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2026

Decarbonisation in Bulgaria

Powering the low-carbon transition




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Introduction

Origins

Few terms have gained as much prominence in the 21st century as decarbonisation - the process of reducing greenhouse gas (GHG) emissions, particularly carbon dioxide (CO_2), across sectors such as energy, transport, industry and agriculture to mitigate climate change. While the first uses of the noun "decarbonisation" and the verb "decarbonise" can be dated back to the 19th century, the world began to actively pay attention to environmental issues on a geopolitical level more than a hundred years later.

"The protection and improvement of the human environment is a major issue which affects the well-being of peoples and economic development throughout the world; it is the urgent desire of the peoples of the whole world and the duty of all Governments."

The above is one of the proclamations made in the Stockholm Declaration on the Human Environment, agreed upon during the historic United Nations Conference that took place in 1972 in the capital of Sweden. Since then, humanity has been waging a fierce war with itself in an attempt to preserve its environment, whilst not abandoning progress and industrialisation. It took even longer for the concept of decarbonising society to emerge as a central global policy objective. This happened in the 2000s and culminated with the signing of the Paris Agreement in 2015, which made decarbonisation a mainstream economic and political priority.

Post-communist transition before the energy transition

With the fall of Communism in Bulgaria, the country had some urgent challenges to deal with, including the rise of organised crime and hyperinflation, but nevertheless made the first steps to transforming the largely administrative environment-related measures from the socialist era into modern environmental governance. More specifically, it adopted an Environmental Protection Act in 1991 and proceeded to update its legislation in the following years in preparation for joining the European Union in the 2000s. Today, the country's environmental legislation is largely driven by EU directives and regulations. Consequently, Bulgaria pursues the common goal of achieving net-zero GHG emissions by 2050.

As in many other countries, political and social divisions over what causes climate change and how critical of a topic this is have complicated Bulgaria's decarbonisation efforts, particularly regarding the importance and pace of the energy transition. Over the years, the concept of decarbonisation has seemingly been identified by many as an expensive and outright unnecessary measure, especially when looking at much more urgent local issues.

The situation changed with the start of Russia's invasion of Ukraine, which made it clear that the EU must turn to clean energy not just for the environmental benefits but also to ensure its energy security. With rising energy prices and photovoltaics and batteries becoming increasingly cheaper, the private sector proactively embraced solar energy rather than waiting for the necessary regulatory framework to catch up. The energy costs situation worsened with the beginning of the war in Iran, which only served to reaffirm what Europe learned from the Russia-Ukraine conflict.

Even in a sceptical Bulgaria, decarbonisation is now increasingly associated with improved energy efficiency and lower electricity prices. The substantial solar expansion in the country over the past few years was also supported by a surprising boom in the energy storage market, where Bulgaria quickly turned into a major player.

Stable position in emissions reduction

This report examines Bulgaria's progress in reducing greenhouse gas (GHG) emissions in 2024 compared with both the previous year and 1990 levels. It finds that the country maintained its overall position within the bloc relative to 2023. However, much of Bulgaria's decarbonisation progress has been driven by demographic decline, meaning that future emissions reductions will depend more than ever on effective policy measures.

The report also analyses the decarbonisation of the country's major sectors, with a special focus on FMCG & Retail and delves into the latest developments in renewable energy and energy storage. Major players are sharing experience and lessons learned, while pursuing a combo of lower emissions and energy savings.



Key findings

Net GHG emissions reductions (2024):

57.8% (vs 1990) **5.1%** (vs 2023)

Net GHG emissions per capita reductions (2024):

42.8% (vs 1990) **6.8%** (vs 2023)

Intra-EU rank in net emissions reductions (1990-2024):

5th Overall › **15th** Per capita

GHG emissions intensity (2024):

Bulgaria: **486** tCO2-eq per mln EUR › EU: **183.5** tCO2-eq per mln EUR

GHG emissions intensity reduction (2024):

Bulgaria: **70.8%** down vs 1991 › EU: **64.7%** down vs 1990

Intra-EU rank in GHG emissions intensity (2024):

13th for intensity reduction › **2nd** most carbon-intensive economy

Largest-emitting sector (2024):

Energy supply **33.3%** of gross GHG emissions

Deepest sectoral emissions cuts (1990-2024):

Industry **70.4%** down

Sharpest sectoral emissions increase (1990-2024):

Domestic transport **66.9%** up

FMCG & Retail greenhouse gas footprint (2024):

Industry emissions **1.292** million tonnes

Share in total emissions of Bulgaria: **3.2%**

GHG emissions in 2024 and progress over 2008-2024:

Manufacture of food and beverages: **617,000** tonnes 18% down

Wholesale: **504,000** tonnes 21% up

Retail: **172,000** tonnes 65% up

Total economy: **40** million tonnes **36%** down

GHG emissions intensity in 2024 and progress over 2008-2024:

Manufacture of food and beverages: **362** grams/EUR 41% down

Wholesale: **97** grams/EUR 22% down

Retail: **47** grams/EUR 12% down

Total economy: **629** grams/EUR **53%** down

23.21% Share of renewable energy in gross final energy consumption (2024) → **34.96%** Target share of renewable energy in gross final energy consumption (2030)

33.84% Share of renewable energy in gross final electricity consumption (2024) → **49.34%** Target share of renewable energy in gross final electricity consumption (2030)

Renewable energy highlights of Bulgaria in 2025

10 GW total installed renewable capacity

6 GW installed solar capacity
1.5 GW added in 2025 alone

3.3 GW installed BESS capacity as of May 2026
the fastest-growing battery storage market in the EU

0.7 GW installed wind capacity

Part I: Decarbonisation landscape

Emission trends and policy context

Despite only accounting for a relatively small share of the EU's GHG emissions, Bulgaria's decarbonisation profile carries relevance due to its historically high emissions intensity and reliance on coal-fired energy generation. In 2024, the country only sliced a 1.3% share in the EU's aggregate net GHG emissions and 1.4% in the gross series, on par with its 1.4% share in the bloc's population. However, its decarbonisation record places it among the bloc's better performers. Bulgaria curbed its net GHG emissions by 57.8% relative to 1990 levels, ranking fifth across the EU by this metric. Nevertheless, this performance is partly explained by demographic contraction, as Bulgaria's population shrank by 26.6% during the same period. Consequently, this moderated the country's decarbonisation profile in per capita terms. Net emissions per person fell by 42.8% in 2024 relative to 1990 levels, placing the country only 15th among EU peers. Simultaneously, Bulgaria remained one of the EU's most carbon-intensive economies. In 2024, it ranked second for net GHG emissions per unit of GDP, while consistently ranking either first or second by this measure since 1997. This indicates that future progress will hinge less on demographic decline and more on structural changes in the energy sector and hard-to-abate industries.

Bulgaria also appears well positioned to meet GHG emissions reduction targets, having already surpassed the EU's collective 2030 objective of cutting net GHG emissions by 55% relative to 1990 levels. The country's latest projections also reflect optimism, pointing to a negative net GHG emissions balance by 2050 under existing measures.

Bulgaria's regulatory decarbonisation framework is largely shaped by the EU's climate policy architecture. The European Green Deal and European Climate Law set the bloc's broad climate-neutrality objective, while the Fit for 55 package translated it into policy tools for 2030. The Emissions Trading System (ETS) applies carbon pricing to power generation, energy-intensive industry, aviation and maritime transport, while the Effort Sharing Regulation (ESR) sets national targets for sectors outside the ETS, such as transport, buildings, agriculture, small industry and waste. Looking ahead, the second iteration of the Emissions Trading System (ETS2), set to be enforced from 2028, will extend carbon pricing upstream to fuels supplied to buildings, road transport and additional sectors, mainly consisting of small industries not covered by the existing EU ETS. These policy instruments are also complemented by the Carbon Border Adjustment Mechanism (CBAM), which entered into force in 2026. CBAM aims to support EU producers of carbon-intensive goods by applying a carbon cost to certain imports into the EU, thereby levelling the playing field with non-EU competitors operating in jurisdictions devoid of equivalent carbon-pricing mechanisms.

Overview of total emissions

Bulgaria's decarbonisation path followed a broad downward trajectory from 1990 levels, with the latest available data published by the European Environment Agency (EEA) indicating a continued decline in GHG emissions in 2024. The country's gross GHG emissions fell to 43.4 MtCO2-eq in 2024, edging down by 5.1% on the year, while shrinking by 56.7% compared with 1990 levels.

The progression has not been marked by steady annual emissions slashes as much as by a mix of sharp early declines during the post-communist restructuring period, intermittent rebounds and a renewed reduction after 2022. While the initial decline was driven less by climate policies and more by the structural transition from a centrally planned to a market economy - including industrial contraction and lower demand - the 2022-2024 period witnessed the sharpest recent reduction in emissions, with gross GHG emissions falling by approximately 26% over two years. This recent decline is more closely linked to the dynamics of the power sector, lower coal-fired generation, a growing renewable output and the effects on energy prices, rather than the broader structural shift observed in the 1990s. Climate policies, including pressure on coal-fired generation through carbon pricing mechanisms, along with tighter environmental standards and net-zero financing instruments, have also galvanised this recent development.

Net emissions, which include the effect of the Land Use, Land-Use Change and Forestry (LULUCF) sector, followed a similar downward trajectory. In 2024, Bulgaria's aggregate net emissions were gauged at 35.4 MtCO2-eq, decreasing by an annual 6.9%. Relative to 1990, emissions saw a 57.8% contraction, mostly in lockstep with the evolution of the gross series.

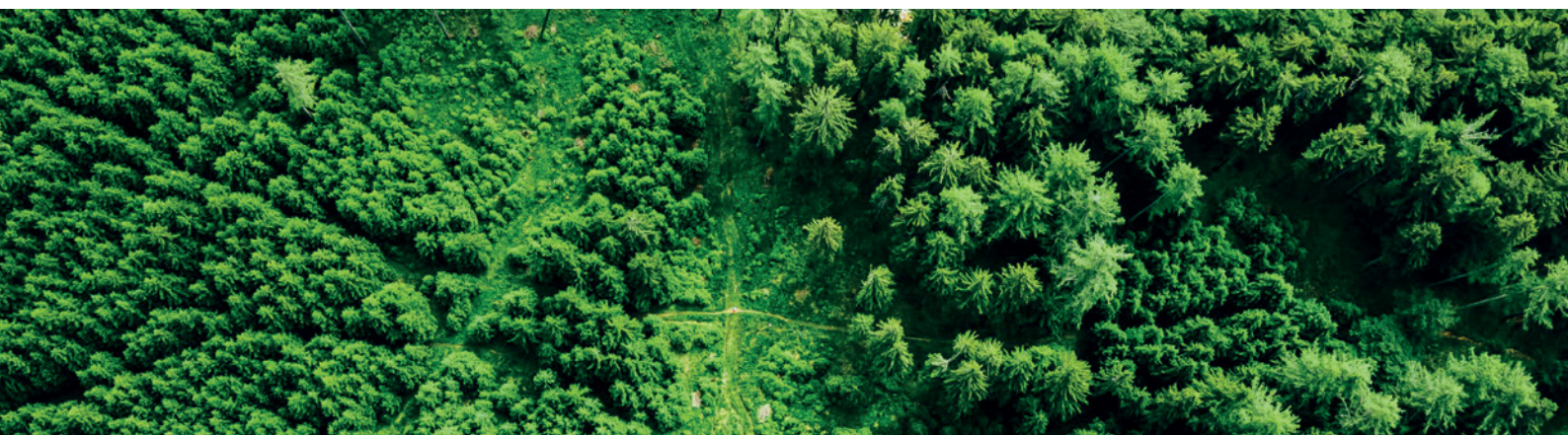
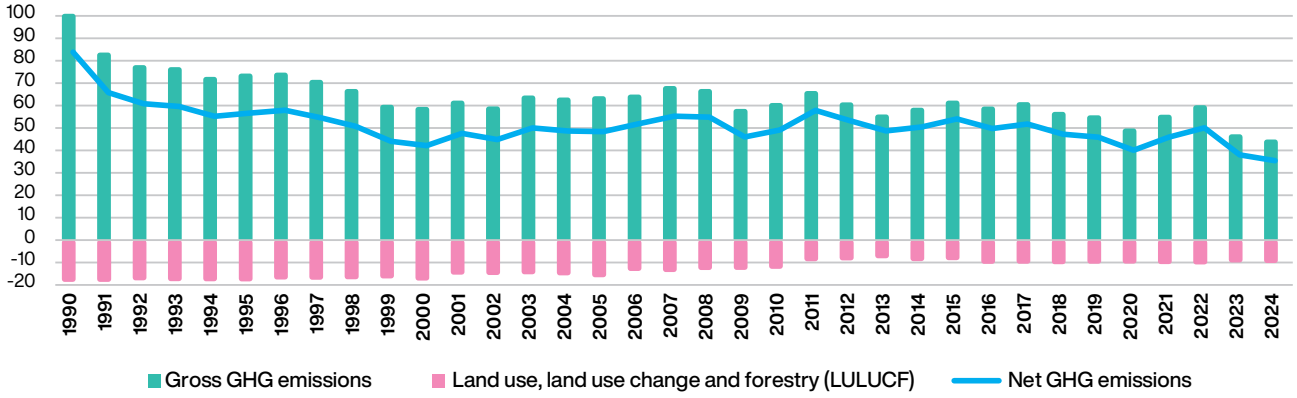


