cost shares for selected industrial sectors and the impact of **energy expenditure on households' budgets.** It also looks at the importance of **energy taxes** as a source of government revenue.

As in previous editions[2], the report relies on data and analyses from an in-depth study[3] and the European Commission's own work. Public statistical sources were privileged in the report, complemented by a series of specific data collections. Following Brexit, the report focuses on the EU27.

[1] Depending on availability, some benchmarks were updated as of September 2023 to reflect latest available data
[2] COM(2016)769 final, COM(2019)1 final and COM(2020)951 final
[3] The study will be published through the Publications Office.

2. TRENDS IN ENERGY PRICES

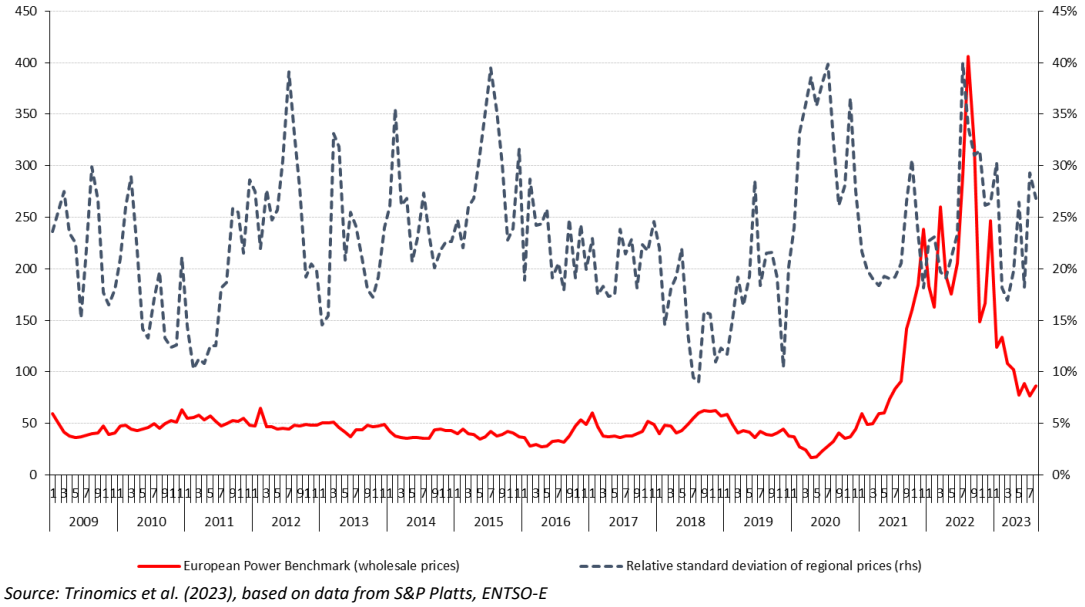
2.1. Electricity prices

From 2015 to 2019, European **wholesale electricity prices** fluctuated between 40 and 60 EUR/MWh. **Spot prices** were relatively stable until the end of 2018, then decreased in 2019 due to weak demand, lower fuel costs, and increased renewable generation. In 2020, COVID-19 led to a further significant drop in the demand for electricity, which, together with rising renewable generation, pushed wholesale prices to exceptionally low levels (17 EUR/MWh in May 2020), including increasingly frequent periods of negative prices during the day.

The post-COVID economic recovery starting in 2021, Russian interference with gas supply to the EU and, finally, Russian invasion of Ukraine led to a widespread disruption in global and European energy markets. This also impacted wholesale electricity prices in the EU, as higher gas prices (see Chapter 2.2 on gas) drove electricity prices upwards to between 150 and 270 EUR/MWh (Figure 1). In Europe, gas-fired power stations are often the marginal technology setting the wholesale electricity prices. The limited options to replace gas-fired electricity generation with cheaper power generation sources, together with low levels of hydropower and renewable generation, as well as nuclear outages, have pushed electricity prices to record highs during 2022 (reaching 400 EUR/MWh in August 2022).

However, since the end of 2022, the general trend of falling gas prices, reduced demand, higher nuclear and renewable generation and recovering hydro stocks have led to a return of relatively lower prices (in the range of 70 and 120 during the first half of 2023).

Figure 1: Evolution of monthly average wholesale day-ahead baseload electricity prices in Europe (EUR/MWh, left scale) and the range of minimum and maximum prices across the main EU markets (%, right scale)

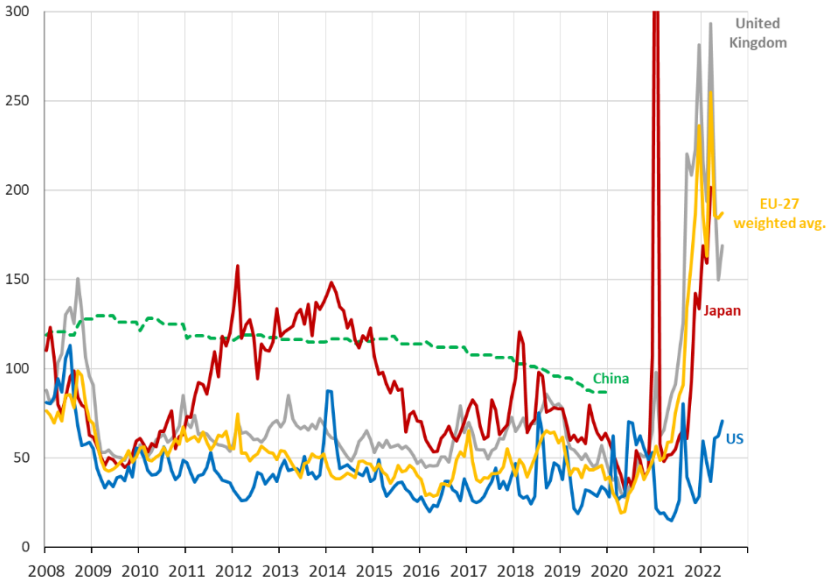


Source: Trinomics et al. (2023), based on data from S&P Platts, ENTSO-E

In the decade before the energy crisis, European wholesale electricity prices were lower than or comparable to Japan and China (Figure 2) and historically (up to 40%) higher than US prices most of the time. The energy crisis and Russia's war in Ukraine have led to a convergence of prices between Europe and Asia. Prices in the US, thanks to abundant domestic gas production, stayed comparatively low and European electricity wholesale prices became between 2-5 times higher than the US prices. Wholesale electricity prices in UK and Japan have experienced

similar increases. Chinese electricity prices could reflect the presence of large-scale subsidies before 2020 (no more cent data available).

