CENTER FOR THE STUDY OF DEMOCRACY

SOLVING THE ENERGY POVERTY AND DECARBONISATION CONUNDRUM WITH CARBON PRICING

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Bulgaria is facing the most severe energy poverty crisis in the EU. Skyrocketing energy prices and high inflation rates following the Russian invasion in Ukraine have starkly demonstrated the devastating consequences from the slow pace of the energy transition and the excessive fossil energy intensity of the Bulgarian economy. At the same time, the lack of adequate policy instruments to tackle the energy and climate security risks associated with the Ukrainian conflict have made the country particularly vulnerable to Kremlin-linked disinformation narratives that blame high energy prices on the EU Green Deal. Their key aim is to undermine political stability and to delay any progress towards decarbonisation, ultimately keeping Bulgaria in the same social, economic, and political path-dependencies.

Accelerated decarbonisation through effective policy tools that empower vulnerable consumers is the only sustainable way to improve Bulgaria's energy and climate security in the long term. The carbon price is a market-based policy mechanism that can incentivise polluters to be drivers behind the increase in low-carbon investments such as energy efficiency or the addition of renewable energy power capacities. Hence, investments driven by the carbon price reduce not only harmful emissions, but also production costs and foster research and innovation. Meanwhile, the additional revenues from the carbon price are utilised to accelerate decarbonisation. The EU's carbon pricing mechanism, the ETS, currently covers greenhouse gas (GHG) emissions from electricity and heat generation, as well as from energy intensive industries such as cement and crude oil refining[1], ultimately covering around 40% of the EU's total GHG emissions. ETS II is part of the 'Fit-for-55 legislative package' and will be a new separate EU ETS scheme for emissions from

KEY POINTS

- **Carbon pricing is the cornerstone of the EU decarbonisation policies** as it presents incentives to polluters to invest in lowering their carbon footprint, while the additional government revenues from the carbon price are utilised to accelerate the transition process.
- A comprehensive analysis of the macro- and microeconomic effects of the introduction of carbon pricing to cover the entire Bulgarian economy reveals that the **benefits from carbon pricing significantly outweigh the negative socio-economic impacts**.
- Carbon pricing may negatively impact economic growth in the short run but it will also **improve labor market conditions and strengthen energy security**.
- The transformation of the energy sector away from loss-making and heavily subsidised fossil energy assets as a result of carbon pricing would lead to **higher added value in the sector** but would depend on **stronger policy and market design** factors currently obstructing the transition.
- Carbon pricing, coupled with well-implemented tax revenue redistribution policies could contribute to **a net welfare gain for the poorest 50% of households**, reducing energy poverty and social inequalities in Bulgaria.
- Tackling the energy poverty crisis in Bulgaria would also require **clearly defined institutional responsibilities,** high administrative capacity and strong political will.

Federal Ministry for Economic Affairs and Climate Action

European Climate Initiative EUKI

[1] Small installations can be exempted in some sectors.

buildings and road transport. To address the social and distributional impacts of the ETS II, the new Social Climate Fund has been established as a policy tool to support vulnerable consumers, starting one year before the ETS II. Still, carbon pricing remains a controversial policy because of the impact of such policy instruments on the economy and on households, especially in countries with high fossil fuel energy intensity and energy poverty such as Bulgaria.

A comprehensive analysis of the macro- and microeconomic effects of the introduction of carbon pricing to cover the entire national economies of Bulgaria, Germany, Romania, Hungary and Poland provides new data-based evidence that could underpin better-informed national energy poverty and decarbonisation policies. The study revealed that the potential negative impacts from economy-wide carbon pricing on the macroeconomic performance of Bulgaria are minor, while it provides notable benefits such as a improving the labor market conditions and strengthening energy security. Meanwhile, the negative socio-economic impact on households can be fully offset by redistribution mechanisms such as a national energy poverty reduction program and the EU Social Climate Fund, even leading to improved social welfare. More broadly, the study breaks common decarbonisation myths that carbon pricing would obstruct economic development and lead to greater energy poverty. On the contrary, it accelerates the low-carbon transition at the lowest cost for society.

Assessing the Barriers for Accelerated Decarbonisation of the Bulgarian Economy

Macroeconomic Considerations

Bulgaria is one of the most energy- and carbon-intensive countries in the EU. In 2019, Bulgaria used 2.9 times more energy and emitted 3.4 times more CO2 to generate the same GDP as compared to the EU average. In fact, Bulgaria emitted 22% more carbon dioxide per EUR 1000 of GDP than Poland, a country much more reliant on coal for power generation than Bulgaria. Meanwhile, CO2 emissions measured on a per capita basis are slightly lower than the EU average mainly due to the lower living standards and the higher level of energy poverty.[2] There are a number of major challenges for decarbonising the Bulgarian economy that require special attention.