Fig 1. Bulgaria GHG emissions 1990-2024 (Mt CO2-eq)



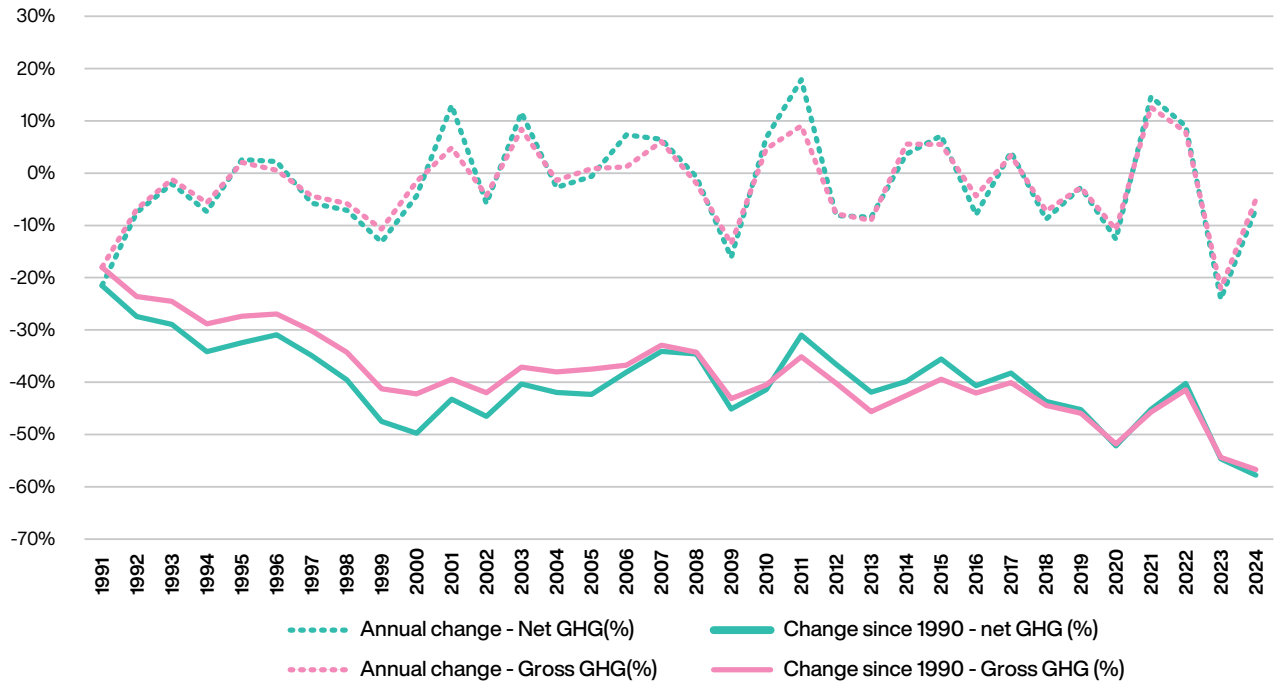
Source: EEA

While gross and net emissions broadly followed a similar trajectory, the latter saw a marginal acceleration in their decline due to the LULUCF sector acting as a carbon sink. However, its absorbent capacity diminished substantially compared to the early 1990s, when it offset an average of 15.7 MtCO2-eq, compared to 12.8 and 7.8 MtCO2-eq in the two decades thereafter, before inching up to average slashes equivalent to 8.1 MtCO2-eq between 2021 and 2024. This indicates that while Bulgaria's long-term emissions reduction has been driven primarily by direct cuts in gross emissions, land-based removals still played a supporting role. However, the declining strength of the LULUCF sink also suggests that Bulgaria cannot rely on it to compensate for the decarbonisation of carbon-intensive sectors such as energy, industry, buildings or transport.

In 2024, Bulgaria's GHG emissions continued to fall, but the pace of the reduction differed substantially from the drop seen in 2023, when gross emissions plummeted at a record annual rate of 22.1% following surges driven by the post-pandemic recovery and the 2021–2022 energy crisis. Consequently, the slower decline in 2024 points to a possible consolidation of a lower emissions baseline.

While the statistical effects of the post-COVID economic rebound and Russia's invasion of Ukraine cannot be ignored, 2023 also marked a turning point in Bulgaria's energy production. The aforementioned factors disrupted markets, reduced gas flows and likely increased reliance on coal. In 2023, the country made a significant leap in decarbonising its most emissions-intensive sector, contributing to the overall emissions contraction. According to the country's transmission system operator, ESO, renewable capacity, including hydro, solar and wind power, represented 41.8% of Bulgaria's aggregate generation capacity in 2022, before expanding its footprint to 49.1% in 2023 and 53.6% in 2024.

Fig 2. GHG emissions: Annual Change vs Change since 1990 (%)



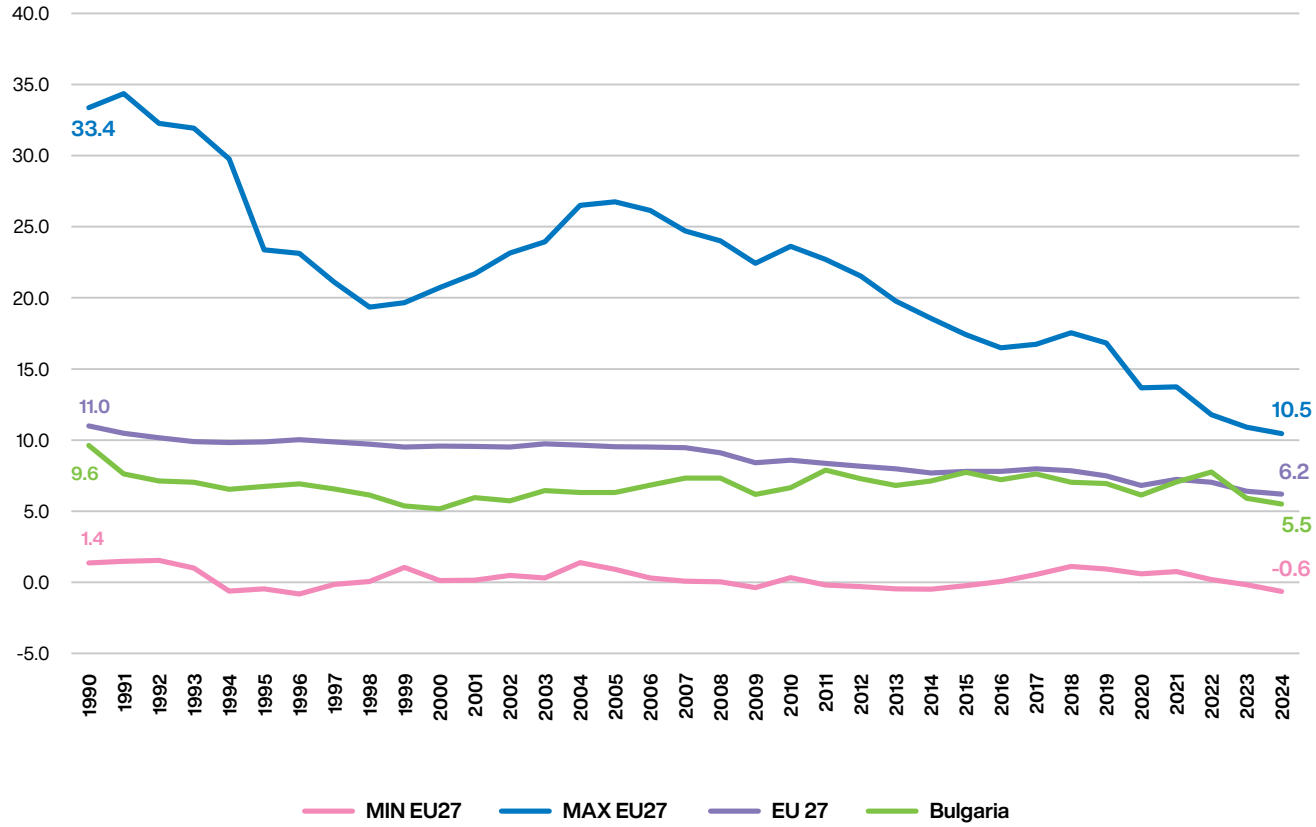
Source: EEA

When measured against the performance of its EU peers, Bulgaria's emissions contraction in 2024 ranked fifth both on an annual basis and relative to 1990 levels, in both net and gross terms. The annual decline in net and gross emissions represented a relative deterioration from 2023, when Bulgaria was the bloc's runner-up, only behind Sweden. Compared with 1990 emissions, Bulgaria's contraction maintained its position from 2023 in gross terms but dropped one spot in net terms.

Although Bulgaria's decarbonisation progress in absolute terms shows a strong climate record, the per-capita picture moderates it. A significant part of the country's aggregate GHG emissions reduction was driven by the country's demographic decline. By the end of 2024, Bulgaria's population had shrunk by 26.6% to 6.4 million people, according to Eurostat data. This constituted the second-largest population decline in the EU over the period, behind only Latvia.

On a net GHG emissions per-capita basis, the EU member state reduction ranking reshuffled, with Bulgaria's standing no longer exceptional. Net emissions per capita plummeted from 9.6 tCO2-eq per person in 1990 to 5.5 tCO2-eq in 2024, marking a decline of 42.8%. This placed Bulgaria 15th in the Union, which makes for a weaker standing than the fifth place secured by the absolute emissions ranking. In absolute terms, Bulgaria's 2024 net emissions per capita place it 13th lowest in the EU, around the middle of the distribution. Convergence with the EU's stronger decarbonisation performers hinges less on demographic effects and more on the transformation of the energy system, industrial efficiency, transport electrification and behavioural shifts.

Fig 3. Net GHG emissions per capita (tCO2-eq/pop)



Source: EEA



St. George Solar Park: Delivering Large-Scale Renewables at Speed in Bulgaria

In May 2026, Rezolv Energy announced the commissioning of the 225 MW St. George solar park in Silistra, Bulgaria, the first of the company's large-scale projects to come onstream. A total investment of approximately $300 million, St. George was delivered at speed, reaching full operational status less than three years after Rezolv acquired the development rights.

St. George will generate approximately 313 GWh of electricity annually, making a significant contribution to Bulgaria's installed solar capacity while supporting the country's energy security and decarbonisation objectives. The project also includes a 90 MW / 240 MWh battery energy storage system.

Built on the site of the former Silistra airport, which was decommissioned more than 25 years ago, St. George demonstrates how renewable energy projects can deliver both environmental and economic value through the repurposing of under-utilised brownfield land.

How St. George was financed

The construction phase of the project was supported by €90 million in debt financing from the International Finance Corporation (IFC) and Raiffeisen Bank International.

Construction was also underpinned by a long-term Virtual Power Purchase Agreement (VPPA) with Ardagh Glass Packaging-Europe (AGP-Europe), an operating business of Ardagh Group. The VPPA – one of the first of its kind in Bulgaria – will supply 110 GWh of renewable electricity annually to AGP-Europe over a 12-year period.

Rezolv has since expanded its corporate PPA portfolio in Bulgaria through a 10-year VPPA with Etem Gestamp. Under the agreement, Etem Gestamp will procure renewable electricity from Rezolv's 461 MW VIFOR wind farm, which is nearing completion in Romania. The deal – the first publicly announced cross-border wind PPA involving a Bulgarian offtaker – highlights the growing demand for clean power among industrial businesses in Bulgaria.