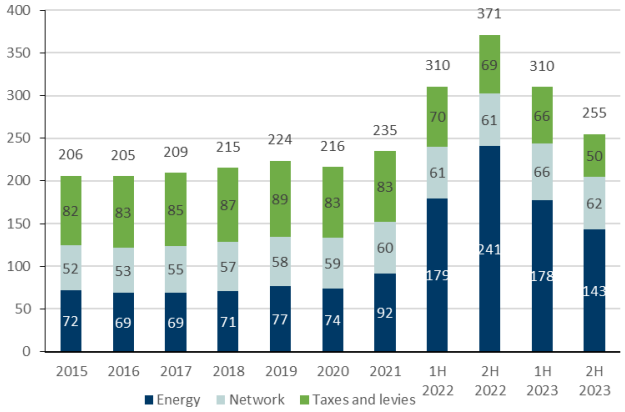
Figure 2: Comparison of monthly average day-ahead wholesale electricity prices in the EU, US, UK, Japan, and China (EUR$_{2021}$/MWh[4])



Source: Trinomics et al. (2023), based on data from S&P Platts, ENTSO-E, JEPX, EIA, CEIC

After a prolonged period of relative stability (2010 – 2019), **retail electricity prices** started to increase significantly in 2021 in response to rising wholesale prices (Figure 3). Retail prices are normally higher than wholesale prices, but since late 2021 they have been lower than wholesale market prices at the price spikes during the crisis (e.g. just after the invasion of Ukraine and during the summer of 2022).

Figure 3: Composition of weighted average household retail electricity prices for EU27 (EUR/MWh)



Source: Trinomics et al. (2023), based on data from Eurostat, VaasaETT

This happened because the increase in wholesale prices was quick and significant reflecting the need to balance supply and demand. On the other hand, the pass-through to retail prices reflected retailers' market situation and was reduced by their supply strategies (e.g. long-term contracts and other price hedging), the structure of contracts in Member States (dynamic price vs fixed price contracts), level of retail competition, and by public interventions[5]. Average EU

[4] All prices were converted to 2021 euros.

[5] Cf. 2023 Report on Energy Subsidies in the EU (COM(2023) 651, 24th October 2023)

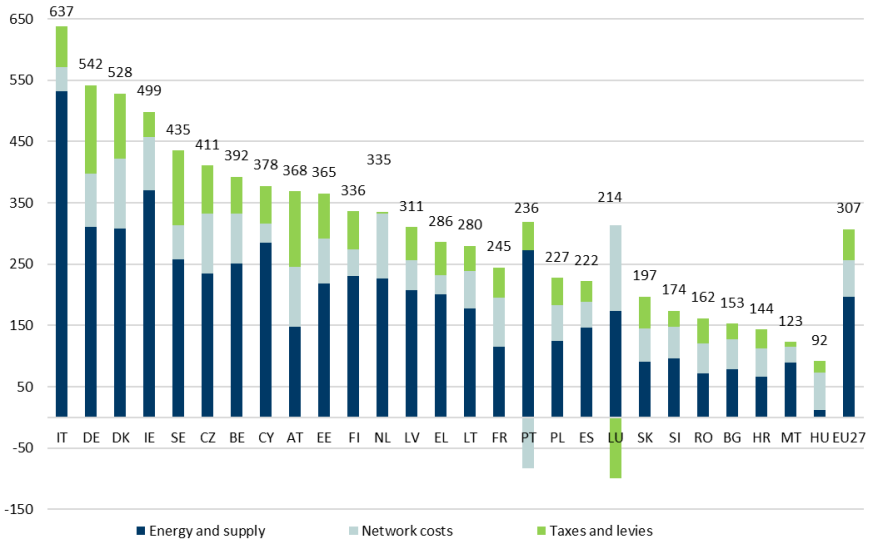
retail electricity prices started to increase around 6 months later than wholesale prices in late 2021. They reached their highest level in October 2022 and decreased in 2023 due to falling wholesale prices.

With regards to the components of electricity prices (energy costs, network charges, and taxes and levies), increases in the energy costs component (mainly the wholesale prices but also mark-ups charged by the energy suppliers) and to a much lower extent value-added tax (VAT) drove the retail electricity price rises in 2021-2022. Network charges remained stable, while energy taxes slightly decreased during the same period, reflecting a temporary policy response to the crisis.

In concrete terms, the average EU27 retail electricity price increased by 9% (+19 EUR/MWh) to 235 EUR/MWh between 2020 and 2021. In the first half of 2022, prices jumped to 310 EUR/MWh (+32%), and in the second half of 2022, to 371 EUR/MWh (+20%). In the first half of 2023, following the decrease in wholesale markets, retail prices fell back to 310 EUR/MWh (-16%). Retail electricity prices peaked above 500 EUR/MWh in Austria, Belgium Denmark, Germany, Italy and the Netherlands.

The composition and level of retail household prices varies widely across Member States (Figure 4). Retail electricity prices for households ranged from 637 EUR/MWh (Italy) to 92 EUR/MWh (Hungary) in January 2023, with most of the difference clearly attributable to the energy component (blue bar in Figure 4). Rebates on energy taxes in Lithuania, Luxembourg and the Netherlands and on network charges in Portugal reduced, in some cases significantly, the retail price actually paid by consumers in these countries. Bulgaria, Hungary, Ireland and Latvia reduced the energy taxes and levies on electricity to 0 EUR/MWh as part of their national measures to address the energy price crisis.

Figure 4: Household electricity prices, January 2023 (EUR/MWh, most representative consumption band[6])



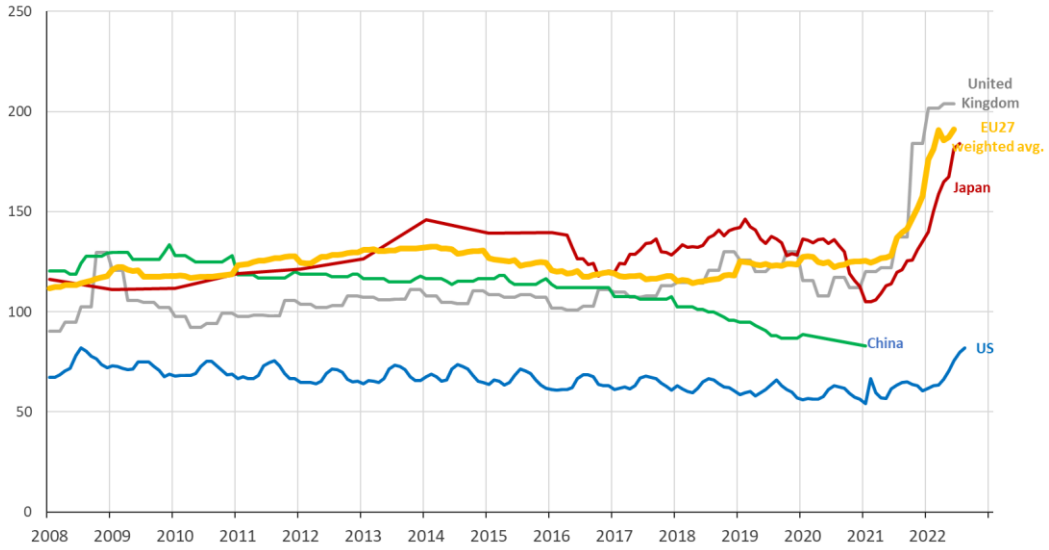
Source: Trinomics et al. (2023), based on data from Eurostat, VaasaETT