One of these challenges is Bulgaria's failure to get serious with the decarbonisation of the power sector accelerate the coal phase-out. In addition, the Bulgarian government actively supports decarbonisation myths exaggerating the role of coal-fired power plants as the cornerstone of the country's security of supply. Most recently, the government decided to begin talks to renegotiate its commitment in the National Recovery and Resilience Plan to reduce GHG missions from the power sector by 40% by 2026 vs 2019 in view of maintaining coal power plants in the system at least until 2038. Maintaining coal plants beyond 2030 risks leading to the disbursement of even higher coal subsidies, without which national coal power plants cannot be commercially viable. Meanwhile, severe regulatory and administrative barriers have hindered the uptake of renewable energy sources in the electricity sector and the existing political and economic framework fails to incentivize power sector decentralization and instead enables utility-scale projects, highly prone to corruption practices[3].

The growing role of services in the Bulgarian economy has not translated into a bigger decarbonisation push, mainly due to the central role of carbon-intensive transportation and the lack of low-carbon alternatives. This sector has the lion's share of national demand for oil and petroleum products – 85%. In addition, the current transportation policies lack focus on decarbonising the sector's commercial segment.

Bulgaria's industrial sector is the second largest sector in terms of value-added (17%), employment (18%), and share of final energy demand in the country (27%). Its importance in the national economy comes together with high fossil energy intensity, CO2 emissions, and a general vulnerability to fossil fuel price volatility. Across the four sectors (industry, services, households, and agriculture), industry requires the largest amounts of natural gas and solid fossil fuels. It consumes 60% of the coal and 70% of the natural gas in Bulgaria's

[2] Vladimirov, M., Rangelova, K., and Dimitrova, A., *The Great Energy and Climate Security Divide: Accelerated Green Transition vs. the Kremlin Playbook in Europe*, Sofia: Center for the Study of Democracy, 2022.

[3] Center for the Study of Democracy, *Technological and Policy Innovation Scenarios for the Low-Carbon Transition of the Bulgarian Energy Sector*, Policy Brief No. 109, April 2022.

final energy demand[4]. Meanwhile, industrial energy efficiency in Bulgaria is among the lowest in the EU.

The sector's dependence on natural gas in different manufacturing processes not only poses a hurdle for Bulgaria's green transition but in light of Russia's invasion of Ukraine also exposes the Bulgarian economy to high geopolitical and geoeconomic risks. High natural gas and CO2 costs could become strong economic incentives for industrial energy consumers to decarbonize the manufacturing processes and boost efficiency. However, populist governments with short-term agendas prefer to splash helicopter money at the sector that entrenches the current consumption patterns, instead of supporting energy efficiency measures and investments in low-carbon technologies. The deep decarbonisation of the industry sector requires a structural shift in all industrial production processes, especially in chemicals, iron, steelmaking, cement and ceramics, which still have a dominant role and have poor sustainability performance[5]. Additionally, it requires a reorientation of the economy towards lighter industries with higher added value.

In the buildings sector, the high share of renewable energy in final energy consumption among households conceals the excessive reliance on firewood for heating, the most important component of the energy demand in the sector. The dependence on firewood comes together with severe environmental sustainability and air pollution risks revealing the enormous energy poverty challenges that have become in themselves a brake on the energy transition process. Despite the large spending on energy efficiency programs for residential and public buildings implemented so far, the actual impact in terms of renovation rate and depth has been negligible. The government grant scheme for multi-family residential buildings between 2015 and 2019 has had a limited scope of around 2000 buildings. Moreover, the actual renovation has been shallow, mostly focusing on wall and rooftop insulations and no measures targeting net-zero energy buildings[6].

Bulgaria's overall energy policies lack a high decarbonisation ambition and are not aligned with the EU goals under the Green Deal and the "Fit-for-55" package which Bulgaria is currently not officially supporting. It delayed the publication of a long-term low carbon strategy by almost two years and when appropriate plans were announced, the government faced an immediate backlash from the industrial sector. The least costly decarbonisation pathway for Bulgaria requires accelerated electrification, in combination with deep decarbonisation of the electricity sector and a strong focus on energy efficiency and economic transformation towards lighter industries and services with higher added value[7].