St. George at a glance

Location:	Silistra, Bulgaria
Site:	The former Silistra airport – 165 hectares of brownfield land
Capacity:	225 MW
No. of solar panels:	Almost 400,000
Storage capacity:	90 MW / 240 MWh
Annual generation:	313 GWh
Total investment:	Approximately $300 million
Status:	Operational since May 2026
Operational lifespan:	30+ years



Local partnerships

St. George has been delivered alongside leading Bulgarian and international partners. Sofia-headquartered Solarpro, Eastern Europe's leading technology integrator and CMC Europe acted as engineering, procurement and construction (EPC) partners. Green Solar Energy, another Bulgarian company, delivered the high-voltage works required for grid connection.

The decision to give Bulgarian companies such a leading role brought further value to the local economy.

Contributing to the momentum behind battery storage in Bulgaria

The battery energy storage system at St. George, which was supported by a grant under the European Union's NextGenerationEU programme, will enhance flexibility and support grid stability by enabling energy generated during peak sunlight hours to be deployed when it is most needed.

Bulgaria has rapidly emerged as a European leader in storage, last year becoming the third-largest battery storage market in the EU, behind only Germany and Italy. St. George will help build on that momentum.

Setting a benchmark for sustainability in Bulgaria

As well as building a 2.3 GW portfolio of large-scale solar and onshore wind projects in Southeastern Europe, Rezolv is committed to setting a new benchmark for sustainability in the region.

> "St. George began as a vision to transform a disused brownfield site into a flagship renewable energy project that could make a meaningful contribution to Bulgaria's energy security and climate goals. Today, that vision has become reality. Importantly, it also marks Rezolv Energy's transition from builders to operators and long-term custodians of critical clean energy infrastructure."
> **Alastair Hammond, CEO, Rezolv Energy**

Investing in impact programmes is a core pillar of Rezolv's strategy, with more than €400,000 committed to these initiatives in 2025 alone. In Bulgaria, these include:

- **The SCION Accelerator**, developed in partnership with the NGO SCION to support startups developing solutions in CleanTech and NatureTech, ecosystem restoration, climate resilience and biodiversity protection. The Accelerator's second programme concluded one week after St. George was commissioned. A third cohort will be chosen in the autumn, with further programmes planned for 2027.

- **The Rezolv Energy Skills Academy,** through which Rezolv is investing in local people and long-term skills development. In Silistra, members of the local community have already graduated as certified solar technicians, with the ambition of training up to 500 people across Bulgaria and Romania in 2026.

- **'Home for Wild Neighbours'**, a nature restoration programme being delivered with a local NGO and in partnership with AGP-Europe. The programme creates habitats for hedgehogs, birds and other wildlife, while engaging local schools to connect younger generations with the St. George project.

A blueprint for Bulgaria's energy future

Projects like St. George demonstrate that Bulgaria is entering a new phase in its energy transition – one defined by utility-scale infrastructure capable of delivering meaningful decarbonisation impact while strengthening long-term energy security.

Delivered in less than three years, St. George also highlights how rapidly large-scale renewable energy projects can be brought onstream when supported by private investment, strong local partnerships and innovative financing structures.

As Bulgaria continues to expand its renewable energy capacity and storage infrastructure, projects of this kind will play an increasingly important role in shaping the country's long-term energy future.

Project timeline

July 2023:	Rezolv Energy acquires the rights to build and operate St. George
September 2024:	CMC Europe, Solarpro and Green Solar Energy selected to build St. George
September 2024:	Ardagh Glass Packaging-Europe signs a major long-term Virtual Power Purchase Agreement for offtake from St. George
October 2024:	Up to €90 million in debt financing secured from the International Finance Corporation (IFC) and Raiffeisen Bank International
November 2024:	Construction work starts
October 2025:	Grant secured under the NextGenerationEU programme for the deployment of the battery energy storage system at St. George
May 2026:	St. George commissioned

> "Green energy production represents the future of Europe and the world. The fact that the municipality of Silistra will host a solar power plant of this size places us in a prominent position on the national map. I would like to extend my sincere thanks to the team at Rezolv Energy for choosing Polkolvnik Lambrinovo as the site for the implementation of their large-scale project."
>
> **Alexandar Sabanov, Mayor of Silistra**





Martin Langham, Rezolv Energy's Chief Operating Officer, opens the St. George solar park alongside Alexander Sabanov, the Mayor of Silistra and Krasen Mateev, CEO of Solarpro Holding.

About Rezolv Energy

Launched in 2022 by Actis, a leading growth market investor in sustainable infrastructure, Rezolv is one of the largest independent renewable energy producers in Central and Eastern Europe.

As well as St. George, Rezolv has a 2 GW portfolio of large-scale onshore wind and solar projects in construction or late-stage development in Romania.

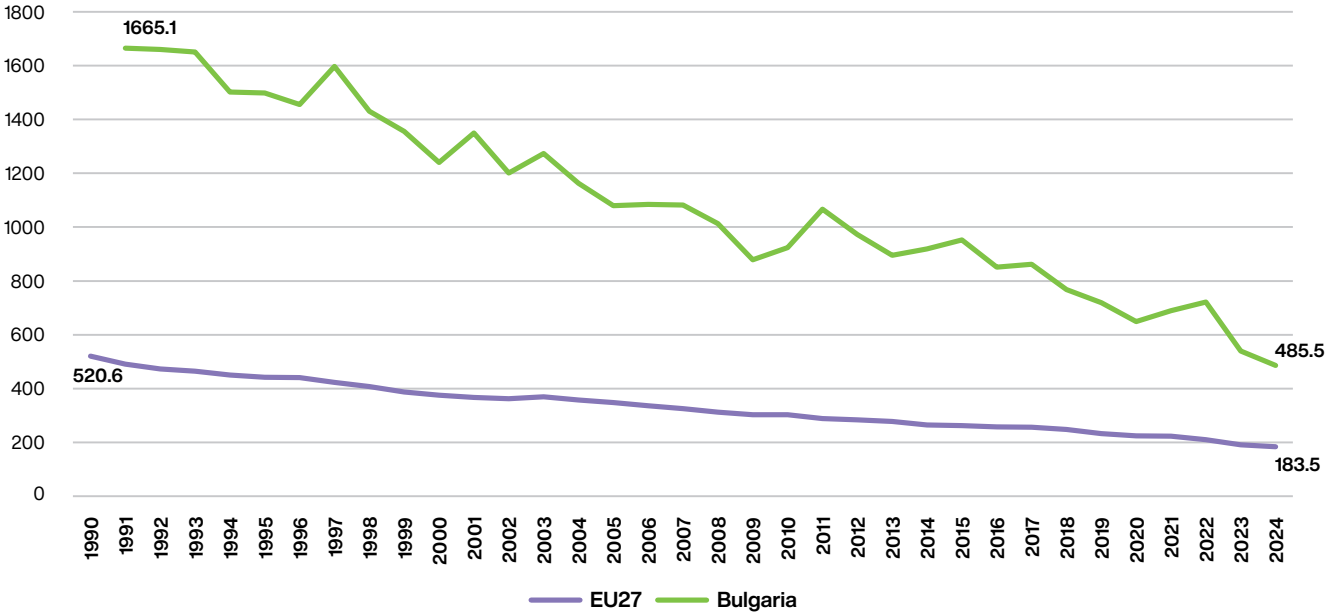
One of Rezolv's projects in Romania is Dama Solar which, with a capacity of 1,044 MW, is expected to be the largest solar park anywhere in Europe once it is operational.

Emission intensity and progress towards reduction targets

Bulgaria has consistently ranked among the EU's most carbon-intensive economies, while also making significant strides in decarbonising its output. In 2024, the country's net GHG emissions intensity stood at 485.5 ktCO2-eq per unit of GDP, positioning it as the second most carbon-intensive economy across the bloc, only behind Poland. This showed a marginal improvement from the previous five years, when Bulgaria had been the member state with the most GHG emissions per GDP. This record consolidates a broader trend, exemplified by the fact that each year between 1997 and 2024, the country positioned itself as either the most or the second-most carbon-intensive economy among the EU's current 27 members. Between 1991 and 1996, as Bulgaria was transitioning to a market economy and scaling down its industrial footprint, its standing was not substantially different, ranking between the third and sixth most carbon-intensive economies. While the country's emissions intensity remained markedly above the EU average, the gap narrowed significantly from 240% above the EU level in 1991 to 170% above it by 2024.

Despite its high carbon intensity within the EU, Bulgaria's progress is undeniable. In 2024, the country's net GHG emissions intensity plummeted by 70.8% from 1991 levels to 485.5 ktCO2-eq per unit of GDP, placing it 13th among EU peers from an emissions reduction perspective. In annual terms, Bulgaria's net emissions intensity fell by 9.9% in 2024. The country ranks mid-table when gauged against the EEA's earliest available baseline, but in 2024 it recorded the second-largest annual reduction, behind only Lithuania.

Fig 4. Net GHG emissions intensity (tCO2-eq per mln EUR)

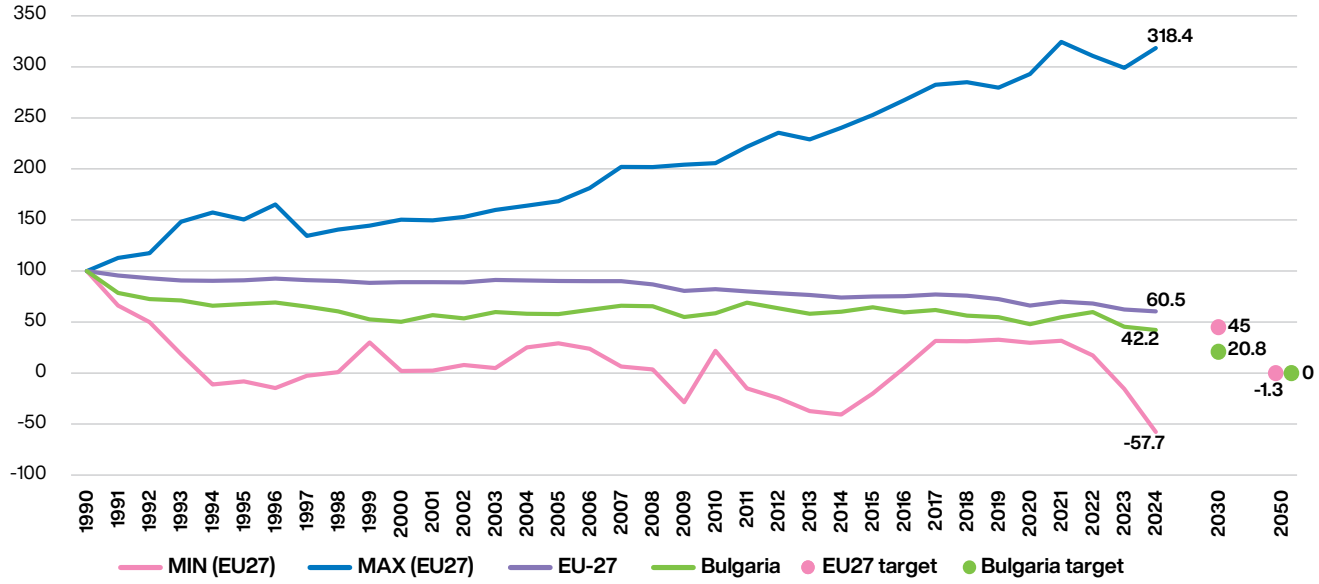


Source: EEA

The drop in Bulgaria's emissions intensity indicates a substantial improvement in the carbon efficiency of its economy. However, the emissions intensity constitutes a measure that is relative to economic performance, given that it can fall even as total emissions are stable or increase, provided GDP grows at a faster rate. Although Bulgaria's emissions per unit of GDP fell more sharply than absolute emissions between 1990 and 2024, declining by 70.8% compared with a 57.8% reduction in net emissions, the country ranked higher on absolute decarbonisation than on emissions intensity. Bulgaria's net emissions index fell to 42.2 in 2024 relative to 1990 levels, 18.2 points below the EU average, placing it behind only Sweden, Lithuania, Romania and Estonia. Its net emissions reduction placed it fifth across the EU, while its emissions intensity ranked only 13th.