Figure 5 below presents the development of retail industrial electricity prices in the EU, the US, Japan and other countries between 2008 and 2022. Average industrial retail electricity prices in

[6] The most representative band is defined as the one with the highest share in total consumption in any given Member State. While the DC band is used as the main point of reference for comparative analysis, in some Member States another might be the most representative.

Japan and the EU27 are at a similarly high level, while prices in the US are significantly lower than in the EU (around 2 to 3 times lower). The increase in average EU and Japanese prices since 2020 is clear. In 2022, prices in the US have also started to trend upwards, although these remain significantly below EU levels. In percentage terms, between January 2021 and June 2022, EU average prices (+231%) and US prices (+225%) increased at a relatively similar pace.

Figure 5: Industrial retail electricity prices in the EU27, the US, the UK, China and Japan (EUR$_{2021}$/MWh[4])



Source: Trinomics et al. (2023), S&P Platts, Eurostat, US DoE, Enerdata (NBS, E-Stats, BEIS, KESIS), IEA.

2.2. Gas prices

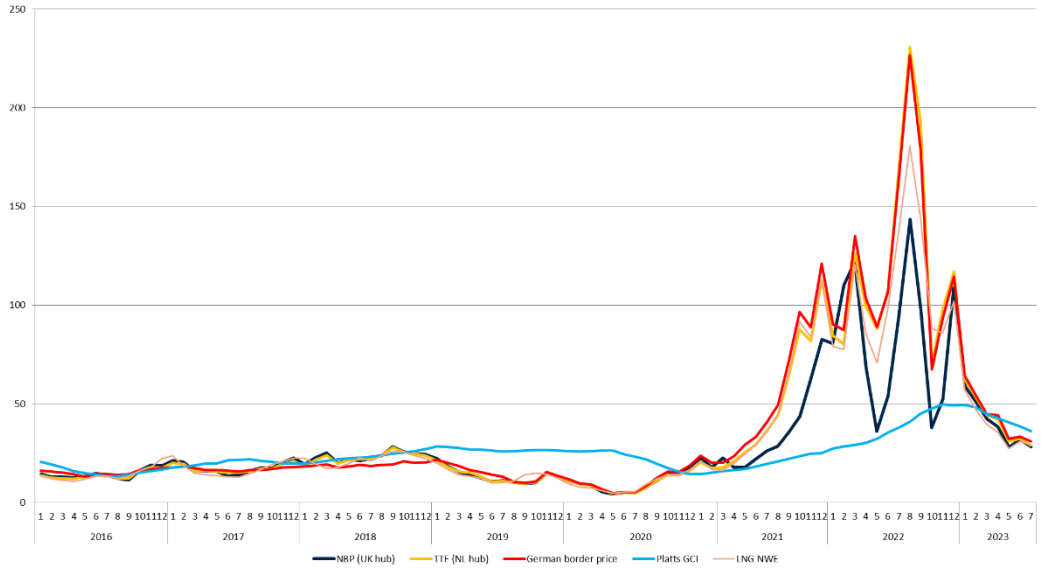
Historically, European **wholesale gas price**s fluctuated between 5 and 30 EUR/MWh in the period from 2015 to 2020. Prices fell to historic lows during 2019 and 2020 (below 5 EUR/MWh in May-July 2020), when a relatively mild winter and COVID lockdowns depressed gas demand. Increasing gas demand in the post-COVID recovery period started to drive gas prices higher from mid-2021. By December 2021, increased European and Asian gas demand, combined with reduced gas exports from Russia and almost empty Gazprom-owned European storages[7], had tightened European gas markets and had driven wholesale prices to 113 EUR/MWh; more than 3.5 times above the historical range (Figure 6).

Then, in March 2022, the Russian invasion of Ukraine drove gas prices to a new peak of 127 EUR/MWh. The gas market became extremely volatile due to geopolitical risks and disruption of Russian gas supplies to Europe. Summer heatwaves, water scarcity, low renewable and nuclear electricity generation and storage refilling increased gas demand. At the same time, gas supplies to Europe from Russia had fallen and there was uncertainty on the availability of increased LNG supplies[8]. This resulted in month-ahead gas prices rising to an unprecedented 320 EUR/MWh by the end of August 2022, despite a strong increase in LNG imports.

[7] Gazprom did not refill the gas storages owned by its subsidiaries in Europe, and did not offer spot gas deliveries to address the rise in demand on global and European gas markets, which may have contributed to tighten gas markets. Other gas storages were not fully replenished because of high summer gas prices.

[8] On June 8, 2022, a fire at an LNG liquefaction plant in Freeport, US, led to the shutdown of the facility and reduced US LNG export capacity by approximately 20 bcm per year. In parallel, infrastructure bottlenecks in North-Western Europe (limited LNG regasification and transborder pipeline capacity) were preventing increased LNG supply to reach key markets in the EU.