Energy Poverty Considerations

The magnitude of the energy poverty crisis in Bulgaria makes it a primary energy and climate security risk. According to Eurostat survey data, it has the largest share of people who are unable to keep their homes adequately warm in the EU. As of 2020, this concerned 28% of Bulgarian households, down from 67% in 2010, yet a staggering 20 percentage points above the EU average. The improvements made over the past decade have primarily been a side effect of overall economic development, rather than targeted government policies to tackle energy poverty. Such policies have been very limited in scope and, in many respects, counterproductive.

The main roadblock to effective energy poverty mitigation policies in Bulgaria is the absence of a clear legal definition of the phenomenon and of appropriate tools to measure it. How energy poverty is defined can radically change which and how many households would be considered vulnerable. This is mainly due to the interplay between the three key factors that are at the heart of the phenomenon – low income, high energy prices, and low energy efficiency of the home. For Bulgaria, the range of the estimated share of the population that can be considered energy poor is very wide – between 12% (based on the low income/ high energy expenditure method) and 55% (the 10% share of energy in total expenditures method). The 10% indicator is too broad in scope to allow for truly targeted measures. Meanwhile, a more restrictive definition such as the low income/ high expenditure method focuses mainly on poor households in energy inefficient dwellings. It misrepresents poor households that spend little on energy as "energy efficient", while

[4] These shares are related to the final energy demand outside of heat and electricity, where coal and natural gas are considered inputs in their generation.

[5] Center for the Study of Democracy, *Green recovery pathways to Bulgaria's carbon neutrality by 2050*, Policy Brief No. 101, June 2021.

[6] Center for the Study of Democracy, *Accelerating the Energy Transition in Bulgaria: A Roadmap to 2050*, Policy Brief No. 96, December 2020.

[7] Rangelova, K. et al., *Switching the Gears of Decarbonisation: Policy Action for a Low-Carbon Transformation of the Bulgarian Economy*, Sofia: Center for the Study of Democracy, 2021.

in reality, they may be simply unable to afford their basic energy requirements.

Defining and measuring energy poverty requires going beyond budgetary indicators in favour of a more comprehensive, multi-dimensional approach, which considers a number of high-granularity quantitative indicators. These include a definition of basic energy requirements of households (considering household size, climate zone, the energy efficiency level of the home, the type of heating system used, etc.) and together with additional information on pricing, to derive normative expenditures for meeting these energy requirements. In this case, energy-poor households would be those that would fall below the poverty line after meeting those basic energy requirements.

Assessing Existing Energy Poverty Alleviation Policies in Bulgaria

A key policy related to energy poverty has been the provision of financial aid for covering heating expenses. Only around 300.000 households typically qualify annually for this aid or less than 10% of the population. This does not even cover half of the population living below the poverty line – 22%. The size of the aid is also limited, covering only the energy requirements for the heating of one room and minimal usage of electrical appliances. Moreover, this approach provides short-term alleviation but has no structural impact in terms of reducing energy poverty in the long term. In addition, this social support mechanism sends a wrong signal to consumers that instead of investing in energy efficiency and decarbonising the fuel mix to electricity or cleaner systems such as gas or hot-water-based heating, they can use the funds to extend their dependence on firewood, coal, and heating oil. The widespread use of these heating fuels, predominantly by vulnerable consumers such as pensioners, is a structural issue blocking both energy poverty mitigation and decarbonisation policies.

The energy poverty risks exhibit strong correlation with air pollution and health-related issues. Specific measures in large cities such as Sofia and Plovdiv to support a switch to cleaner fuels in residential heating have had limited success. Only a small number of households have switched their heating appliance and many of the approved participants have delayed or cancelled their participation in the program. This measure is also not sufficiently aligned with decarbonisation goals, as natural gas is among the available technology switch options, while low-carbon energy technologies such as solar thermal energy and heat pumps have not been included as an option.

Energy efficiency policies have also had a limited impact. Despite the substantial government funds allocated to energy efficiency projects, the exclusive approach of providing a 100% government grant for buildings renovation, irrespective of the financial situation of households, has reduced the number of projects that could benefit from the government program. At the same time, the regulated electricity market and government efforts to keep electricity prices for households artificially low have reduced the incentive for the middle class to invest in energy efficiency. Hence, the annual renovation rate of the national buildings stock over the past several years has remained below 1%. The depth of renovation has also been limited – mostly to wall and rooftop insulation.