Bulgaria's ambitions are inextricably shaped by EU climate targets, which envision climate neutrality by 2050 under the Green Deal. To this end, the bloc has set several intermediary targets. The Fit for 55 Package 2030 target is aimed at reducing net GHG emissions by 55% relative to 1990 levels, while a motion greenlit by the EU Parliament in February 2026 set the bloc's sights on a 90% cut by 2040. Bulgaria's current reduction progress puts it on track to meet these emissions reduction targets. In 2024, the country already surpassed the EU's collective aim to slash net GHG emissions by 55% by 2030, achieving a 57.8% cut. Expanding the time horizon, under the WEM (With Existing Measures) scenario, Bulgaria's net emissions are projected to reach 26.19 MtCO2-eq by 2030, shrinking by 46% compared to 2022 and by 73% compared to 1988, according to the country's latest update to its National Energy and Climate Plan (NECP) submitted in 2025. By 2050, net emissions are expected to reach 17.73 MtCO2-eq, declining by 82% from 1988 levels and falling short of the bloc's collective net zero target. Under the WAM (With Additional Measures) scenario, net GHG emissions are projected to decrease by 82% by 2030 compared to 1988, before achieving net zero by 2050. In its latest 2025 report of national projections of anthropogenic GHG emissions under the Governance of the Energy Union and Climate Action, Bulgaria displayed more optimism, expecting a 79.2% reduction of net emissions by 2030 before reaching a net negative balance by 2050, both under WEM and WAM scenarios, according to the EEA.

Fig 5. Index of net GHG emissions (1990=100) and targets



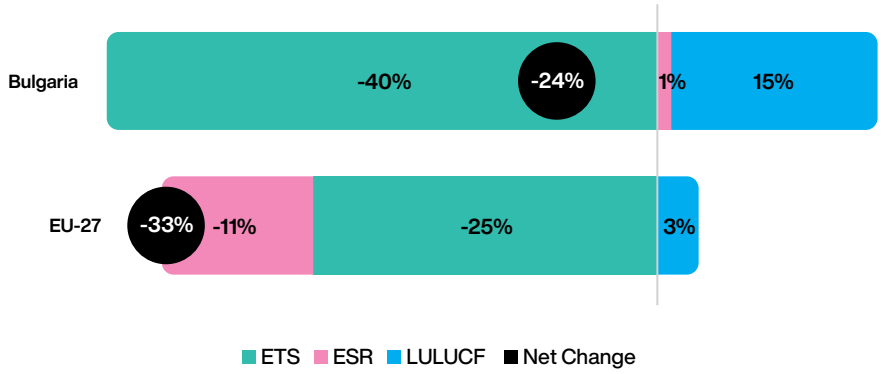
Source: EEA

A more granular breakdown of the bloc's 2030 targets puts Bulgaria's progress into perspective. The ETS and the ESR are the EU's main emissions-curbing market mechanisms aimed at delivering the collective goal of slashing net emissions by 55% by 2030. Launched in 2005, the ETS functions as a cap-and-trade system by setting an EU-wide cap on roughly 40% of the bloc's emissions derived from power and heat generation, energy-intensive industry, intra-EU aviation and, since 2024, maritime transport. Companies must surrender allowances corresponding to their verified emissions, with each allowance representing one tonne of CO2-eq. Allowances are either auctioned or, in some sectors, allocated for free and can be traded between market participants. The cap is reduced annually in line with EU climate targets, narrowing the supply of allowances and incentivising decarbonisation. While no national targets have been set under the ETS, the bloc's collective goal is to reduce emissions associated with relevant sectors by 62% compared to 2005 levels. The trajectory of Bulgaria's ETS-regulated emissions, tracked from 2013 to 2024, shows a 41.9% reduction over the same period, according to EEA data.

Complementary to the ETS, the ESR covers the sectors responsible for the EU's remaining non-ETS emissions - transport, buildings, agriculture, small industry and waste. The mechanism sets annual emission limits for each member state, binding national reduction targets and a 40% collective reduction target for the EU relative to 2005 levels. Bulgaria is the member state with the lowest ESR target, aiming to reduce relevant emissions only by 10%. According to EEA data, the country's 2024 ESR emissions are estimated at 26.2% above the base-year level, exceeding its allocated emission limit of 7% above the same level. However, by 2030, Bulgaria expects to curb emissions by 36%, positioning it among the only six member states on track to meet ESR targets with current measures and among the fourteen projected to reach them with additional measures. Bulgaria was also among the six member states that only submitted ETS projections based on existing policy measures.

Bulgaria's net greenhouse gas emissions fell by 24% between 2005 and 2024, but the reduction was uneven across policy areas. Emissions covered by the ETS made the largest downward contribution, cutting 40 percentage points (pp) from total net emissions in 2005. Emissions under the ESR were broadly flat, inching up the aggregate by 1 pp, while the LULUCF sector's carbon sink capacity shrank, adding a positive contribution of 15 pp and partly offsetting the reductions achieved elsewhere.

Fig 6. ETS and ESR emissions, LULUCF removals



Note: Absolute changes of ESR, ETS and LULUCF are expressed as percentage changes relative to the total net GHG emissions of 2005. The change in total net GHG emissions between 2005 and 2024 is broken down into changes of emissions covered under these policy instruments.

Source: EEA

Decarbonisation as a Business Imperative: Turning the Energy Transition into Opportunity

How energy efficiency, electrification and new technologies are reshaping industrial competitiveness and accelerating the transition to low carbon energy systems.

Siemens Energy is a global leader in energy technology, supporting customers across the entire energy value chain with innovative solutions that enable the transition to a more sustainable, reliable and low carbon energy future.

Decarbonisation has evolved from a long term ambition into a defining business priority. Across Europe, industries are under increasing pressure to reduce emissions while ensuring competitiveness, resilience and security of supply. This shift is reshaping how energy systems are designed and operated, turning the energy transition into both a challenge and a strategic opportunity.

At its core, decarbonisation is not a single technological solution but a systemic transformation. It requires coordinated action across power generation, industrial processes, and entire value chains. This complexity is particularly evident in energy-intensive industries such as steel, chemicals and cement, which account for a substantial share of global emissions and remain highly dependent on fossil fuels.

The most immediate and cost-effective starting point lies in improving **energy efficiency**. Optimising existing assets, upgrading equipment and reducing losses can deliver rapid emission reductions without major structural changes. These measures often also enhance reliability and reduce operational costs, making them a logical first step.

As systems evolve, **electrification** is becoming an increasingly important pillar. Shifting processes from fossil fuels to electrified alternatives offers significant potential—especially when combined with the growing share of renewable energy. This transition is gaining momentum across Europe and opens new opportunities in Southeast Europe, where renewable capacity is expanding.

Nevertheless, electrification alone cannot address all emission sources. Some industrial processes require high temperatures or involve chemical reactions that cannot easily be electrified. In such cases, **hydrogen and alternative fuels** are expected to play a key role, enabling emissions reductions in hard-to-abate sectors.

Digitalisation is another essential enabler. Advanced monitoring and analytics allow companies to optimise energy use, improve transparency and integrate renewable energy more efficiently. This helps maximise the impact of decarbonisation measures and reduce overall resource consumption.

Importantly, decarbonisation extends beyond individual operations. It increasingly involves a broader ecosystem perspective, including supply chains, infrastructure and partnerships. Companies are recognising that meaningful emission reductions require collaboration across the entire value chain.

From a strategic perspective, decarbonisation is also a driver of innovation and growth. Companies that act early can improve efficiency, reduce exposure to regulatory risks and position themselves in emerging segments such as hydrogen and digital energy services. In this sense, decarbonisation is not only about compliance—it is about long-term competitiveness.

For Southeast Europe, the transition presents both challenges and opportunities. Countries in the region must modernise existing infrastructure while integrating renewable energy and new technologies. This requires a balanced approach, combining upgrades of current assets with targeted investments in future-oriented solutions.

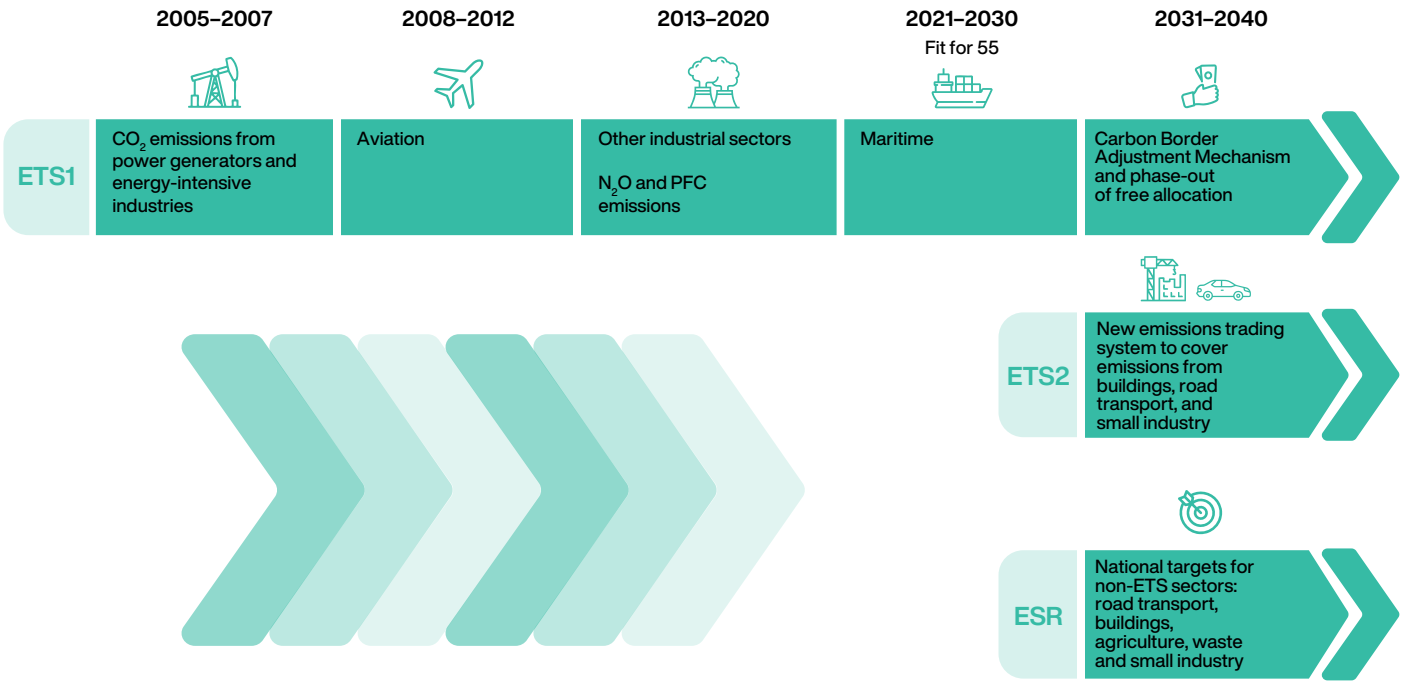
Ultimately, the success of decarbonisation will depend on execution. The technologies are available, but the pace and scale of deployment remain critical. Those who can translate ambition into action will be best positioned to succeed.



Developments on the regulatory decarbonisation horizon

Rather than being primarily driven by a domestic policy agenda, Bulgaria's decarbonisation regulatory landscape is nested within the EU's wider climate policy framework. The bloc's main strategic direction was established by the European Green Deal in 2019, setting its sights on climate neutrality by 2050. In 2021, the European Climate Law turned the Green Deal's objective into a legally binding target, with an interim goal of achieving 55% cuts in net GHG emissions by 2030 relative to 1990 levels under the Fit for 55 package. In February 2026, the EU Parliament enacted a subsequent target for 2040, aiming to slash emissions by 90%. This latest target was more flexible than initially proposed, allowing member states to meet up to 5 percentage points of net emissions reductions from high-quality international carbon credits starting from 2036.

Fig 7. Regulatory timeline



Source: EEA, adapted from (Böttcher, H. et al., 2025)

Emissions Trading System (ETS1)

As part of these broader goals, several EU policy instruments are particularly relevant for Bulgaria. The first iteration of the Emissions Trading System (ETS1) was introduced in 2005, in the context of the Kyoto Protocol, the first international treaty to impose legally binding reduction targets on developed countries. The ETS is based on a cap-and-trade principle, whereby a limit is set on the total amount of GHG emissions generated by the electricity, heat generation, industrial manufacturing, aviation and maritime transport sectors. The cap is reduced annually in line with the bloc's climate target and is expressed in emission allowances, with one allowance equal to one tonne of CO2-eq. Allowances are sold in auctions and may be traded, while some are received for free. When a company in a relevant sector reduces emissions, it can either sell the spare allowances or save them for future use. As the cap is narrowed, leading to a scarcity of allowances, carbon pricing incentivises emissions reductions, with revenues supporting climate investments.