Figure 6: Selected wholesale gas prices in Europe, nominal prices (EUR/MWh)

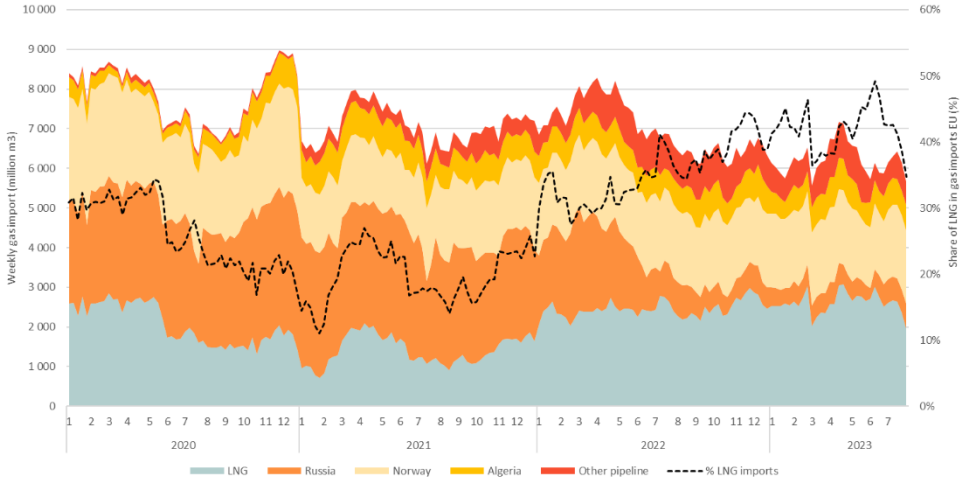


Source: Trinomics et al (2023), based on data from S&P Platts, EnergyMarketPrice, BAFA, Eurostat Comext

Since April 2022, there has been a considerable divergence in spot prices between national gas hubs in Europe, which is a trend not seen in the previous 10 years. Gas prices have been significantly lower in hubs directly connected to LNG import capacity (e.g. in the UK, France, Belgium and Spain) than in those Members States without direct access to LNG terminals (most significantly, at the time, Germany).

To replace Russian gas, Europe turned to liquefied natural gas (LNG), imported especially from the US (Figure 7), supplemented by increased pipeline imports from Norway, the UK and Azerbaijan.

Figure 7: Weekly natural gas imports to the EU (2020 – July 2023, pipeline and LNG)



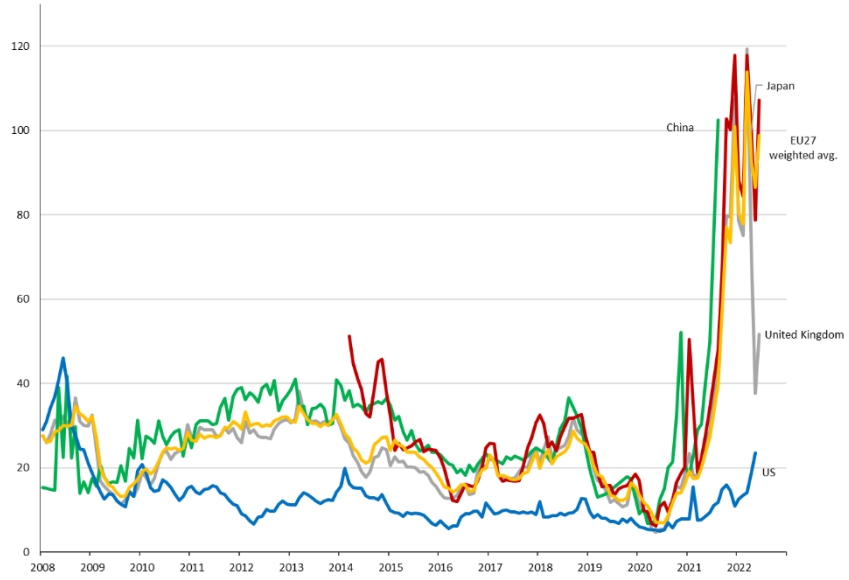
Source: Trinomics et al. (2023), based on data from ENTSO-G, Brueghel

LNG imports increased from a very low level during COVID and reached historically high levels in 2022, 73% higher than in 2021. The share of LNG in EU gas imports jumped from below 20% in 2021 to over 40% in September 2023. This, together with EU demand reductions efforts and lower Asian gas consumption, enabled Europe to refill gas storages before the

2022/2023 winter and reach the targets stipulated in the Gas Storage Regulation[9].

Gas prices on European wholesale markets have always been higher than those in major gas exporting countries (Canada, Norway, Russia and the US), and comparable to those in other G20 economies. The exponential increase in gas prices had a profound impact both in Europe and in other gas importing countries (Figure 8), while prices did not change so drastically in gas producing countries.

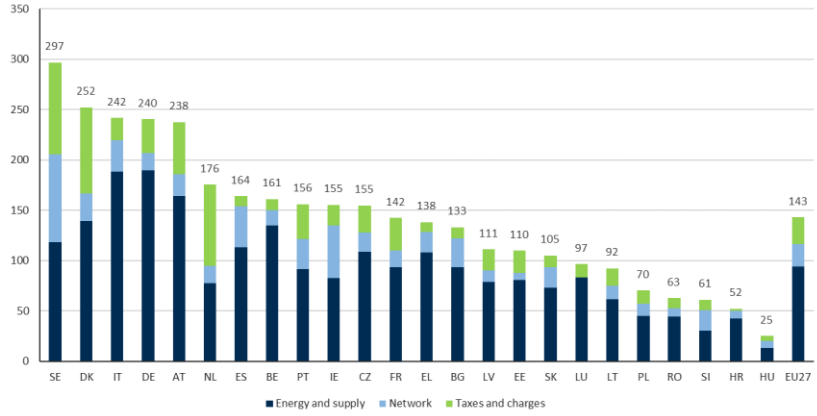
Figure 8: Day-ahead wholesale gas prices in the EU (weighted average), China, Japan, the UK and the US (EUR$_{2021}$/MWh[4])



Source: Trinomics et al., based on data from S&P Platts

Retail gas prices are mainly driven by wholesale gas prices, but changes during 2021 and 2022 were reflected differently (in the magnitude and the speed of the pass through) across Member States (Figure 9). This was mainly due to differences in type and ambition of national crisis mitigation measures, but also to Member States' difference contract-length structures and retailers' difference gas procurement strategies (long-term contracts, price hedging).

Figure 9: Average EU household gas prices in January 2023 (EUR/MWh)