Skyrocketing energy prices and overall inflation amid the war in Ukraine have exacerbated existing vulnerabilities and threaten to bring a larger number of middle-class households closer to or even below the poverty line. In response to the energy crisis, the government has doubled down on price regulation and fuel subsidies without a targeted approach that focuses on the most vulnerable consumers. Meanwhile, energy efficiency measures have been scaled down under the National Recovery and Resilience Plan, which together with the significantly higher cost of construction materials is set to slow the rate of renovation, rather than the necessary acceleration of decarbonisation.

Recent efforts by the government to produce a legal definition for energy poverty are a key step forward. Nevertheless, this definition, expected to be finalised in 2023, is unlikely to be operationalised beyond the context of tailoring government support for energy efficiency measures. There is no political will to create a dedicated institution that would take direct responsibility for this issue, nor does any existing government institution have the political will to take that responsibility.

Modelling the Impact of Economy-Wide Carbon Pricing in Bulgaria

Methodology

To assess the potential effects of the economy-wide carbon pricing, CSD and its partners from Germany, Romania, Hungary and Poland employed a comprehensive, data-heavy methodology which can deliver projections of both macroeconomic and microeconomic outcomes. Firstly, the analysis models carbon price levels individually for each country. A CO2 emissions reduction goal is set at 40% to be achieved by 2032, compared to 2022 in all countries. Second, the model estimates the carbon price that is necessary for each country to reduce its national emissions by 40%. Hence, the carbon price depends on the general macroeconomic situation of the country as well as its carbon intensity and energy mix. Carbon price rates are assumed to increase linearly over the modelled period, reaching about $22.58/tonne of CO2 in the case of Bulgaria by the end of 2032.These modelled carbon price levels are then used to compute how macroeconomic indicators such as GDP, employment and value added in different sectors will deviate from a 'no-price scenario' between 2023 and 2032.

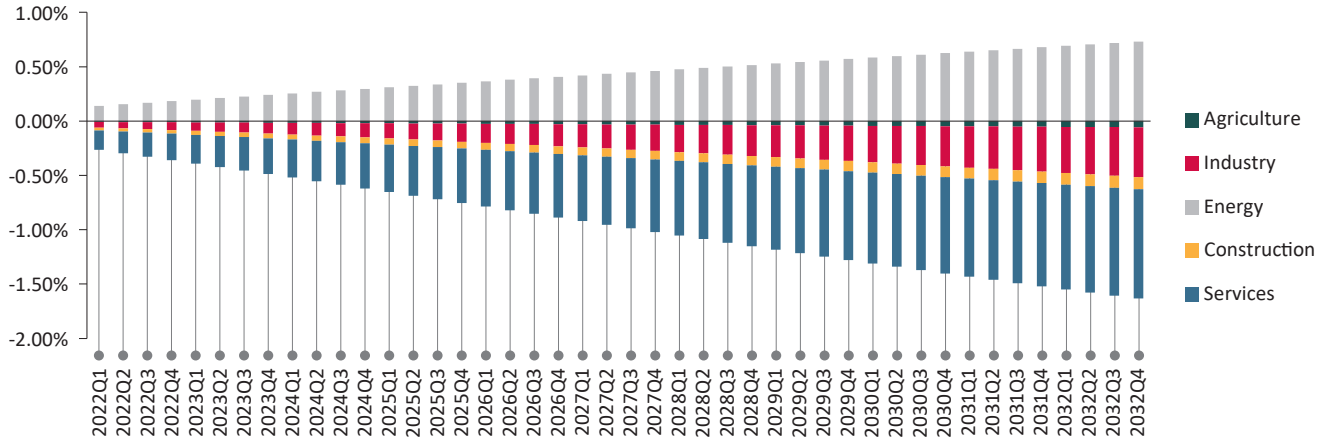
To assess the impact of a carbon price of $22.58/tonne of CO2 in Bulgaria by 2032 on households, the study estimates the changes in welfare across different income groups and in energy poverty levels. The micro-model analysis is based on national household budget survey data and estimates the additional price burden (welfare losses) on households by calculating how much more each income group (from the poorest 10% to the wealthiest 10%) would have to earn on average to maintain their pre-carbon-price consumption level. The estimates consider the carbon intensity of households' consumption, the resulting cost increases from the carbon price, as well as the expected changes in consumption patterns based on microsimulations that consider price changes and price elasticities of demand. The analysis also models how different revenue redistribution mechanisms would change welfare losses and energy poverty rates The study assumes three principal scenarios for redistribution: 1) a lump-sum scenario where each household receives the same amount of funds, 2) a double-dividend scenario where other distortionary taxes are reduced in return, 3) a price subsidy scenario in which revenues are redistributed inversely proportional to household budgets, so that poorer households benefit comparatively more.