According to the European Commission, ETS auctions have raised more than EUR 258 bln in revenue. In 2025 alone, ETS revenues exceeded EUR 43 bln, with approximately EUR 24 bln directly benefiting member states and the remainder supplying the bloc's Innovation Fund, the Modernisation Fund and the Resilience and Recovery Facility, aimed at investments in lean-tech innovation, energy transformation and energy security. In 2024, revenues totalled EUR 38.8 bln, with EUR 24.4 bln going directly to member states. According to the Commission's Climate Action Progress Report 2025, Bulgaria spent 100% of the EUR 826.3 mln collected in 2024 through the ETS on climate action. Almost all of the revenue was disbursed to the Ministry of Energy's Fund for Security of the Electric Power System (FSES) that compensates non-domestic end-users for the rise in electricity prices. The National Trust Eco Fund (EcoFund) also received EUR 4.1 mln, funding nationwide initiatives to curb air pollution, protect biodiversity, manage water, improve public building efficiency, support EV adoption and boost climate resilience.

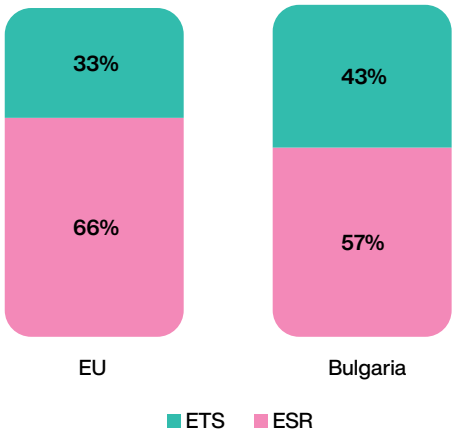
Effort Sharing Regulation (ESR)

The ESR, adopted in 2018 for the 2021-2030 period and

revised in 2023 under the Fit for 55 package, governs emissions outside the main ETS1 perimeter - domestic transport (excluding aviation), buildings, agriculture, small industry and waste. The bloc's updated collective ambition is to reduce ESR emissions by 40% by 2030 compared to 2005 levels, up from a previous target of 30%. Individual member state targets are differentiated according to their respective GDP per capita. As a result, Bulgaria had the lowest ESR target both before the 2023 revision, when it was the only country with a 0% reduction target, and after it, when its target was increased to a 10% reduction.

When viewed through the lens of the ETS and ESR mechanisms, Bulgaria's emissions profile is structurally different from that of the EU. In 2024, a share of 43% of the country's GHG footprint fell under the ETS scope, with the remaining 57% under ESR governance, according to the EC. In contrast, only 33% of the EU's emissions footprint was covered by the ETS. Consequently, Bulgaria's comparatively ETS-heavy profile makes progress more dependent on continued strides in the energy transition and hard-to-abate industrial sectors.

Fig 8. Share of ETS and ESR in total emissions



Source: European Commission

Emissions Trading System 2 (ETS2)

ETS2 was introduced through the 2023 revision of the ETS Directive as part of the Fit for 55 package and is scheduled to enter into force in 2028. The policy instrument expands the scope of the initial iteration of the ETS, creating a separate carbon market for fuels used in buildings, road transport and additional smaller sectors, mainly consisting of smaller industrial domains not covered by ETS1. While ETS2 will also function as a cap-and-trade system whereby emission allowances are auctioned, it differs from ETS1 with respect to the regulated entity. Unlike its predecessor, ETS2 covers upstream emissions, as the compliance obligation falls on fuel suppliers rather than directly on end consumers such as households, drivers or building owners. Anticipating the externalities of ETS2, the Social Climate Fund was also established to enable a fair transition to climate neutrality by supporting vulnerable groups, particularly households and micro-enterprises facing energy or transport poverty. The ETS2 cap will be calibrated in order to curb emissions by 42% by 2030 compared to 2005 levels. According to the latest EEA data, in 2023, Bulgaria saw a 6% increase in its ETS2 emissions relative to 2005 levels. Road transport emissions saw a 10% hike, buildings recorded a 5% reduction, while emissions associated with smaller industrial sectors not covered by ETS1 stood flat.

Carbon Border Adjustment Mechanism (CBAM)

The Carbon Border Adjustment Mechanism (CBAM) is the EU's tool to level the playing field for the bloc's producers of carbon-intensive goods by subjecting extra-EU producers to cleaner industrial production standards. CBAM took effect on January 1, 2026, following a transitional phase between 2023 and 2025. Under the mechanism, EU importers or their direct customs representatives importing more than 50 tonnes of CBAM goods must obtain CBAM declarant status, purchase certificates from national authorities and surrender them annually to cover the embedded emissions in their imports. Certificate prices will track the auction prices of EU ETS allowances, while importers may deduct carbon prices already paid in the country of production. The mechanism initially applies to imports of goods particularly vulnerable to carbon leakage: cement, iron and steel, aluminium, fertilisers, electricity and hydrogen. When fully phased in, CBAM will capture over half of the emissions covered in current ETS sectors. Its implementation can serve as a global carbon pricing alignment tool, disincentivising domestic players from outsourcing production to jurisdictions that are not subject to carbon levies while encouraging non-EU partners to carve out their own regulatory frameworks aimed at curbing emissions.

ESG transparency and compliance

Beyond emissions reduction instruments, Bulgaria's decarbonisation landscape is also shaped by Environmental, Social and Governance (ESG) disclosure and compliance considerations. While these reporting frameworks do not impose emissions caps, they drive decarbonisation by requiring companies to measure, disclose and manage their climate impact.

The Corporate Sustainability Reporting Directive (CSRD) requires large undertakings and public-interest SMEs, except micro-enterprises, to disclose their impact on sustainability

matters, how these may affect their development, performance and position. Under the CSRD, companies must report in alignment with the European Sustainability Reporting Standards (ESRS), a standardised set of regulations dictating the parameters of disclosures. On the decarbonisation front, these standards encompass environmental issues covering climate change, pollution, water and marine resources, biodiversity and ecosystems, resource use and circular economy. In addition, ESRS parameters encompass social dimensions and governance practices. The CSRD is being implemented in four waves, covering large public-interest entities, other large undertakings, listed SMEs and certain non-EU companies with significant EU activity.

The Sustainable Finance Disclosure Regulation (SFDR), in effect since 2021, complements the CSRD by requiring financial market participants to disclose whether their EU products promote environmental or social characteristics or pursue a sustainable investment objective.

The Corporate Sustainability Due Diligence Directive (CSDDD) introduces due diligence obligations for large companies, requiring them to identify and address human-rights and environmental risks in their operations and supply chains. Unlike the CSRD, which focuses on disclosure, the CSDDD creates enforceable duties and accountability measures. Following recent amendments, it applies to EU companies with at least 5,000 employees and EUR 1.5 bln in net worldwide turnover, as well as non-EU companies with at least EUR 1.5 bln in net EU turnover.

The EU Taxonomy Regulation, which entered into force in 2020 with taxonomy-related disclosure obligations applying progressively from 2022, is also part of the EU's ESG policy architecture, introducing a classification system that defines which economic activities qualify as environmentally sustainable. While the CSRD determines the entities subject to reporting obligations and the ESRS defines the content and structure of disclosures, the EU Taxonomy supports companies and investors in assessing whether certain activities are aligned with the EU's environmental objectives.

Seen by some as stifling competitiveness through regulatory burdens, the EU's ESG architecture has undergone simplification. Introduced by the European Commission in February 2025, the Omnibus I package seeks to simplify parts of the EU sustainability framework, including the CSRD, ESRS, EU Taxonomy, CSDDD and CBAM. Its "stop-the-clock" component was adopted in April 2025, delaying CSED reporting for certain entities and CSDDD transposition by one year, while broader reforms are subject to the EU's legislative process. The Commission estimated that the Omnibus package could reduce administrative burdens by 25% for all companies and 35% for SMEs, generating around EUR 6.3 bln in annual administrative-cost savings and mobilising EUR 50 bln in additional investment capacity.





How carbon pricing shapes global decarbonisation

Pavel Sheytanov,
Senior Corporate Trader and F-Gas Lead at Vertis Environmental Finance

Vertis is a MiFID II regulated financial institution that helps its partners understand and navigate different carbon compliance schemes (EU ETS, UK ETS, CORSIA, CBAM, nEHS & F-GAS) and meet their compliance obligations in a cost-effective way.

Pavel Sheytanov is a Senior Corporate Trader and F-Gas Lead at Vertis Environmental Finance, responsible for the Balkan region. Holds a PhD degree from the University of National and World Economy.

With ETS2 expanding to buildings and transport, is this essential for climate protection, or could it raise costs for municipal utilities and tenants?

The EU ETS has gradually expanded into new sectors as its effectiveness has been proven in those where it is already in place. This is the case with aviation, added in 2012, and the maritime sector, added in 2024.

Including fuel suppliers for buildings and road transport is the next logical step, as they account for roughly 35-40% of EU emissions not yet been addressed.

ETS2 could indeed lead to increased costs that are passed on to the end consumer. That is why, even before its entry into force in 2028, authorities have already launched the Social Climate Fund, endowed with EUR 86.7 billion, to mitigate the impact of high fuel and heating costs on households, small businesses and transport users. The Fund will facilitate access to more efficient and cleaner technologies that reduce the exposure of vulnerable groups to carbon costs and support Europe's energy independence. It plans to finance projects ranging from renovations to improve insulation and energy efficiency, replacement of heating and AC systems, installation of renewable energy sources in buildings and electric public transportation.

However, this transition is a long-term process and many fuel distributors will indeed be subject to carbon pricing under ETS2 starting in 2028. Understanding the market and developing an appropriate compliance strategy will be critical to achieving cost-effective compliance and limiting the impact on fuel costs.

Do rising CO_2 prices create opportunities for new municipal business models, or do the short-term risks outweigh the benefits?

The decarbonisation of the economy ceased to be merely a matter of environmental well-being some time ago. Dependence on imported fossil fuels makes Europe more vulnerable to external supply shocks such as the war in Ukraine or, more recently, the closure of the Strait of Hormuz. A recent Goldman Sachs report expects the euro area economy to grow by an annual 0.7% in the fourth quarter of 2026. This reflects more pessimism, halving its previous forecast released before the war.

Aware of this vulnerability, the European Commission has been promoting energy independence through the adoption of renewable, local and low-emission energy technologies. The CO2 price set by the EU ETS is just one mechanism that has proven effective at incentivising the economy to move in that direction.New business models can flourish with the implementation of the ETS as the cornerstone of the EU's decarbonisation policy and other related regulations.

A recent example is the ReFuelEU Aviation Regulation, under which fuel suppliers must blend a minimum share of Sustainable Aviation Fuel (SAF) into jet fuel supplied at Union airports - beginning at 2% in 2025 and rising steadily to 70% by 2050. This regulation is expected to boost SAF production and the wider economy surrounding them.

In the case of municipal waste incineration facilities, they are only required to report emissions above certain thresholds under the EU ETS. However, there is enormous potential to develop businesses such as biomethane production, which does not require significant infrastructure changes and can replace natural gas without major complications, thereby increasing the continent's energy independence. However, progress is needed on the regulatory framework, as has been the case with SAF.

Could a stricter ETS weaken European competitiveness and is the Carbon Border Adjustment Mechanism (CBAM) enough to prevent emissions shifting abroad?

CBAM is designed to level the playing field for European industry, which is subject to stricter environmental regulations than other non-EU countries.

By requiring importers in carbon-intensive sectors such as steel, cement, aluminium, fertilisers and electricity to bear a carbon cost equivalent to that faced by EU producers, CBAM directly addresses the risk of carbon leakage, whereby production shifts to jurisdictions with weaker environmental standards.

Based on our client experience, we have not observed evidence of carbon leakage to date. Since CBAM currently represents primarily an administrative burden, without immediate cost implications, it may still be too early to draw firm conclusions. At this stage, affected companies are less concerned with emissions relocation than with effective implementation, clear rules and strong coordination with international partners.

CBAM should also be viewed within a broader global context. Decarbonisation is no longer driven solely by environmental considerations. It is increasingly shaped by economic efficiency, industrial competitiveness and energy security. Many major trading partners, including China and Turkey, are already developing or expanding their own emissions trading systems. Over time, this convergence reduces the structural differences CBAM is designed to address and limits the incentive to relocate emissions-intensive activities.