Source: Trinomics et al. (2023), based on data from VaasaETT

Average EU household retail gas prices increased from 68 EUR/MWh in 2021 to

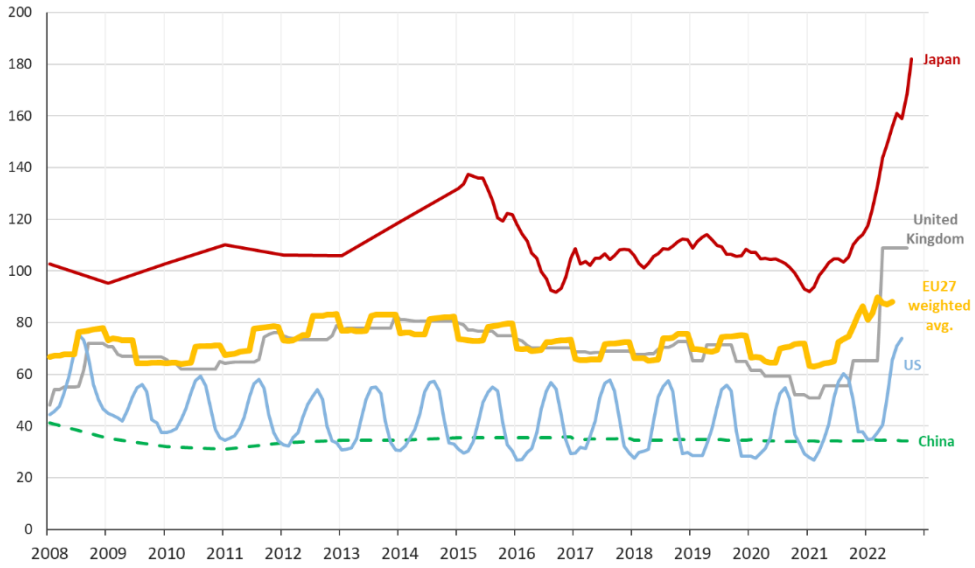
[9] EUR-Lex - 02022R1032-20220630 - EN - EUR-Lex (europa.eu)

143 EUR/MWh by January 2023. Behind the average EU price, there were significant differences between Member States - the ratio of the highest to the lowest price increased from 3.5 in 2021 to more than 10 by 2023.

Because of the crisis, the relative shares of energy costs, networks charges and taxes and levies in household gas prices changed significantly. The energy costs component (wholesale price plus a mark-up) accounted for 44% of the retail price in 2021, but reached 66% in 2023. The share of the network charges component dropped from 23% (2021) to 16% (2023). The share of taxes, levies and VAT increased from 28% in 2010 to 34% in 2021, but subsequently significantly decreased to 18% in 2023 as a result of government interventions in retail prices.

Industrial retail gas prices in the EU are significantly higher than in the US and other gas-producing countries, although these also increased in 2021 and 2022. Prices in the UK and the EU average are very similar although they diverged somewhat in 2022 as the UK has easier access to LNG as well as domestic gas production. Industrial gas prices in China and Japan were higher in the past, due to these countries' higher wholesale prices and dependence on LNG deliveries.

Figure 10: Retail industrial gas prices in the EU and selected countries (EUR_{2021}/MWh[4])

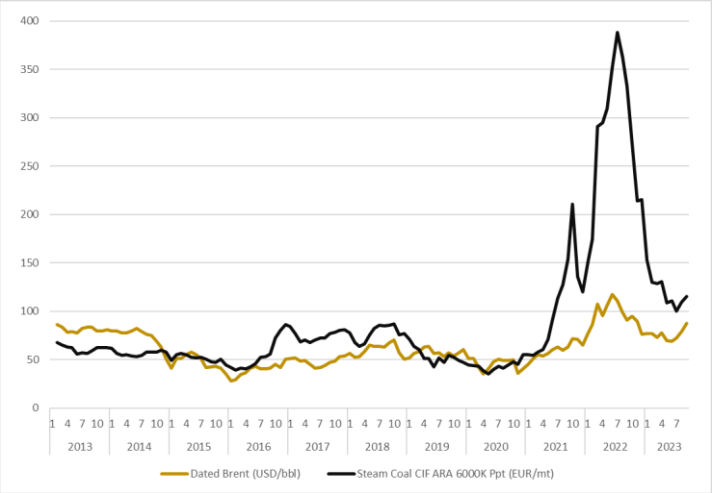


Source: Trinomics et al (2023), based on data from Eurostat, US DoE, Enerdata (BEIS, NBS)

2.3. Oil and coal

Recent years have also seen new episodes of volatility in **crude oil prices**, which fell to less than 20 USD/barrel (dated Brent) in April 2020 due to significantly reduced demand and excessive supply during the first months of COVID lockdowns. Crude oil prices started to rise in parallel with economic recovery and the easing of COVID travel restrictions, peaking at 130 USD/barrel in March 2022. Since then, prices have fallen below 80 USD/barrel, despite OPEC+ production cuts and geopolitical tensions and conflicts in the Near and Middle East, mostly due to increased production in the US and relatively low consumption in Asia (Figure 11).

Figure 11: Monthly average of crude oil and thermal coal prices (USD/bbl; EUR/mt)

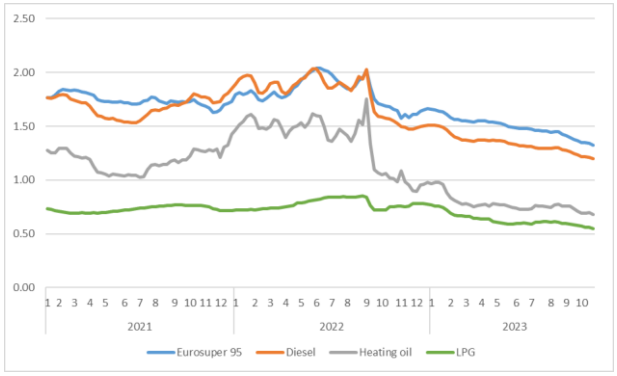


Source: DG ENER ENERScope, based on Energy Market Observatory database

Coal prices have also increased significantly since September 2020, from around 50 EUR/tonne to more than 380 EUR/tonne in July 2022, driven by increased post-COVID demand, nuclear generation problems and gas-to-coal switching in electricity generation. Since then, coal prices have stabilised at lower levels, ending the first half of 2023 at 111 EUR/tonne.

Overall, retail prices of **oil products** (Figure 12) followed the crude oil price trend and significantly declined after the autumn of 2022. Diesel and heating oil experienced more severe price hikes mainly due to globally restricted refinery capacities.

Figure 12: Average EU consumer prices of petroleum products, including duties and taxes (EUR/liter)



Source: DG ENER ENERScope, based on Energy Market Observatory database

Temporary tax breaks and other forms of subsidies provided in several Member States only partially mitigated rising fuel prices. Diesel retail prices peaked in most Member States in March 2022, then decreased due to temporary tax breaks and other support measures by December 2022. After the expiry of these temporary measures, diesel prices again increased again in most Member States in September 2023, but they generally remained lower than at the price peak of the crisis.

