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Carbon and commodities

What diverging energy prices mean for the CEE region

- **CEE countries face significant cost pressure, though from different energy sources.** Countries across the CEE region are highly exposed to high and volatile energy and carbon prices. This exposure varies dependent on the structural characteristics of each country. Coal remains king in Poland and is also important in the Czech Republic, while Hungary, Romania and Turkey rely to a greater extent on natural gas in their electricity production.
- **The macro implications of these structural differences in energy mix are real, especially for Poland and the Czech Republic.** They have a significant shortfall of up to 1% of GDP in their carbon emission allowances (EUAs), which impacts their balance of payments (by over €4bn in Poland and €2bn in the Czech Republic in 2022). These amounts weigh on FX fundamentals. For Hungary, Romania and Turkey, our analysis suggests that dependence on natural gas in 2022 equated to a disproportionate impact on both PPI and HICP inflation. But the return to a normal relative price relationship between coal and natural gas in late-2023, driven by high and - most probably - rising EUA carbon prices, leaves Poland and the Czech Republic's competitiveness at risk. These high and recurrent operational costs in electricity production have serious implications for external and fiscal balances.
- **As an escape strategy, CEE countries need to accelerate investments in clean power supply and electricity grids to protect competitiveness.** Acceleration of energy investments is critical in light of heavy operational costs, associated with burning (imported) fossil fuels, and an ambitious EU climate policy. This is especially true for Poland and the Czech Republic. High carbon-intensity may also provoke an adverse chain reaction at the corporate level due to ESG risks. This is reflected in the requirements of leading blue-chip companies searching for a reduction of carbon content of final products or services in the entire supply chain. This is relevant for all CEE countries and Turkey, also because of the phasing-in of CBAM (Carbon Border Adjustment Mechanism), the EU's carbon border tax.
- **EU money and sustainable financing from the private sector can catalyse scaling up of energy investments.** EU grants and preferential loans, both from the Resilience and Recovery Fund (RRF), available through to 2026, and traditional cohesion policy funds from the 2021-27 budget, together with sustainable financing from private sources can enable significant energy investments. Because of high capital costs and long investment lead times in the energy sector, public money may crowd-in private financing, both bank lending and capital market instruments, such as green bonds.
- **Adequate action by boosting power system investments will pave the net zero path to other sectors through electrification.** Decarbonisation of CEE power systems – by scaling up to state-of-the art through existing technologies, such as photovoltaic, wind or nuclear, including small modular reactors (SMRs) – will largely pave the path to net zero by 2050 in other sectors, through electrification. This is critical for decarbonisation of transport, buildings and many industries.
- **Is there a pilot flying with us?** CEE countries need ambitious and robust long-term energy strategies as part of their development agendas. Such strategies could be directly reflected in corporate strategies and investment plans of incumbent power

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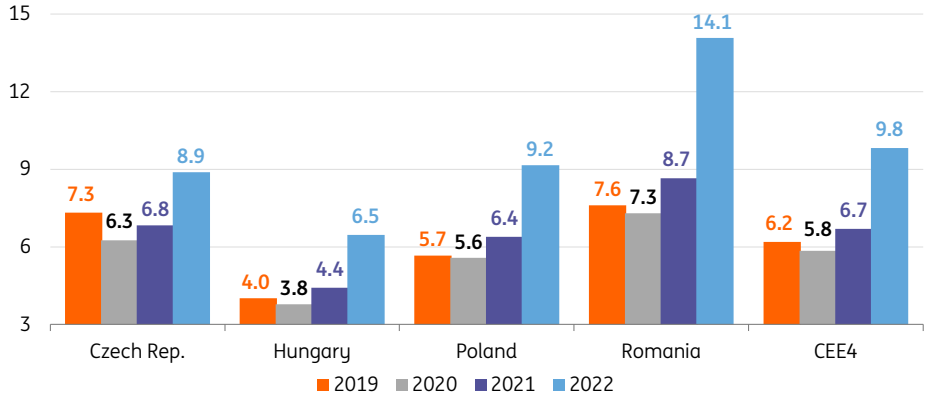
producers and grid operators, largely SOEs. These would also define a scope and financing options for companies and households interested in investments in own energy sources and energy efficiency. We believe it is high time for the CEE region to focus more on becoming Europe's factory in clean energy manufacturing. Carbon and commodities

In this article, we look to assess how volatile energy prices and high emission costs affect the outlooks of CEE countries.