For countries without carbon pricing, CBAM creates a clear strategic choice: implement domestic mechanisms that both drive decarbonisation and retain fiscal revenues at home or effectively outsource that pricing to the EU by paying a levy at the border. In this sense, CBAM can act as a catalyst for broader international alignment on carbon pricing.

Part II: Sectoral analysis

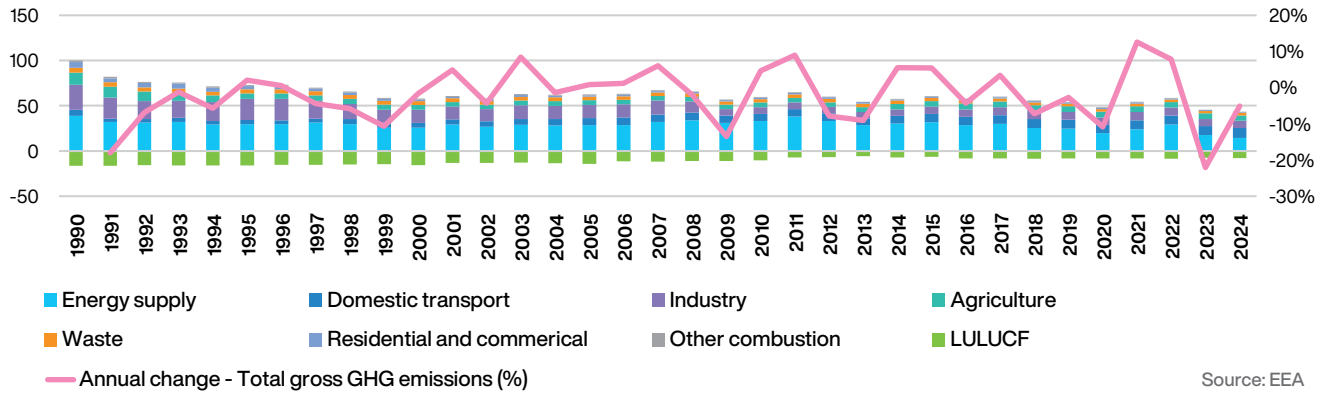
The sectoral structure of Bulgaria's emissions profile has changed markedly since the early 1990s. Energy supply was the largest emitting sector for most of the period but was also among the sectors with the most substantial cuts, achieving a 63% reduction to 14.4 MtCO2-eq in 2024, compared with 1990 levels. The sector's share of overall emissions increased during the 2000s and early 2010s as industrial emissions fell at a faster pace, but subsided from 2022 to a record low of 33.3% in 2024 as substantial structural transformations were driven by renewable generation.

Industry recorded one of the largest absolute and relative declines of 70.4%, from 27.6 MtCO2-eq in 1990 to 8.2 MtCO2-eq in 2024. Industrial emissions shrank considerably in 2009, likely reflecting the combined effect of the global financial crisis. Since the mid-2010s, however, industrial emissions have fluctuated within a narrower band. The sector went from being the second largest emitter in 1990 to the third largest by 2024.

By contrast, domestic transport was the clear outlier. Emissions soared by 66.9% to 10.9 MtCO2-eq in 2024 compared to 1990 levels. As a result, the sector's share in gross GHG emissions grew at the fastest pace, from 6.5% to 25.1%, making it the second largest emissions source in 2024.

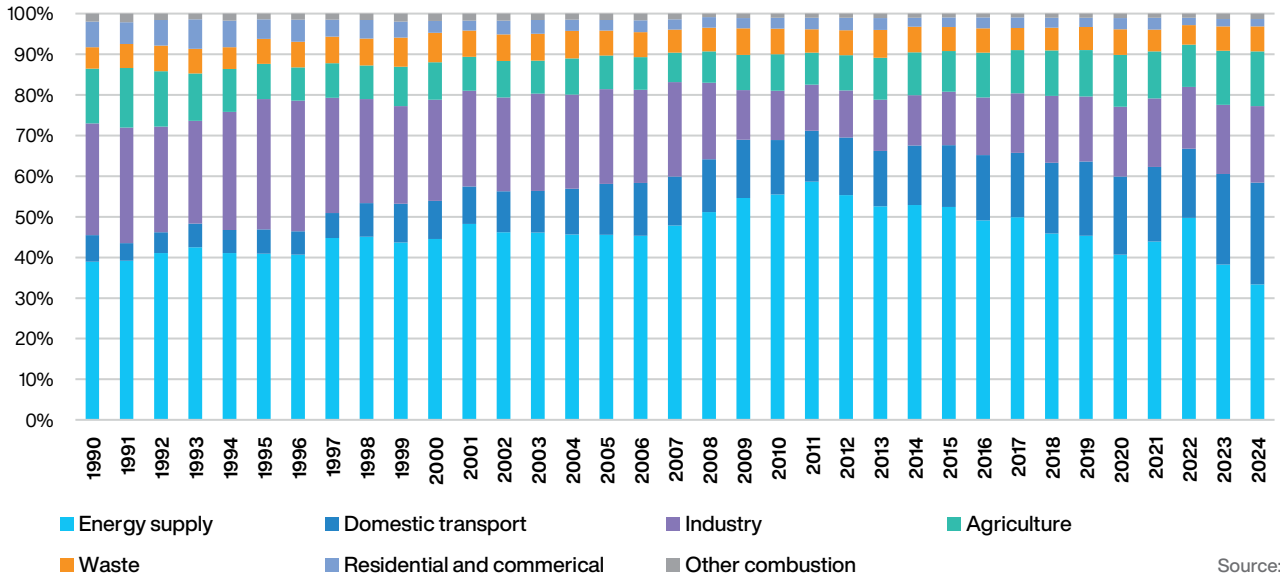
Other sectors showed steady reductions. Agriculture fell by 56.8% to 5.8 MtCO2-eq by 2024, representing the fourth largest source of emissions, with a relatively stable share of 13.4%. Emissions in the waste sector declined by 49.1%, slicing a share of 6.2%. Residential and commercial emissions fell at the sharpest rate of 87.5%, albeit their absolute value of 0.8 MtCO2-eq only constituted 1.8% of the aggregate. Other combustion processes not attributable to the aforementioned sectors also declined by about 70.7% by 2024, representing a 1.3% share of total gross GHG emissions.

Fig 9. GHG emissions by sector (MtCO2-eq)



Source: EEA

Fig 10. Share in gross GHG emissions by sector (%)



Source: EEA



Sungrow: Accelerating Bulgaria's Energy Transition Through Advanced Energy Storage

Founded more than 29 years ago, Sungrow is a global leader in renewable energy technology, with more than 1,000 GW of power electronic converters installed worldwide by the end of 2025. Recognised by Bloomberg NEF as the world's most bankable PV inverter and energy storage company, Sungrow continues to support the global transition towards cleaner, smarter and more resilient energy systems through advanced PV inverter and energy storage solutions.

As Southeast Europe accelerates its decarbonisation efforts, Bulgaria is rapidly emerging as one of the region's most dynamic energy storage markets. The rapid growth of renewable energy capacity is creating increasing demand for flexible infrastructure capable of supporting grid stability, energy security and long-term system reliability. In this evolving landscape, battery energy storage systems (BESS) are becoming a critical pillar of the energy transition.

Turning Renewable Growth into Grid Stability

The increasing penetration of solar and wind energy is transforming electricity systems across Europe. However, the intermittent nature of renewables also requires technologies capable of balancing electricity generation and consumption in real time.

Battery storage systems play a key role in this transformation by storing excess renewable electricity and delivering it back to the grid when demand increases. Beyond energy shifting, BESS solutions also provide frequency regulation, voltage support and improved grid flexibility, helping operators integrate larger shares of renewable energy while maintaining network stability and reliability.

As storage deployment accelerates across Europe, Bulgaria is positioning itself as an important strategic market for utility-scale energy storage investments. By leading in the top three markets at the current stage of development.

Fast-Track Deployment Supporting Bulgaria's Energy Transition

Sungrow is actively supporting some of Bulgaria's most important utility-scale storage developments, contributing significantly to the country's decarbonisation and grid modernisation efforts.

A key differentiator has been the speed of project execution. Several large-scale storage projects have moved from signing agreements to commissioning within less than a year, demonstrating the company's ability to deliver complex utility-scale infrastructure rapidly and efficiently. This fast-track deployment model is becoming increasingly important as energy markets across Southeast Europe seek to accelerate renewable integration and strengthen grid resilience within ambitious timelines.

The company's strong execution capabilities are supported by its extensive local presence in Southeast Europe, including dedicated technical, engineering and service teams in Bulgaria and across the region. By combining global technological expertise with local support and rapid response capabilities, Sungrow ensures efficient project implementation, high operational reliability and long-term service support throughout the full project lifecycle.

With more than 3.4 GWh of storage projects expected to be deployed in Bulgaria by the end of 2026, Sungrow continues to contribute to the development of a more flexible, secure and sustainable energy system for the country and the wider Southeast European region.

Technology, Safety and Reliability at Scale

At the core of these projects is Sungrow's PowerTitan 2.0 energy storage platform, a next-generation liquid-cooled BESS solution designed for utility-scale applications.

The system combines high energy density, modular architecture and advanced thermal management, enabling efficient deployment, reduced operational costs and improved lifecycle performance. Its integrated safety concept includes intelligent monitoring, multi-level protection systems and rigorous testing protocols aligned with international safety standards.

Sungrow continues to invest heavily in innovation and reliability, supported by seven global R&D centres and more than 7,600 R&D professionals, representing around 40% of the company's workforce. By the end of 2025, Sungrow had surpassed 1,000 GW of installed power electronic converters globally and delivered 43 GWh of energy storage systems during the year, reinforcing its position as one of the world's leading energy storage providers. With more than 520 service outlets worldwide, the company continues to support utility-scale projects with strong local expertise and long-term operational reliability.



Interview

Dimitar Kirchev, Country Manager Bulgaria at Sungrow

Dimitar Kirchev is the Country Manager for Bulgaria at Sungrow, a global leader in renewable energy technology. With academic backgrounds in International Business and Entrepreneurship & Innovation from leading German universities and extensive experience in business development across the DACH and Southeast European markets, he has played a key role in strengthening Sungrow's presence in Bulgaria and supporting the expansion of utility-scale solar and battery energy storage projects in the country.

As Bulgaria's solar capacity rises, midday surplus and grid-balancing issues are also emerging. How can Sungrow's BESS support renewables integration, replace coal's grid-stability role and how urgent is deployment?

Bulgaria's renewable energy growth over the past few years has been extremely impressive, particularly in solar PV. However, as renewable penetration increases, the challenge is no longer only about adding generation capacity, it is about managing flexibility and maintaining grid stability.

Battery energy storage systems are becoming essential for this next phase of the energy transition. Traditionally, coal plants have provided balancing services, frequency regulation and grid inertia. As these conventional assets gradually reduce their role in the energy mix, storage technologies will increasingly take over many of these critical grid-support functions.

Sungrow's BESS solutions are designed exactly for this purpose. Our systems can absorb excess midday solar generation, reduce curtailment, provide frequency and voltage support and improve overall grid reliability. Large-scale deployment is becoming increasingly urgent because renewable capacity in Bulgaria is growing much faster than grid flexibility infrastructure. Without sufficient storage, grid congestion and renewable curtailment will become more frequent and could slow down further decarbonisation.

It is important for the investors to understand the importance of selecting the right system for their project as a large focus is put purely on the battery and not enough on the full solution and system optimisation which can significantly affect the return on investment. That is why we specialise in providing a full equipment solution to the client with our integrated PCS technology to save on installation costs and improve operating efficiency and maintenance time.

We believe Bulgaria is entering a decisive period where utility-scale storage will move from an emerging technology to a fundamental part of the national energy system.

Sungrow's Bramley project in the UK has benefited from particularly fast commissioning. Which lessons are transferable to Bulgaria and what constraints could hinder deployment?

Fast commissioning is becoming a major competitive advantage in the energy sector. One of the key lessons from projects such as Bramley in the UK is that early coordination between technology providers, EPC teams and grid operators is critical for accelerating deployment.

In Bulgaria, many of these lessons are directly transferable. Standardisation, modular system design and strong local technical support can significantly reduce implementation timelines. Sungrow's PowerTitan 2.0 platform was specifically developed to simplify installation, commissioning and operational integration, allowing projects to move faster from delivery to grid connection. In the last few months, we have delivered rapidly completing commissioning of over two GWh in projects in not months but weeks. Thanks to the system design and partnerships.