3. TRENDS IN ENERGY COSTS

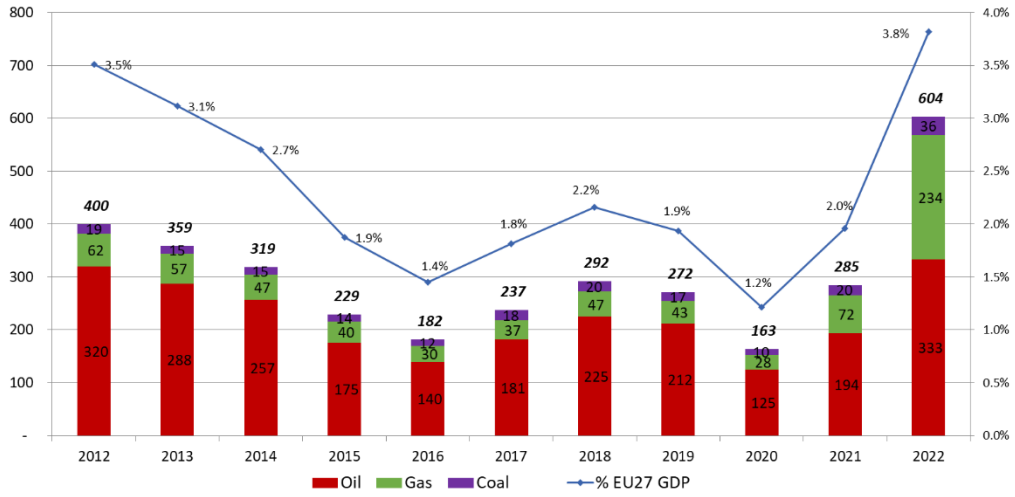
3.1. EU energy import bill

The EU energy import bill declined to EUR 163 billion in 2020 due to the impact of COVID

(Figure 13) and then increased back to EUR 285 billion in 2021. In 2022, it reached an unprecedented EUR 604 billion EUR (3.8% of EU27 GDP). Oil prices drove the increase in 2021 (oil imports accounted for 69 % of the total import bill), while in 2022, both oil and gas prices contributed to the increase in the EU import bill.

The drop in the energy import bill in 2020 to 1% of GDP and the sharp increase in 2021 and 2022 to nearly 4% of GDP shows how much fossil fuel prices are weighing on growth and how much a lower energy bill during the pandemic enabled EU economies to avoid a serious recession. Despite lower prices, the energy bill for 2023 could still be very significant in historical terms – although much lower than in 2022 - and drag down European economic growth.

Figure 13: Estimated EU energy import bill 2014-2022 (billion EUR; % EU GDP)



Source: Trinomics, DG ENER, based on data from Eurostat Comext

Putting this differently: if the low-carbon energy transition had been accelerated before the crisis, the EU would have had less fossil fuels in the energy mix (still 69% in 2021) and the impact of volatile energy prices would have been much lower.

3.2. Household energy expenditure

The energy expenditure of European households (determined by retail prices and households' consumption) fell for all income levels between 2012 and mid-2021, when the trend was reversed by the energy crisis. In 2020[10], low-income European households[11] spent on average 7.8% (EUR 953) of their total budget on energy. Lower-middle- and middle-income households tend to have higher absolute energy expenditure, but this expenditure represents a smaller share of their household budget. In 2020, these households spent 7.2 % and 6.4 %, respectively, of their total budget on energy (down from 7.6% and 6.9% in 2010).

Rising energy prices, particularly in the second half of 2021 and during 2022, resulted in higher than usual energy expenditures for European households (Figure 14), with increasing number of households struggling to meet their energy needs. Energy cost increases in 2022

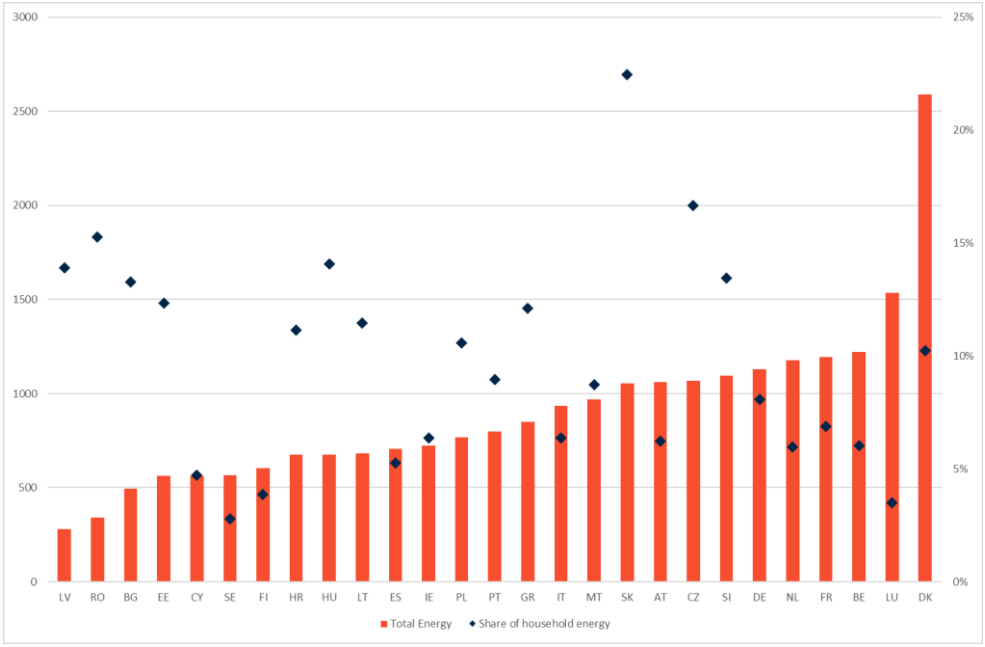
[10] Latest data available from the Household Budget Survey.

[11] In this report, households in the first income decile are defined as low-income; low-middle income households are in the third income decile; and the fifth income decile is used as a representation of middle-income households. For those Member States where only quintile data is available the first, second, and third income quintiles are used respectively

disproportionally affected the most vulnerable households. Across EU Member States, the energy expenditure of low-income households increased to an estimated 12% between 2020 and 2022.

This increase was mainly driven by the prices of natural gas, liquid fuels and electricity and could not be counterbalanced by action to reduce energy consumption. National measures supporting households' energy expenditures helped to mitigate the impact of the energy crisis, but very often these measures (for example a decrease in VAT rates) were not specifically targeted at the most vulnerable households.

Figure 14: Energy expenditures in low-income households (absolute and as % share in total household budget, 2020[12])



Source: Trinomics et al, based on ad hoc data collection on household consumption expenditures

The situation of households varied substantially across EU Member States, both in terms of absolute expenditures and expressed as a share of total expenditures.

- In relative terms, the poorest households spent over 20% of their household budget on energy in Slovakia; and less than 5% of their budget in Sweden and Luxembourg.
- In absolute terms, the poorest households spent less than EUR 500 on energy products in Latvia and Romania, while they spent more than EUR 1 500 in Luxembourg and more than EUR 2 500 in Denmark.