What diverging energy prices mean for the CEE region

Energy is an important input to the consumption and production of any modern economy. For example, over 2019-21, the value of energy sector output averaged 4% of GDP in Hungary, 6% in Poland, 7% in the Czech Republic and 8% in Romania (Figure 1). In 2022, these shares increased significantly following large swings in fossil fuel and carbon prices. For each of these countries, the sizeable changes observed in the energy sector had a substantial impact on inflation, output, current account and budget balance.

Fig 1 Share of gross output in the energy sector to GDP (%)

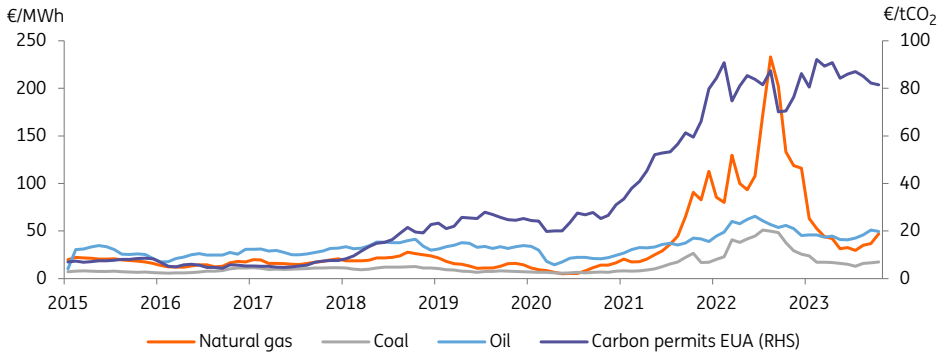


Output of energy sector is approximated by nominal value of production in NACE D sector (electricity, gas, steam and air conditioning supply).
Source: ING, Eurostat

Energy prices

Fossil fuel prices have been very volatile since the beginning of the 2020s. During the Covid lockdowns, the price of major fossil fuels reached multi-year lows. In EUR/MWh terms, at the end of April 2020 these stood at €14.4 (Brent oil), €5.9 (coal ARA) and €6.6 (natural gas TTF). The post-Covid reopening and rebound of demand as of mid-2021 and the Russian invasion of Ukraine in February 2022 pushed these prices to record high levels. The most spectacular price increase was observed for natural gas, which peaked on 25 August 2022 at €311/MWh. On that day the Brent oil price was six times lower than natural gas at €51/MWh. Subsequently, due to a mild 2022/23 winter and global arbitrage on the LNG market, natural gas prices returned to lower levels. Since April 2023, the situation has normalised and previous relationships between prices have been restored – highest for crude oil and lowest for coal (Figure 2).

Fig 2 Price of fossil fuels and EU Allowances (EUA) carbon permits, since 2015



Natural gas price is proxied by TTF quotation, coal by ARA and oil by Brent. Brent prices are converted from US$/bbl to €/MWh using spot USD/EUR rate and conversion factor of 1.7MWh/boe. ARA prices are converted from US$/tonne to €/MWh using conversion factor of 7.0MWh/tonne, which equates to the assumption that the energy content of 1kg of coal is 6000kcal.

Source: Macrobond

Carbon prices on the EU ETS market

In recent years, carbon prices in the EU have increased to levels that strongly affect the costs of energy production. In the European Union the cost of emissions is mostly set by the Emissions Trading System (ETS), which covers around 45% of all EU greenhouse gas emissions. Energy producers are obliged to purchase an ETS allowance (EUA) for each tonne of CO_2 emitted. This means that EUA prices are an important component of electricity generation costs for power plants based on fossil fuels. Recently, this cost has become relatively high as the EUA price almost quadrupled from €25 in December 2019 to €89 in October 2023. Importantly, we believe that this price increase should be perceived as permanent, rather than related to transitory factors, for instance demand or sentiment fluctuations. ETS prices are expected to rise even further with the introduction of the EU's decarbonisation policy (Fit55); according to October's '*EU ETS Market Outlook*' by BloombergNEF, the forecast is €93 per tonne of CO_2 in 2024, €98 in 2025, and €149 in 2030.