At the same time, Bulgaria still faces several structural challenges. Grid connection procedures, permitting timelines and network upgrade requirements remain key bottlenecks in certain regions. Transmission and distribution infrastructure also needs continued investment to support the rapid growth of renewable generation and storage capacity.

However, the market is evolving very quickly and we see strong commitment from both institutions and industry stakeholders to accelerate deployment processes.

Bulgaria became the EU's third-largest BESS market in 2025. What factors have driven this acceleration?

Bulgaria's rapid rise as one of Europe's leading BESS markets is the result of several factors converging at the same time.

First, the country experienced extremely fast solar growth over recent years, which naturally increased the need for flexibility solutions and storage capacity. Second, policy support mechanisms and funding programmes helped accelerate investment activity and improve market confidence.

At the same time, investors increasingly recognise that storage is not only a decarbonisation tool but also an important infrastructure asset capable of generating long-term value through balancing services, flexibility markets and grid support.

Technology costs have also improved significantly in recent years, making large-scale storage projects much more competitive and financially attractive. Combined with growing awareness around energy security and grid resilience, this created the ideal conditions for rapid market acceleration.

What are the main factors shaping the bankability of BESS projects in Bulgaria and what still makes investors or lenders cautious?

Bankability in the storage sector depends on several key factors including technology reliability, long-term performance guarantees, safety standards, revenue visibility and the overall regulatory framework.

Investors and lenders today are much more familiar with battery storage than they were just a few years ago. However, the market is still evolving and some caution remains, particularly around long-term revenue structures and market predictability.

This is where technology providers with strong global track records become extremely important. Investors increasingly prioritise partners capable of demonstrating operational reliability, financial stability, proven safety standards and long-term service support.

At Sungrow, our global experience, bankability recognition and extensive operational track record help provide confidence to developers, investors and financial institutions entering the Bulgarian storage market.

Sector: Energy

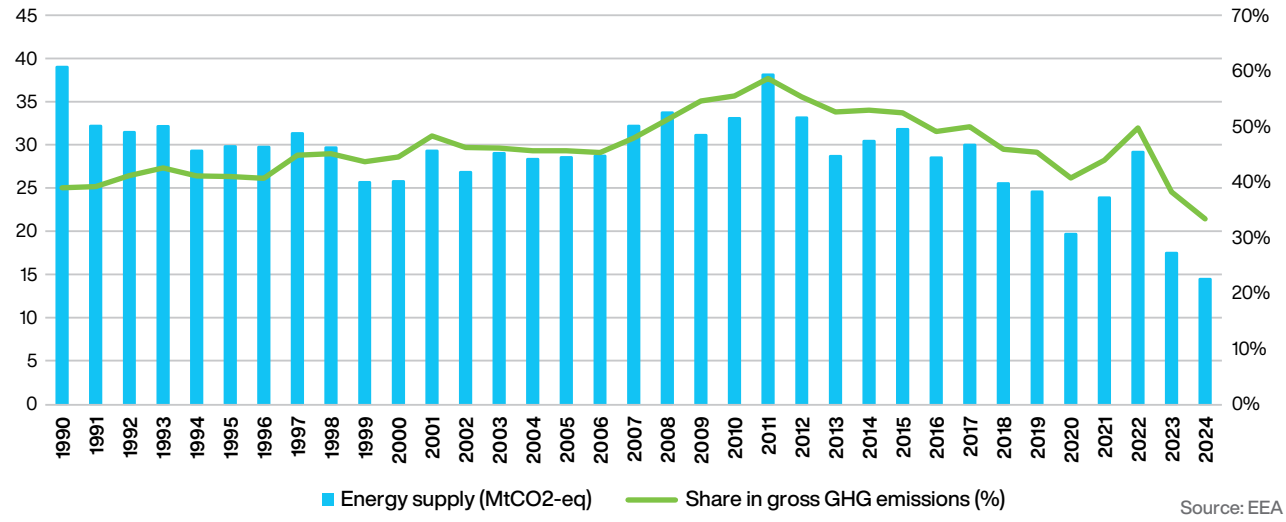
The energy supply sector is the dominant driver of Bulgaria's emissions trajectory. Emissions plummeted from 39 MtCO2-eq in 1990 to 14.4 MtCO2-eq in 2024, marking a 63% reduction. Despite the long-term drop, its path fluctuated considerably, reflecting the volatility of electricity demand, energy prices, exports and the role of fossil fuels. The first major decline of 34% occurred in the early 1990s when energy supply emissions fell from 39.0 MtCO2-eq in 1990 to around 25.7 MtCO2-eq by 1999. The reduction overlaps with Bulgaria's post-socialist market restructuring, which spurred contraction of industrial activity and energy demand.

Emissions rose again in the 2000s and early 2010s, reaching 38.1 MtCO2-eq in 2011, the second largest value during the 1990-2024 period and up by 48% since the close of its first decade. This suggests that earlier reductions were partly the ripple effect of structural and economic factors, rather than deliberate decarbonisation efforts.

After 2011, the energy supply sector followed a more volatile, albeit downward trajectory. Emissions declined to 28.7 MtCO2-eq in 2013, while the late 2010s were marked by continued volatility, with the pandemic spurring further reductions in 2020, followed by a spike until 2022, as economic activity gradually regained its momentum. The sharpest recent change is between 2022 and 2024, when emissions decreased from 29.2 MtCO2-eq to 14.4 MtCO2-eq, the lowest value since 1990.

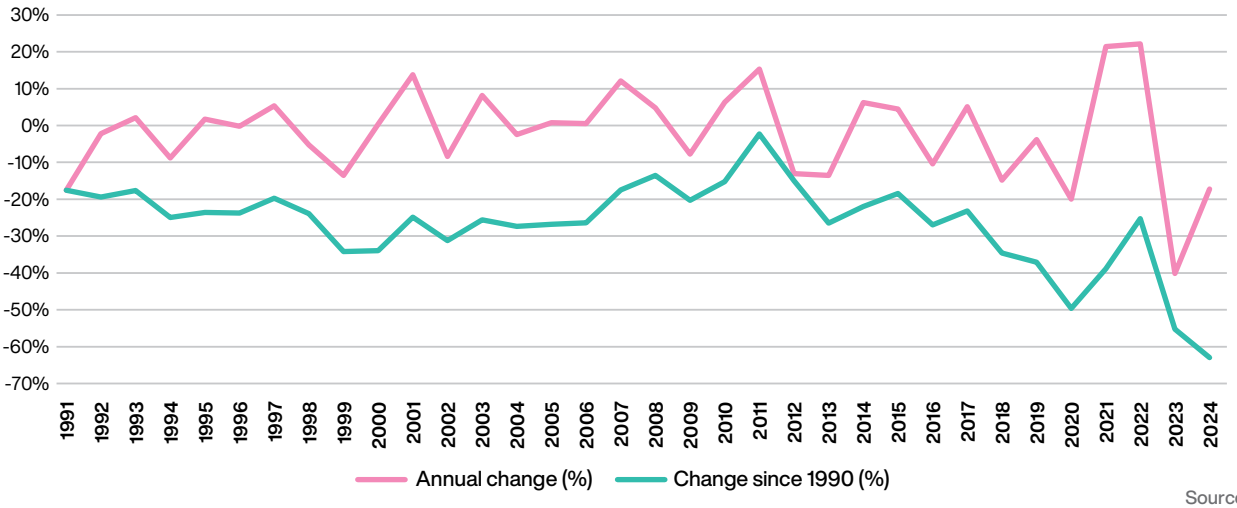
The energy supply sector accounted for the largest footprint in the country's emissions profile between 1990 and 2024, even as absolute emissions declined. The sector represented 38.9% of gross GHG emissions in 1990 before increasing its share during the 2000s and early 2010s. It reached the largest share of 58.6% across the time horizon in 2011 as industrial emissions fell at a faster rate. By 2024, energy supply still constituted the largest source of gross emissions, but its dominance had weakened substantially. Its share plummeted to 33.3% but maintained the largest footprint, indicating that recent emissions cuts in Bulgaria are heavily concentrated in energy supply and future decarbonisation strides will depend on whether the energy transition is sustained.

Fig 11. GHG emissions in the energy supply sector



Source: EEA

Fig 12. Change in energy supply GHG emissions (%)



Source: EEA



From copper cathodes to clean power: How Aurubis is rewiring copper production

Diversification is not optional, it is essential.

Eng. Martin Katinov,
Manager Energy Projects at Aurubis Bulgaria

Aurubis Bulgaria is part of Aurubis AG, one of Europe's leading copper producers and a major contributor to the Bulgarian economy. The company ranks as the largest industrial taxpayer in the country, generating around 9% of national exports while employing over 1,000 people and creating about 2,500 indirect jobs. In 2025, it completed the largest plant modernisation in three decades and continues to invest in capacity expansion, decarbonisation through solar power and high-efficiency technologies and sustainable infrastructure development as part of its long-term "Investment for Progress: Bulgaria 2027" program.

Eng. Martin Katinov, Manager Energy Projects at Aurubis Bulgaria, has over 10 years of experience in energy management. He leads projects in renewables, electrification, and battery storage that advance the company's carbon reduction goals.

What is Aurubis' total installed renewable energy capacity in Bulgaria today and what stage have you reached in relation to your longer-term self-generation targets?

Aurubis Bulgaria has been building its renewable energy portfolio steadily, with a strong focus on photovoltaic installations for self-consumption. We currently have 23 MWp of installed capacity from three PV plants and by the end of the year, they will grow to 41 MWp. This is a significant step forward and it reflects our commitment to the Aurubis Group's broader sustainability strategy: increasing the share of self-generated renewable electricity across its operations, reducing dependency on conventional energy sources and strengthening long-term energy resilience across our operations.

How do Aurubis' photovoltaic investments in Bulgaria fit into the group's 2030 emissions reduction targets?

Aurubis' photovoltaic investments in Bulgaria are an important component of the group's long-term decarbonisation strategy and directly support its 2030 climate targets. By increasing the share of renewable electricity used in industrial processes to around 16%, Aurubis Bulgaria is actively reducing the carbon intensity of copper production and lowering indirect CO_2 emissions associated with purchased electricity.

The investments also strengthen the company's energy independence and resilience against energy market volatility, while supporting the transition toward more sustainable and resource-efficient industrial operations. As part of the broader Aurubis Group sustainability roadmap, the photovoltaic projects contribute to achieving significant reductions in Scope 2 emissions across the company's European operations.

What have been the main constraints on expanding on-site renewable energy at industrial sites in Bulgaria and what measures would help large industrial consumers develop renewable assets more easily?

The challenges are real - limited available industrial land, grid connection capacity, administrative procedures and permitting timelines. Balancing requirements and the need for grid modernisation can further complicate the project implementation. Faster permitting procedures, improved grid infrastructure and a more predictable regulatory framework would go a long way in helping industrial companies accelerate their renewable energy investments and scale up self-generation.

What has primarily driven Aurubis' investment in renewable electricity for self-consumption? Has the main motivation been decarbonisation requirements, protection against power price volatility, industrial competitiveness, or a mix of these factors?

It's genuinely a combination of all three. Decarbonisation objectives and compliance with increasingly ambitious environmental and climate policies are key priorities, but energy security, protection against electricity price volatility and maintaining industrial competitiveness have also played a major role. There's also something worth highlighting: our PV plants are built on land from former remediated depots, which means we're giving new purpose to previously industrial land without encroaching on agricultural areas. That's a double win from an environmental standpoint.

Given the limits of on-site solar output for a large industrial operation, is Aurubis' broader decarbonisation strategy integrating other tools such as PPAs, energy efficiency or storage?



Absolutely. On-site solar is an important piece of the puzzle, but it's far from the whole picture. Our decarbonisation strategy also includes upgrading less efficient equipment, optimising industrial processes, evaluating long-term renewable electricity supply agreements (PPAs), and exploring the integration of energy storage solutions. For an energy-intensive operation running continuous production, the diversification is not optional, it's essential.

You mentioned on-site solar power only being one piece of the puzzle. What are some of the other efficiency gains you managed to achieve at the Pirdop site?

In addition to on-site photovoltaic generation, Aurubis Bulgaria has been implementing a broader range of energy efficiency and decarbonisation measures at the Pirdop site. These include investments in process optimisation, electrification and improved energy recovery systems aimed at reducing overall energy consumption and emissions intensity.

One important area is the increased utilisation of waste heat generated during metallurgical processes. By recovering and converting waste heat into electricity and usable process energy, the company improves overall energy efficiency while reducing reliance on external energy sources.