Macroeconomic Impact

Bulgaria's GDP will rise by 22% between 2022 and 2032, according to the OECD projections for the country's economic growth. Introducing a carbon price at the suggested level results in 0.27% lower GDP in 2032 compared to the no-price scenario and the OECD assessment. Similarly, the total value-added across all sectors in Bulgaria would be only marginally lower, 0.9%, albeit the effect varies between sectors. The negative deviation in added value in Bulgaria (see figure 1) would be mainly driven by the services sector (-1.01%), followed by industry (-0.46%), construction (-0.11%) and agriculture (-0.06%). As the services sector has been growing very strongly in recent years, the expected negative deviations vs the no-carbon-price scenario remains marginal. Crucially, Bulgaria's macroeconomic performance will not really suffer but on the contrary the carbon pricing is likely going to bring notable benefits such as improved labor market conditions and stronger energy security. In addition, the modeling assessment shows a strong positive impact on value added in the energy sector and will contribute to a larger share in the total added value compared to the scenario without a carbon price. A carbon price would further strengthen the competitiveness of the renewable energy industry, which already benefits from low marginal costs, and therefore means a strong shift of resources from the fossil fuel industry to the RES sector, ultimately leading to a higher share of RES in the energy mix. The large gap between renewables' low marginal costs and the high market prices will drive the increase in the sector's added value.

Employment in Bulgaria will also not suffer a major, negative impact from the introduction of a carbon price, as negative deviations from a no-price scenario do not exceed 0.5% in any sector, while employment in services will even grow by roughly 0.18% over the observed period. The growth of this sector coincides with a small negative deviation in comparison to a no-price scenario equal to 0.4% in the industry sector which implies that employment would shift towards higher-skilled labour and higher-value-added segments. These effects can be easily mitigated as Bulgaria already has a low unemployment rate, while the labour shortages in key sectors are a much greater concern. The changes in the labour demand will require widespread and well-coordinated training of workers to help meet the demand for high-skilled labour.

Figure 1. Differences in value-added in Bulgaria (% deviation from the no-carbon price scenario)



Source: *CSD based on the MEMO model.*

Figure 2. Differences in employment in Bulgaria (% deviation from the no-carbon price scenario)

Source: *CSD based on the MEMO model.*

The decarbonisation of the Bulgarian industry sector is likely to prove the most difficult challenge going forward, as it will require extensive government interventions based on a coherent policy strategy that focuses on fostering innovation and deep sector transformation. A key step along the way towards decarbonisation is the electrification of industrial processes which in turn requires the expansion of the share of RES in the electricity mix. This cannot happen without a clear coal phase-out timeline.

In light of the war in Ukraine and the resulting energy crisis, a carbon price can additionally act as an efficient measure to improve Bulgaria's energy security. Bulgaria is heavily dependent on imports of natural gas, which before the war, came almost exclusively from Russia, putting Bulgaria in a delicate position when Gazprom cut its deliveries in April 2022. The macroeconomic modelling results show that a carbon price would decrease Bulgaria's natural gas imports by a quarter over the next decade, mainly as a result of the additional pressure on the industry sector to decarbonise. Naturally, diversifying its supply sources for natural gas, as Bulgaria is doing right now, is also critical for improving its energy security. However, this more of a short-term solution, whereas in the long run, phasing out natural gas from the energy mix is the most sustainable way to achieve better energy and climate security.