Literature review

Discussion of the effects of higher emission costs on the economy presented in academic literature is ambiguous. Simulations with the ECB NAWM model extended for the energy sector[1] indicate that a permanent increase of spot energy prices or carbon tax in the euro area would entail a transitory rise in inflation and a lasting, albeit moderate, decline in GDP. The analysis also indicates that the economic effects of a carbon tax depend on the monetary and fiscal policy response. In turn, empirical papers, which estimate the response of the economy to higher energy and carbon taxes using historical data, find almost no evidence for a negative impact of these taxes on employment and GDP[2], or indicate that energy and carbon taxes might limit economic activity[3]. These studies also indicate that high carbon prices create incentives for green innovation.

Structural energy characteristics of CEE countries

Dependence on fossil fuels varies across CEE countries, which leads to energy mix differences. Figure 3 illustrates that Poland and, to a lesser extent, the Czech Republic, are very reliant on highly CO_2-emitting coal. For that reason, the economies of these two countries are likely to be relatively strongly affected by changes in spot energy prices and EU carbon allowance. Turkey is also dependent on coal but is not subject to EU ETS. In the future, with the implementation of the EU Carbon Border Adjustment Mechanism

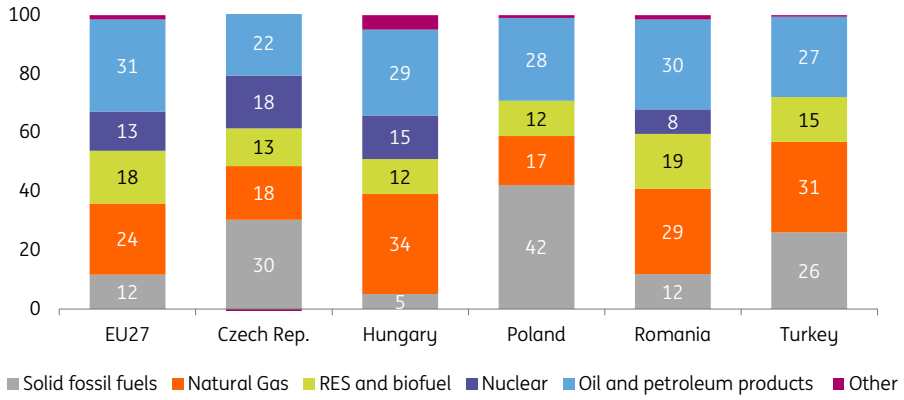
[1] Günter C., Matija L., Romanos P., 2023. Macroeconomic effects of carbon transition policies: an assessment based on the ECB's New Area-Wide Model with a disaggregated energy sector, ECB WP 2819.

[2] Metcalf G., Stock J., 2023. The Macroeconomic Impact of Europe's Carbon Taxes. American Economic Journal: Macroeconomics, 15 (3): 265-86.

[3] Diego Känzig, 2023. The Unequal Economic Consequences of Carbon Pricing, NBER Working Papers 31221

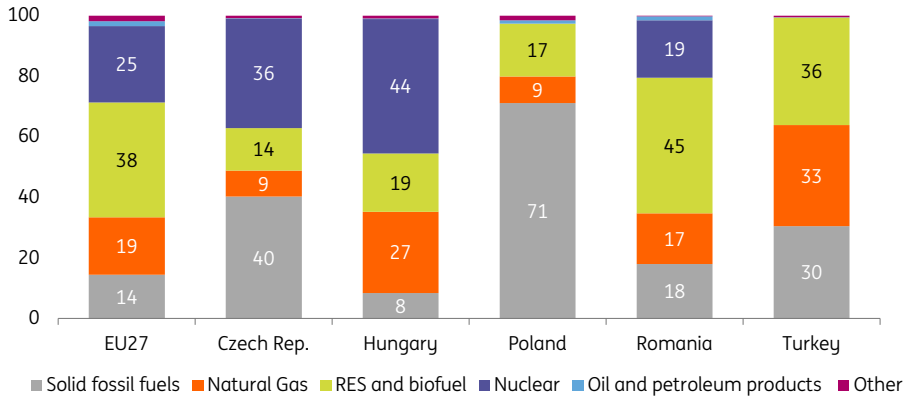
(CBAM), this dependence on coal might affect the price competitiveness of Turkish products on the EU market. With regards natural gas prices, they are relatively important for Hungary, Turkey and Romania. Figure 3 illustrates that Hungary and Romania are more advanced in their decarbonisation process than the remaining CEE countries. We also note that all countries are reliant on oil and petroleum as part of their total energy supply.