As regards consumer choice, electricity remained the most expensive energy carrier in 2022 (252 EUR/MWh) (Table 1). In comparison, natural gas (86 EUR/MWh in 2022) and oil-based fuels (between 140 and 203 EUR/MWh) were cheaper. Even considering that heat pumps are significantly more efficient than oil or gas heaters[13], the disparity between gas and electricity

[12] Year of data is as follows: Portugal (2010), Sweden (2012), Ireland (2015), Malta (2015), the Netherlands (2015), Cyprus (2016), Estonia (2016), Finland (2016), Lithuania (2016), Spain (2017), France (2017), Germany (2018), Denmark (2018), Slovenia (2018), Croatia (2019), Latvia (2019), Romania (2019), Slovakia (2019). For all others 2020 data was available. The EU 2020 average is based on expenditure data from those Member States that reported for 2020 and where the number of surveyed households were reported. This includes Austria, Belgium, Bulgaria, Czechia, Hungary, Italy, and Luxemburg. The average was weighted according to the number of households.

[13] See for example: https://www.technologyreview.com/2023/02/14/1068582/everything-you-need-to-know-about-heat-pumps

prices could slow down the electrification of household heating and cooling.

Table 1: Comparison of various energy options for households in EU per MWh

	Electricity (DC)		Gas (D2)		Gasoline		Diesel		Heating oil	
Component	2022 price (EUR/ MWh)	2022 share	2022 price (EUR/ MWh)	2022 share	2022 price (EUR/MWh)	2022 share	2022 price (EUR/M Wh)	2022 share	2022 price (EUR/MWh)	2022 share
Energy	111	44%	41	48%	109	54%	109	60%	105	75%
Network	80	32%	21	25%						
Taxes	59	24%	23	27%	94	46%	74	40%	35	25%
Total	252		86		203	100%	183	100%	140	100%

Source: Eurostat; for electricity NRG_PC_204 and NRG_PC_204_C, data for first semester; for gas NRG_PC_202 and NRG_PC_202_C, data for first semester DG ENER Weekly Oil Bulletin (for oil products), data for 2022. Conversion of gasoline to MWh was done using factor of 1.000 l = 8.9 MWh. Conversion of diesel and heating oil to MWh was done using factor of 1.000 l = 10 MWh

3.3. Industrial energy costs

Although energy is essential to economic activity, it plays an increasingly modest role in European industrial production costs. For the average European business (Table 2), energy costs accounted for 1.7% of productions costs in 2019[14], down from 2.3 % in 2010. Higher energy efficiency was the main driver of energy cost reduction in this period. Fuel switching (e.g. from oil to gas, or from gas to electricity) played a smaller role.

Table 2: Energy costs shares across industrial sectors in 2019

Energy share of production costs	
Average European business	1.7%
Manufacturing sectors	
Computer and electronics	0.6%
Pharmaceutical products	0.9 %
Iron and steel	6.1%
Non-ferrous metals	3.0%
Clay building materials	9.0%
Cement, lime and plaster	13.4%
Non-manufacturing sectors	
Mining and quarrying	4.7%
Construction	1.0%
Wholesale and retail trade	0.2%
Land transport	34.1%
Air transport	29.2%
Accommodation and restaurants	2.1%
Information and communication	0.4%

Source: Trinomics et al. (2022), based on Eurostat and highly aggregated ad hoc data collection on industrial energy costs

Energy cost shares in production costs are more important for the energy intensive industries (EIIs). In the most energy intensive sub-sectors, the share of energy in production costs can reach very high levels, especially in *Fertilizers* (71%), *Ferro-alloys and silicon* (38%), *Primary*

[14] At the time of writing (October 2023) complete and reliable energy prices and costs data for EU industry is only available up to 2019; while partial data is available for 2020 and 2021.

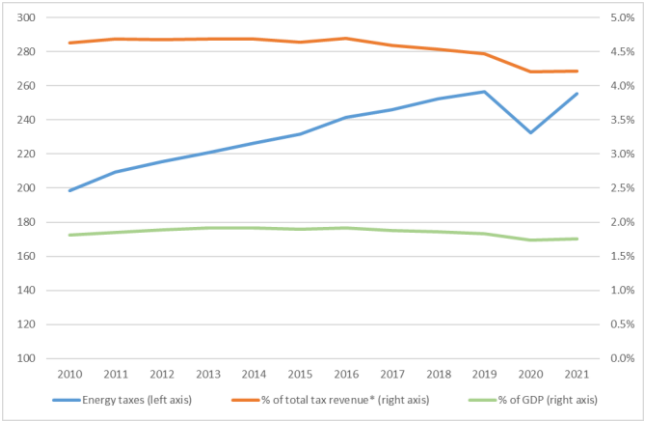
aluminium (34%), *Ceramics* (37%), *Container glass* (23%) and *Zinc* (22%). Latest available data[15] suggest that, between 2021 and the first quarter of 2022, the average energy costs share in these sectors could have increased by between 20 and 55%. In the sector *Fertilisers*, which uses natural gas as both feedstock and energy source, energy costs could have reached up to 90% of production costs by that point.

In the international perspective, manufacturing sectors in some non-EU G20 countries are often enjoying lower energy costs thanks to: (i) access to abundant domestic energy sources; (ii) a lack of strict clean energy and climate policies; or (iii) energy subsidies and other governmental support measures. This suggests that European industry needs to continue its work on improving energy efficiency and decarbonisation efforts, which could help to reduce dependency on fossil fuel imports and bridge the energy price differences with international trade partners.

3.4. Energy taxation

Energy taxes, both on the production and on the consumption of energy, provide significant revenues to EU Member States' budgets. Energy tax revenue was stable in 2010-2019 at an average of 1.88% of GDP, but during COVID, lower energy prices and lower consumption triggered a drop to 1.74% of GDP. Data available for 2021 shows an increase in energy taxes collected by Member States, which amounted to EUR 255 billion or 1.76% of EU GDP and 4.2% of total tax revenues (Figure 15).