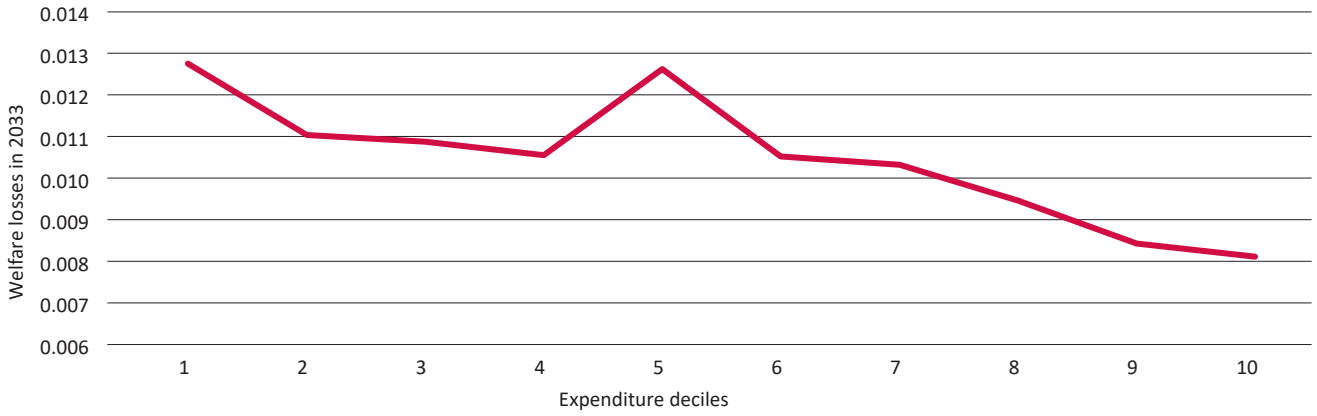
Impact on Micro-Economic Indicators

The results from the microeconomic analysis show that welfare losses for Bulgarian households range between 0.8% and 1.3% with a clear regressive trend. The poorest 10% of Bulgarian households are expected to be most affected by the introduction of a carbon price, as they would have to earn 1.3% more on average to maintain their pre-price consumption levels. According to data from the National Statistical Institute, this welfare loss is almost half of what the poorest 10% regularly receive as money transfers from relatives, crucial for making ends meet.

The observed negative trend is likely to be the result of the relatively high share of electricity in household expenditures across all deciles, as well as the high level of social inequality in Bulgaria. Although the margin between the poorest and richest 10% appears to be narrow in absolute terms, the poorest 10% would still be 60% more affected than the richest 10%. As the poorest 10% spend most of their income on bare necessities, this additional price burden would also lead to a disproportionate loss of welfare compared to the richest 10%. All three scenarios modelled in this study show that the redistribution of the additional tax revenues lead to reduction in welfare losses on the national level, with certain income groups, depending on the scenario, even registering net welfare gains in comparison with a no-carbon-price baseline.

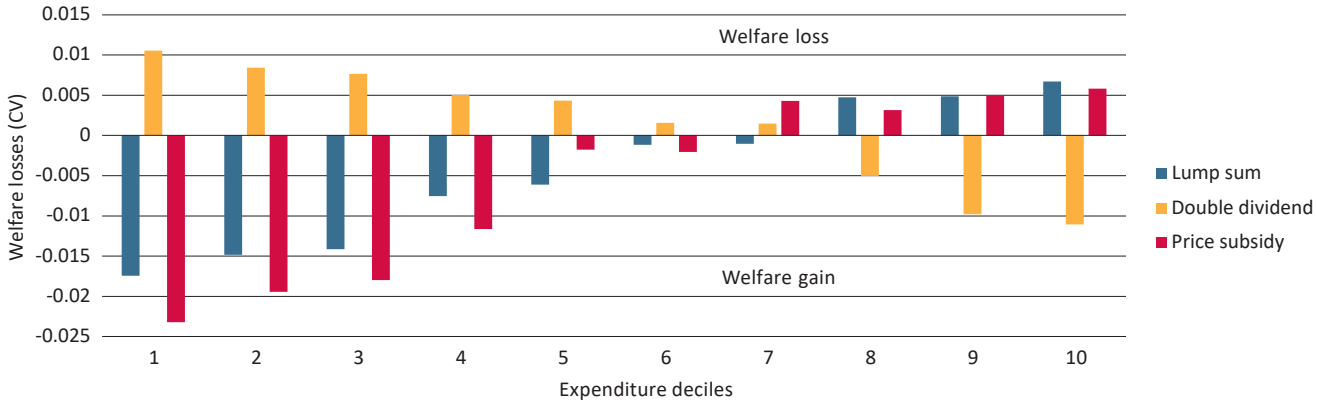
The double-dividend redistribution scenario, is assumed to act like an income tax reduction and hence the rebate is directly proportional to income. In this scenario, the poorest 50% still experience welfare losses between 1% and 0.5%, while the richest 30% increase their consumption compared to a no-price scenario. Hence, such a redistribution policy would

Figure 3. Welfare Losses Across Deciles in 2032 Before Redistribution



Source: *CSD based on the QUAIDS model.*

Figure 4. Welfare Losses (Represented by the Positive Values) Across Deciles in 2032 in Three Revenue Redistribution Scenarios



Source: *CSD based on the QUAIDS model.*

only exacerbate the regressive tendencies of a carbon price and overall socio-economic inequality.