Fig 3 Total energy supply mix, as of 2021 (%)



Source: Eurostat

Fig 4 Electricity generation mix, as of 2021 (%)



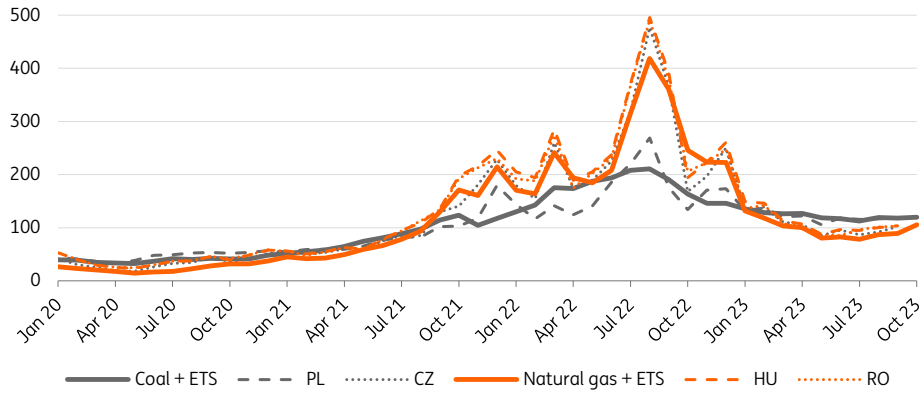
Source: Eurostat

Impact on wholesale electricity prices

Energy mix differences lead to wholesale electricity prices divergences. In the merit order system, ie, a mechanism that rebalances the demand and supply of energy within each EU economy, the last plant qualified in the auction is that with the highest marginal cost. As a result, the most expensive energy provider determines the price of electricity for all power plants involved. Figure 5 shows that in Poland the wholesale electricity price is predominantly driven by the price of burning coal, including the cost of carbon emissions. For Hungary and Romania, it is given by the marginal cost of burning natural gas.

This energy mix was favourable for Poland in 2022, ie, when abnormally high natural gas prices prevailed for a few months and moved well above those for coal. However, when natural gas prices decreased, the highly emissive coal together with currently high EU carbon allowance drove wholesale electricity prices in Poland to a higher level than in most EU countries. With the expected high and increasing level of EU carbon allowance this situation is likely to persist or even worsen, which is likely to weigh on the mid-term outlook for Polish economic competitiveness.

Fig 5 Marginal cost of electricity production and electricity prices (€/MWh)



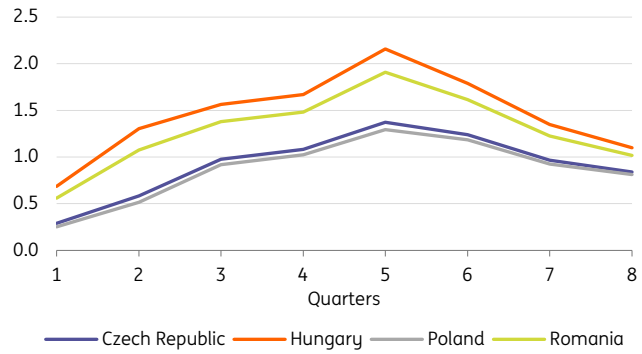
Marginal cost of producing electricity is calculated with TTF and ARA prices and the efficiency of natural gas and coal based power plants at 60% and 38%, respectively.
Source: ING, Bloomberg, https://ember-climate.org

Impact on producer and consumer prices

The differences in the energy mix also cause a CEE economies divergence in response to energy commodity shocks. Based on 2015-23 data for CEE4, we estimate a panel regression to assess the inflation response to a 10% increase in natural gas prices[4]. In general, we find that the reaction of inflation is more pronounced to this kind of disturbance in Hungary and Romania than in the Czech Republic and Poland (Figures 6 and 7). In a broader perspective, this means that in an environment of volatile natural gas price economic dynamics, CEE countries might become less synchronised.