Figure 15: Energy tax revenues in the EU27 (billion EUR; % of GDP)



Source: Trinomics et al., based on data from Eurostat (env_ac_tax)
**: Percentage of total revenues from taxes and social contributions (including imputed social contributions)*

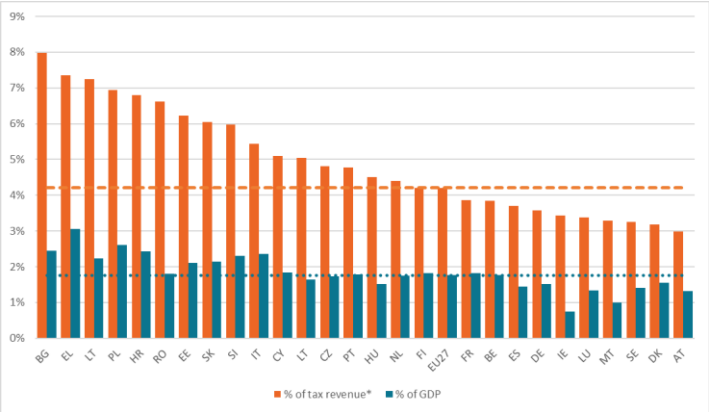
The role of energy taxes in government revenue varies significantly between Member States. In 2021, energy taxes in Bulgaria made up 8% of total tax revenue, while this share was only 2.9% in Austria (Figure 16). When compared to the GDP, energy tax revenue was the highest in Greece (3.1%) and the lowest in Ireland (0.8%). Generally, Member States with a lower GDP/capita have a higher share of energy taxes relative to both total tax revenue and GDP.

In the absence of final official statistics for 2022, the impact of the crisis on energy tax revenues in 2022 remains uncertain. Revenue from VAT linked to higher retail prices would have increased. By contrast, lower energy demand, together with policy measures temporarily lowering VAT rates and introducing rebates in some Member States, would have reduced

[15] Based on data collected in 2022 in responses to a bottom-up questionnaire from 60 plants across 6 industrial sectors.

energy tax revenues, especially for excise duties.

Figure 16: Energy tax revenue as a percentage of tax revenue and of GDP[16] (2021)



Source: Eurostat (data series env_ac_tax)
**: Percentage of total revenues from taxes and social contributions (including imputed social contributions)*

3.5. Influence of energy prices on clean technologies – a case study on heat pumps

Energy prices have a huge influence on the financial attractiveness of renewable energy alternatives and on the energy transition. In order to understand this relationship, we analysed a key measure that households can take to lower their energy use and emissions: switching from gas to electric heating using a heat pump[17].

The following factors influence the viability of heat pumps replacing combustion boilers:

- investment costs;
- operational costs (e.g. electricity prices);
- heating demand and heating flow temperature[18].

Before recent gas price increases, with the average electricity to gas price ratio being around 2.8 in the EU27, heat pumps without subsidy showed similar lifetime costs to gas boilers. However, recent high gas prices made heat pumps a significantly cheaper alternative over their lifetime. Considering long-term gas and electricity prices, heat pumps allow a typical household[19] to lower heating energy bills by 20-25% (annual savings of EUR 300-700) and to recover their investment in 6-9 years.

Another benefit of switching from gas heating to heat pumps is that an average household can save 1 200-2 400 m^3 of gas and reduce its emissions by 70% per year. Additional gas used for generating the electricity used by heat pumps adds less than 10%[20] of this amount to overall gas needs. To put this into perspective, gas savings from 1 million heat pumps would be equal to ~1% of the Russian gas supply to the EU in 2021.

[16] Latest available figures are for 2020.

[17] Based on *Analysis of the affordability of switching to renewable heating for a standardised middle-income family in the EU*, a study by the European Environmental Bureau (2021).

[18] The higher the temperature lift, i.e. the difference between the heating flow temperature and the heat source temperature (air or ground), the lower the coefficient of performance of the heat pump.

[19] Common four-person household in a 110 m^2 house. The four representative heating profiles were cold (e.g. Poland) and moderate (e.g. Netherlands) climate zones with average or good insulation levels.

[20] Around 100 m^3/y/household.

4. CONCLUSION

In 2022, the EU responded with unity, in solidarity and determination to overcome the crisis. EU Member States agreed on measures to increase transparency on price formation in gas markets, to address excessive gas prices, and to plan for solidarity measures in the event of a gas emergency, which all played a role in calming European markets.

While wholesale electricity and gas prices have fallen significantly since the end of 2022, they remain higher than before the crisis; still around two times their historical levels. The impact of higher prices on energy bills, particularly for the most vulnerable households and businesses[21], is still considerable. The rise in energy costs led to higher energy expenditure for low-income households. Similarly, the previously observed decline in energy costs shares in energy-intensive industries stopped and the reversal led to a significant challenges for most energy intensive industrial sectors, despite their good historical record in improving energy efficiency. The impact on the entire EU economy has also been substantial, with a significant increase in the EU's fossil fuel import bill, mainly driven by soaring gas and oil prices.

By contract, the energy market outlook for 2024 has materially improved. The measures put in place by Member States and the Commission to fight the energy crisis[22] significantly contributed to that. Nevertheless, the cut in Russian pipeline gas supply to Europe caused tightness in global gas markets, which are expected to remain tight until new LNG liquefaction capacity comes online as of 2025. A number of risks may also materialise in 2024 and trigger large reactions on energy markets, including a strong rebound in Asian demand, extreme weather conditions, further reductions of gas imports from Russia and armed conflicts in the Middle East and elsewhere. To address these risks, some of the emergency measures introduced in 2022 have been prolonged[23].

The crisis of 2021/2022 has already induced long-lasting changes in the EU's gas supply, with LNG now accounting for a much higher share (~40%). The accelerated energy transition will progressively introduce further changes into gas supply and demand already in the coming decade. Renewable gases should be increasingly used to support the EU's decarbonisation work and achieve a greater degree of independence from fossil fuel imports.

Widespread adoption of low-carbon and renewable technologies, energy efficiency measures and increased electrification rates in heating and in transport could also help to avoid fossil fuels-induced crises in the future. Technologies such as heat pumps and electric vehicles are predicted to play an important role in protecting household budgets, and generate significant savings throughout their lifetime. In order to preserve the competitiveness of European companies, energy-intensive industries should keep improving their energy efficiency, while the EU will introduce measures to enable to benefit from the lower costs of renewables through the new design for electricity markets and ensures an international level playing field by implementing measures, like the carbon border adjustment mechanism.

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[21] The impact on SMEs is detailed in the SME envoy report: SMEs and rising energy prices - First findings & recommendations

[22] These measures include supply diversification, demand reduction, expansion of LNG import capacity, obligations to fill in gas storages in advance, demand aggregation and joint purchasing and measures to address high prices and volatility (e.g. market correction mechanism, intra-day volatility mechanism).

[23] https://www.consilium.europa.eu/en/press/press-releases/2023/12/19/energy-prices-and-security-of-supply-council-agrees-to-extend-emergency-measures/