In the case of a lump-sum redistribution, where each household receives the same amount regardless of their income level, the poorest 50% shift to a net welfare gain compared to the no-carbon-price scenario with the poorest 10% benefitting the most, as they could consume up to 1.7% more with the same income. With the middle class's welfare losses being balanced out and the richest households being the only ones who are still experiencing slight welfare losses, this form of redistribution succeeds in reversing the regressive trend of carbon pricing and improving overall social welfare.

A price subsidy redistribution, where the rebate is inversely proportional to the household's budget, would have a similar effect to the lump-sum rebate but with much greater welfare gains for the poorer social segments (2.3% welfare gain for the poorest 10%). The richest 30% experience welfare losses that are almost identical to the lump-sum scenario. Thus, such a narrowly-tailored approach which specifically targets the poorest households is likely to face some backlash from the middle class. The administrative burden of such a more complex redistribution system also exposes the policy to additional risks associated with national governance gaps, a risk that is particularly potent in Bulgaria. Consequently, there is greater uncertainty as to whether a price subsidy would actually fully deliver the estimated benefits in a real-life application.

As can be seen from table 1, a carbon price without revenue redistribution would increase energy poverty levels in Bulgaria from 16.50% in 2022 to 18.05% in 2032.[8] Nevertheless in the lump-sum and price subsidy scenarios, energy poverty levels would even fall below the initial levels in 2022. The results reflect the previously discussed welfare changes across deciles in the sense that the double dividend scenario benefits primarily richer households and thus unsurprisingly leads to energy poverty levels that are still above the 2022 ones.

The results from the modelling scenarios reveal that a carbon price does not have to lead to welfare losses and higher energy poverty in Bulgaria if it is combined with a well-designed and well-implemented redistribution policy. Due to its relatively easier administrative complexity and its negligibly smaller benefits (compared to a price subsidy), the lump-sum scenario stands out as the most viable option for incentivising a switch to less carbon-intensive consumption that will additionally leave poorer households better off.

The Regulated Price/Energy Poverty Nexus

Even before the introduction of a carbon price, the share of Bulgarian households' total expenditures spent on electricity is significantly larger than in Germany, Hungary, Poland and Romania (anlysed by the carbon pricing study). The poorest 10% in Bulgaria spend 10% of their income on electricity only while the richest 10% still spend almost 4% on their power bills, which is more than the poorest 10% spend in Germany. The assessment reveals that higher prices lead to a strong reduction in spending on electricity, especially among the poorest. This indicates that when prices increase, poorer households choose to sacrifice their comfort by severely cutting consumption. Bulgaria's only energy poverty reduction policy apart

Table 1. Energy Poverty Levels Based on the Different Carbon Price and Redistribution Scenarios

Country	Baseline scenario (2022)	Post-price scenario (2033)	Post-redistribution scenarios (2033)		
			Lump-sum	Double dividend	Price subsidy
Bulgaria	16.50%	18.05%	15.78%	17.01%	15.18%

Source: *CSD based on the QUAIDS model.*

[8] Energy poverty levels are defined as the share of the population whose energy expenditures are below 50% of the national median. This definition focuses specifically on the poorer households, thus failing to fully capture energy poverty among middle class households with low energy efficiency.

from the social transfers targeting a limited number of households is the regulated power price for household consumers. Keeping prices artificially low for all consumers no matter their income has distorted the market by creating wrong incentives for wasteful power consumption and reducing the attractiveness of individual energy efficiency investments. The regulated electricity prices are also the closest to a redistribution mechanism Bulgaria gets, as the low power tariffs for households are largely financed by the Electricity System Security Fund (ESSF), whose biggest share of revenues comes from the sale of EU ETS allowances.

The same mechanism also indirectly subsidise coal power plants in Bulgaria. The National Electricity Company (NEC) has pre-defined available capacity quotas for electricity generation from certain producers including from several independent coal-fired power producers at preferential feed-in tariffs to meet the demand from the regulated market. The ETS revenues practically cover the tariff deficit formed between the price NEC pays to buy the availability capacity and the price, at which it sells the electricity to final distributors (the DSOs). These indirect subsidies are set at BGN 1.6 billion for the regulatory period July 2022-July 2023 by the Energy and Water Regulatory Commission. This is almost a third of Bulgaria's total allocation from the Social Climate Fund. Coal power plants are thus artificially maintained in the market at a high cost for the state budget and would be forced to close in a liberalised market, even at lower carbon prices than the recent range of EUR 80-100 per ton of CO2, as demonstrated also by the present study's modelling results.