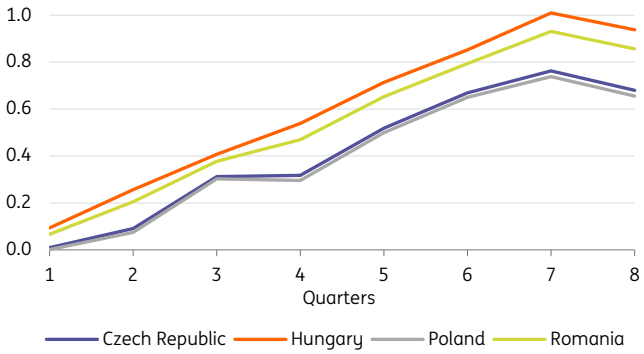
The response to a 10% natural gas price shock

Fig 6 PPI (%YoY)



Response of annual inflation to 10% increase of natural gas prices
Source: ING

Fig 7 HICP (%YoY)



Response of annual inflation to 10% increase of natural gas prices
Source: ING

Impact on fiscal and external positions

Energy mix and carbon prices are also important for budget revenues and current account developments. Figure 8 shows that in 2022 verified emissions, which are subject to the EU ETS, were the highest in Poland and amounted to 184.1 million tonnes of CO_2 (requiring redemption of 184.1 million EUAs). Given that 42.5 million EUAs were freely allocated to industries other than power, the remaining part of emissions had to be covered by redeeming 141.6 million EUAs. Multiplying this number by the average price of EUA at €81 per tonne of CO_2 leads to the conclusion that the market value of carbon emission in Poland amounted to about €11.5bn (1.8% of GDP).

[4] The specification of the regression is $y_{i,t+h} - y_{i,t-1} = \alpha_i + (\beta_h + \gamma_h TES_t^{NG})\Delta p_t^{NG} + \gamma_h z_{i,t-1} + \epsilon_t$, where y stands for the variable of interest (PPI or CPI), p^{NG} is natural gas price, TES^{NG} is the share of natural gas in the total energy supply mix and z stands for control variable.

Emitting industries acquire EU carbon allowances in three ways: freely (mainly heavy industries), through their country's auctions (mainly power), or purchases abroad. In Poland, in 2022 about a quarter of required EUAs was allocated freely. About a third of the cost to industries was made up of government revenues (€5.0bn in 2022), via auctioned allowances[5]. The remaining part to cover verified emissions had to be purchased abroad on the EU-wide carbon market. This can be tracked by looking at balance on acquisition of nonfinancial assets of the capital account of the balance of payments (€4.2bn in 2022). This amount does not match perfectly with the EUAs balance, as companies could also use certificates bought in advance and kept as a financial asset in earlier years.

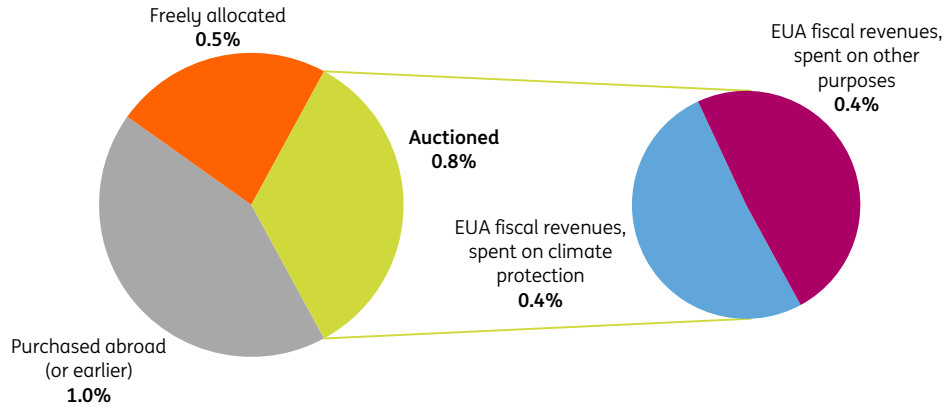
Figure 8 shows that emissions were also relatively high in the Czech Republic, with a significant balance of payment effect amounting to a deficit of almost €2bn. In the case of Hungary and Romania, emissions were much lower and represented neither a significant component of budget revenues nor balance of payments.