The issue of electricity market liberalisation goes beyond carbon pricing but remains relevant to the revenue redistribution mechanisms and the Social Climate Fund. It also risks affecting public perceptions of carbon pricing, as the planned liberalisation of the electricity market and the launch of the ETS II are likely to overlap to some degree. The next two years will be crucial for preparing households for the transition both in terms of informing them about the changes, as well as with a well-designed energy poverty mitigation strategy. The launch of the Social Climate Fund ahead of the introduction of the ETS II means that the benefits could be felt much earlier if a smart spending program is in place to ensure a smooth transition.

There is a clear distinction to be made between government support for the coverage of basic energy needs and for investments in energy efficiency and renewable energy technologies. The latter covers a much wider target group and requires a carefully tailored approach that combines innovative financing mechanisms that support only a share of the investment costs borne out by households. Funding should be tightly linked with energy efficiency and fuel replacement targets, so that households are incentivised to change their energy behaviour limiting wasteful consumption and decarbonising the fuel mix they use for heating.

What's Next?

At a time when skyrocketing fuel prices threaten to push even more Bulgarian households into energy poverty, an additional carbon price signal risks a strong pushback from society and policymakers alike. The present study provides additional evidence on the macroeconomic and microeconomic impacts of carbon pricing revealing that this additional "tax" would not only not cripple the Bulgarian economy, but would actually incentivise the growth of low-carbon energy alternatives. Yet, there is an urgent need to introduce a national ***Social Climate Plan*** that will feature a redistribution mechanism to reduce the small welfare losses for households from the introduction of a carbon price. Carbon pricing should not be considered in isolation but as part of a broader decarbonisation policy toolbox related to the uptake of renewable energy, energy efficiency, low-carbon transportation, and the improvement of energy and climate security.

The assessment identified a number of key priorities, which could reduce energy poverty risks without undermining the decarbonisation policy of the government:

- Introducing a carbon price should be used as a primary tool to accelerate the energy transition without hurting Bulgaria's long-term macroeconomic potential or raising energy poverty levels.

- The revenues from the ETS allowances scheme should not support the operation of coal power plants and the below-market ceiling on household power prices but feature in a targeted redistribution plan aiming to expand the coverage of the existing social transfers for mitigating energy poverty. These funds could be reallocated to investments that will accelerate the uptake of renewable energy technologies, the decentralisation and moderni-

sation of electricity grids and for supporting green innovations.

- The majority of the ETS II revenues and the Social Climate fund should be used for energy poverty reduction measures, focusing on energy efficiency and renewable energy investments.

- The allocation of ETS II funds toward temporary direct income support for vulnerable households should be minimised and directly tied to complementary energy efficiency and fuel replacement measures based on targets for the reduction of energy consumption and the decentralisation of power systems in homes.

- Set up a robust scheme for upskilling the labour force to help meet the growing employment demand in high value-added sectors, partially the outcome of carbon pricing shifting capital in low-carbon industries of a new generation.

- Outline dedicated measures that support decarbonisation in the services sector, with a focus on boosting sustainable transportation and electrification.

- Formulate a clear strategy for the transformation of the Bulgarian industry that replaces the current lavish energy subsidies with investment support that is also linked with a clear program for reducing energy consumption, boosting circularity in production processes and the uptake of prosumer-based renewable energy solutions.

- Complement the current definition of energy poverty with a clear institutional backing. A dedicated executive agency under the Council of Ministers should manage the implementation of energy poverty policies and measures, which will also keep an up-to-date registry of energy poor consumers in attempt to better tailor measures, keep track of the individual support households receive, and evaluate the effectiveness of the support mechanisms.

- Define a clear strategy for the liberalisation of the electricity market, in which regulated prices are replaced with targeted social transfers that are disbursed to the most vulnerable groups fitting the energy poverty definition. The liberalisation process should come hand-in-hand with investment schemes for the middle class, which might be out of the scope of the social transfers program but would like to improve energy efficiency and implement low-carbon technologies domestically. The agency should engage power distribution companies in the process by designing additional mechanisms for shared investments with household consumers in the field of, for example, ESCO services.

- Launch a comprehensive public awareness campaign explaining EU's 'Fit-for-55' strategy and the role of carbon pricing for the transformation of the Bulgarian economy. The goal is to counter widespread disinformation narratives that seek to undermine and delay the low-carbon transition and to perpetuate the country's dependence on fossil fuels.