Fig 8 EU ETS system allotments for CEE4 in 2022

	Czech Republic	Hungary	Poland	Romania
Verified emissions (millions of EUAs)	**57**	**15.6**	**184.1**	**28.2**
Total allocated allowances	24	14.3	105.4	20.1
Freely allocated	15.6	8.5	42.5	14
Auctioned or sold	8.4	5.9	62.9	6.1
Balance, millions of EUAs	**-33.1**	**-1.2**	**-78.8**	**-8.1**
Balance, value as % of GDP	-1.0	-0.1	-1.0	-0.2
Balance on acquisition of nonfinancial assets (€bn)	**-2.0**	**-0.05**	**-4.2**	**0.1**
BoP Balance on acquisition of nonfinancial assets (% of GDP)	-0.7	0.0	-0.6	0.0
EUA budget revenues (€bn)	**0.7**	**0.5**	**5.0**	**0.5**
EUA budget revenues (% of GDP)	0.20	0.30	0.80	0.20
Share of EUA revenues spent on climate and energy in 2022 (%)	**27**	**50**	**51**	**57**
GDP at market prices in 2022 (€bn)	276.2	168.9	654.6	285.9

Balance on acquisition of nonfinancial assets is a position of the Capital Account in the Balance of Payments Statistics that covers trade in EUAs.
Source: European Environment Agency, Eurostat, European Commission (EU Climate Action Progress Report 2023), ING

Fig 9 Poland's allocation and use of EU ETS allowances (EUAs) in 2022 (% of GDP)



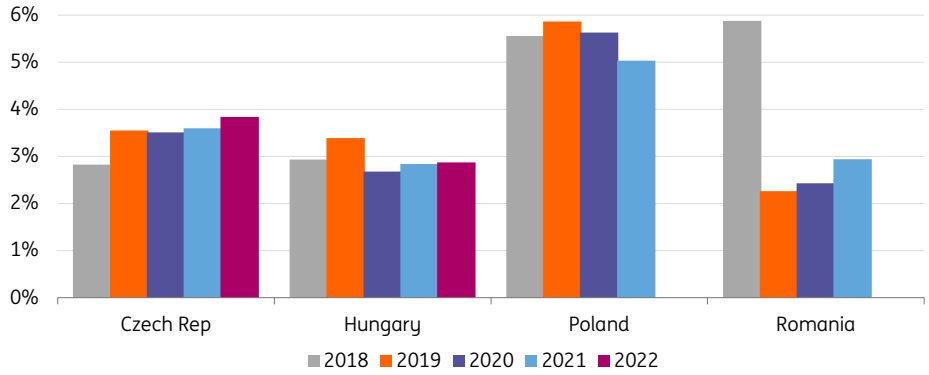
Source: ING based on EU data

Permanently high emission costs and volatile energy commodity prices constitute an incentive to accelerate energy transition and scale up investments in power generation and electricity grids. The different stages of energy transition implies that the scale of these investments is expected to be heterogeneous across CEE countries, as has been already observed in recent years (Figure 10). These investments will require substantial mobilisation of domestic and foreign savings, including EU grants from the cohesion policy and the Resilience and Recovery Facility, and preferential EU loans.

[5] From 2013, Poland's commissioned EEX stock exchange in Leipzig, Germany, for auctioning its EUAs on the primary market.

Moreover, investment needs in the energy transition will be enhanced by the rising role of corporate ESG factors in international trade and investments. Controlling carbon content in the entire production chain may force CEE companies to go green to meet the standards of their trading partners. Otherwise, they risk dropping from the supply chain (see more in our Think report).

Fig 10 Share of investment in energy sector in total investments



The energy sector is proxied by NACE D section: 'Electricity, gas, steam and air conditioning supply'
Source: Eurostat

Conclusions

1) **High and volatile energy and carbon prices** exert a significant impact on macroeconomic variables in CEE countries. On the one hand, in recent quarters they drove up inflation, dampened GDP growth and affected fiscal and external balances. On the other hand, they encourage green investments to enhance resilience today, and benefit from stable (and relatively lower) energy prices in the future.

2) Due to **different structural characteristics of CEE countries**, Poland and the Czech Republic are more exposed to coal and carbon price developments, while Hungary, Romania, and Turkey are more exposed to shifts in natural gas prices. Natural gas prices rose sharply in 2022 following the Russian invasion of Ukraine. There were significant increases of electricity generation in coal-fired power plants in Poland and the Czech Republic in 2021-22, which allowed for increased electricity exports.

3) The **situation on energy markets normalised in 2023**, as relative prices of natural gas and coal, combined with EUA costs, returned to long-term levels in mid-2023. As a result, wholesale electricity prices are again more influenced by highly emissive coal-fired power plants than by gas-fired power units, not to mention renewables, for which variable costs are negligible. If this normal relationship persists, higher wholesale electricity prices will put Poland and the Czech Republic's competitiveness at risk, relative to their CEE peers or other EU countries.

4) In addition to increased spot prices of energy for the economy in 2021-22, **Poland and the Czech Republic were short of ETS carbon allowances**. In 2022, this shortage amounted to around 0.6% of GDP equivalent per year, at an average EUA price of €81. This gap between verified emissions and received **EU carbon allowances** (for free or from auctions) for each country was reflected in their capital accounts or balance of payments. It is not a trivial amount and constitutes an exchange rate fundamental. In Poland, only a half of the fiscal revenues from EUA actions (an equivalent of 0.8% of GDP in 2022) were spent on climate protection, while the other half was not earmarked and added to overall public revenues.

5) This **shortage of EU carbon allowances is to persist** for about a decade if not longer, as lead investment times are long for zero-carbon energy projects, especially for those with higher capacity utilisation coefficients but very high upfront capital

requirements, such as offshore wind (an option for Poland and Turkey) or nuclear power (an option for all CEE countries). In the moderately green transition scenario for Poland through to 2030, carbon intensity of the electricity system is projected to decline by one-third - from above 700kg CO_2 equivalent per MWh in 2021 to around 450kg CO_2 equivalent per MWh in 2030. On the same time horizon, however, EUA prices are projected to double to €150 by 2030, compared to late-November levels of around €75.

6) **Acceleration of investments in green energy and grids is an obvious exit strategy** from elevated operational costs of power units based on fossil fuels. This is true in particular for Poland and the Czech Republic, but other CEE countries and Turkey are also to benefit from investment programmes in cost-competitive green energy installations. They are aimed to secure affordable and less volatile energy supply from renewable domestic sources, rather than imported fossil fuels.

7) **Advances in greening power sectors are critical for the decarbonisation of other sectors**, through electrification in transport, building and many industries. For power, a transition towards carbon neutrality is to be largely achieved by scaling up the already existing technologies for electricity generation and storage. The pursuit towards electrification is set to provoke a demand-side response in other economic sectors, and purchases of electric vehicles, heat pumps or other electric equipment. Some industrial sectors (eg, steel, aluminium, fertilizers) are more difficult to decarbonise, and adequate technologies are either nascent or even not-existing.

8) **Fortunately, EU members could benefit from various EU grants and preferential loans**, already budgeted through to 2030. As pointed out in our Think article, Romania and the Czech Republic already benefit from active access to RRF funds for green transition, while Poland's upcoming government is about to unlock them soon. The green transition in Hungary also hinges on EU financial support, while prospects still look distant. Also, Turkey is to benefit from cooperation with the EU and managing risks associated with the gradual phase-in of the EU's carbon border tax, CBAM. All CEE countries are to face also qualitative ESG requirements from their trading partners, all struggling to reduce emissions across the entire supply chain.

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