Aurubis Bulgaria is also evaluating and implementing electrification solutions where technically feasible, replacing more carbon-intensive technologies with electrically powered systems that can increasingly operate on renewable electricity. This supports both operational efficiency and long-term emissions reduction goals.

Regarding the negative prices of electricity in past years, battery storage and other energy management solutions are being explored as part of the company's broader strategy to optimise renewable energy use, improve grid flexibility and enhance energy security for continuous industrial operations. Together, these measures complement solar investments and contribute to a more resilient and lower-carbon production model at the Pirdop plant.

In 2024, Aurubis announced a EUR 400 mln investment programme in Bulgaria. In addition to PV plants, what decarbonisation-related milestones have been achieved so far and what further investments are planned?

The investment programme is broad in scope. It includes the expansion of production facilities and the implementation of advanced environmental technologies. On the decarbonisation front, we are also focusing on projects aimed at reducing our electricity consumption in addition to infrastructural and transportation upgrades. A key milestone is the expansion of our Tankhouse, which will increase the production of copper cathodes by 50%. Further investments are expected to focus on technological modernisation, circular economy solutions incorporating heat recovery and additional energy transition projects aimed at improving environmental performance and operational efficiency.

In addition, these projects are aligned with the European Union's climate and industrial transition objectives, including the Green Deal and the increasing regulatory requirements linked to carbon emissions and industrial sustainability. Through continuous investments in renewable energy, energy efficiency and modern production technologies, Aurubis Bulgaria is positioning itself as an active participant in the transformation toward low-carbon metals production in Europe.

In 2025, Aurubis has been the recipient of several ESG ratings. How do you see ESG reporting requirements evolving and how are regulatory frameworks such as the EU Emissions Trading System shaping investment and operational decisions?

ESG reporting requirements are becoming increasingly detailed, standardised and integrated into corporate strategy and financing decisions. Regulatory frameworks such as the EU Emissions Trading System are creating stronger incentives for industrial companies to invest in low-carbon technologies, energy efficiency and renewable energy. For Aurubis, ESG performance is not only a reporting obligation but also an important factor for long-term competitiveness, stakeholder trust and access to sustainable financing.

How are current geopolitical disruptions and instability around key trade routes affecting Aurubis Bulgaria's copper concentrate supply and do Scope 3 and responsible-sourcing targets impose any additional challenges?

Current geopolitical tensions and disruptions along major global trade routes continue to create uncertainty for industrial supply chains. As a globally integrated metals producer, Aurubis Bulgaria closely monitors logistics, transportation costs and potential delays affecting raw material deliveries. The company mitigates these risks through diversified sourcing strategies, long-term supplier relationships and flexible supply chain management.

At the same time, Scope 3 emissions targets and responsible-sourcing requirements add another layer of complexity to procurement decisions. Increasingly, industrial customers, investors and regulators expect greater transparency regarding the environmental and social footprint of raw materials throughout the value chain. This requires closer cooperation with suppliers, enhanced traceability and stricter sustainability criteria when selecting sourcing partners.

While these requirements may increase operational and compliance efforts, they are also accelerating the transition toward more sustainable and resilient supply chains. For Aurubis, responsible sourcing and emissions reduction are becoming integral parts of long-term competitiveness, customer expectations and alignment with evolving European sustainability regulations.

Sector: Industry

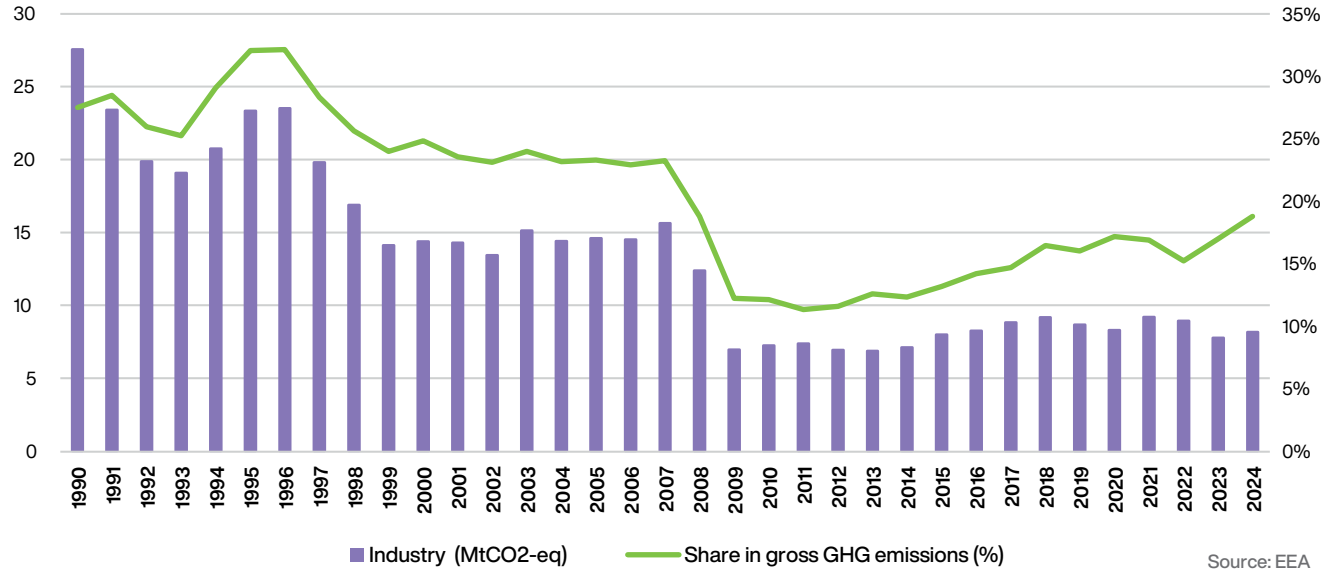
The industrial sector recorded one of the largest declines among the major emitting sectors, slashing its emissions by 70.4% to 8.2 MtCO2-eq in 2024 compared to 1990 levels. The decline was especially pronounced in the second half of the 1990s and late 2000s. During the first decade of the 35-year period, emissions fell from 27.6 MtCO2-eq in 1990 to 14.1 MtCO2-eq in 1999, reflecting major economic restructuring and reduced heavy industrial production. After some volatility in the early 2000s, emissions dropped at the sharpest annual rate of 44% in 2009 compared to 1990 levels. This substantial contraction likely reflects the impact of the global financial crisis on industrial activity.

The 2009 drop delivered a new baseline, as industrial emissions remained much lower than before, reaching their lowest point of 6.9 MtCO2-eq in 2013, following the largest contraction of 75.1% since 1990. By 2024, the sector's emissions edged up to 8.2 MtCO2-eq but remained far below the baseline that defined the first two decades of the period under review.

Industry's share of gross national emissions also fell from 27.5% in 1990 to 18.8% in 2024. The sector held its largest footprint in the mid-1990s, when it accounted for more than 30% of gross GHG emissions, peaking at 32.1% in 1996. Thereafter, its share fell substantially, reaching its lowest point of 11.3% in 2011, before gradually rising to 18.8% in 2025.

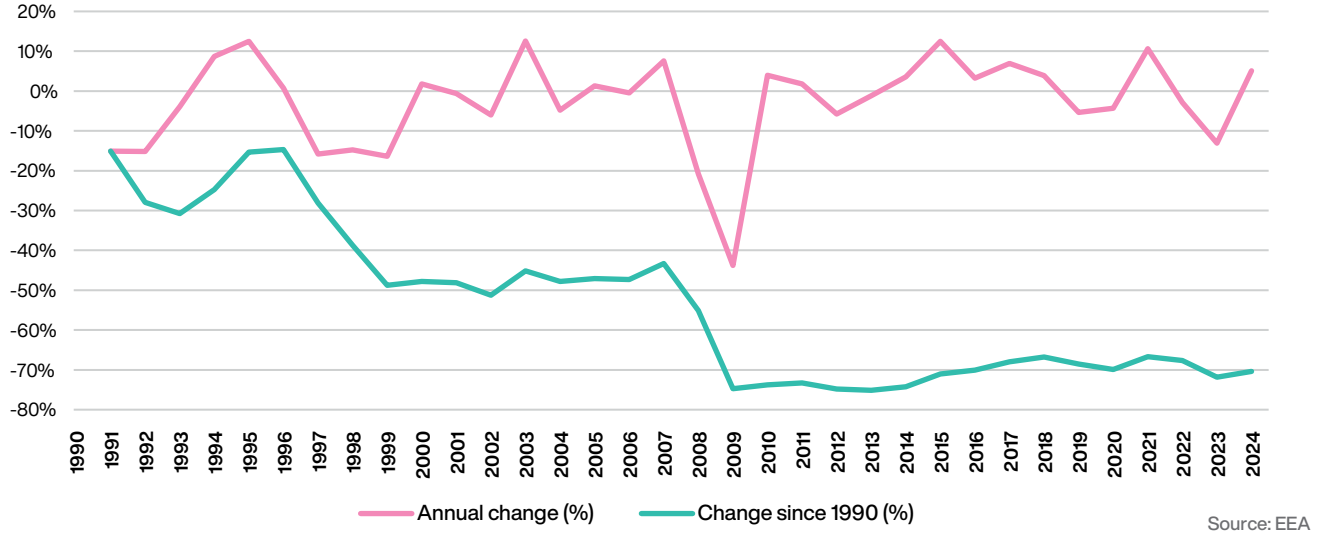
The emissions profile of the industrial sector reflects a mixed dynamic. While long-term reductions are undeniable, much of the reduction path appears shaped by structural economic shifts and crisis-related output contractions rather than by continued targeted decarbonisation efforts. The post-2013 plateau suggests that further reductions may require measures targeting efficiency, electrification of process heat, fuel switching, circular materials and carbon capture.

Fig 13. GHG emissions in industry



Source: EEA

Fig 14. Change in industrial GHG emissions (%)



Source: EEA



Decarbonisation as economic strategy: A path to a more competitive Bulgarian economy

Leveraging financial instruments and carbon revenues to improve efficiency, reduce costs and strengthen Bulgaria's industrial production base.

Luba Nikiforova,
Expert in decarbonisation, energy efficiency and renewable energy

Luba Nikiforova holds a Diploma in Economics with a major in Finance from Karl-Ruprecht-University Heidelberg and an MSc in European Politics and Governance from the London School of Economics, positioning her with strong expertise in economic and policy aspects of energy transition. Professionally, she has almost 20 years of experience in the private and public sectors focused on decarbonisation through leading roles in renewable energy project development, energy efficiency, electricity trading, energy communities and serving as Executive Director of the Bulgarian Energy Efficiency and Renewable Energy Fund, a public-private entity that has been transformed into the Bulgarian Decarbonisation Fund.

In Bulgaria, decarbonisation is still widely perceived as an external obligation - a policy agenda driven by European regulation and associated mainly with costs, compliance and industrial constraints. While this perception is understandable, it is increasingly incomplete and risks encouraging overly cautious, compliance-driven decisions at a moment when Bulgaria has a significant opportunity to modernise its economy and strengthen industrial competitiveness.

Decarbonisation, if approached strategically, is not merely an environmental requirement but a powerful economic transformation tool. Properly designed and financed, it can reduce structural costs, improve productivity, accelerate technological modernisation and increase resilience to volatile energy and commodity markets. The key question is not whether decarbonisation should take place - this is already embedded in the European framework, but how it should be implemented so that it reinforces, rather than undermines, economic competitiveness.

This distinction is becoming more important across Europe. Rising carbon prices, growing expectations from investors, and increasing pressure for industrial efficiency are reshaping the economics of production. Energy-intensive and technologically outdated industries are becoming less competitive, while capital is increasingly directed toward production models that reduce both energy consumption and emissions.

For Bulgaria, where industrial energy intensity remains significantly above the EU average, this should not be seen only as a challenge but also as an opportunity. Reducing energy intensity is not just a climate objective - it is a core economic imperative directly linked to productivity, competitiveness and long-term resilience.

From compliance to competitiveness

European policies provide a clear framework, but if national implementation focuses only on minimum compliance, Bulgaria risks missing a major economic opportunity. Financing mechanisms should not be structured solely around eligibility and procedural alignment. Instead, they should follow the logic of competitiveness, prioritising investments that deliver measurable efficiency gains, lower operating costs and stronger industrial performance.

A compliance-driven approach focuses on short-term alignment with regulations. A competitiveness-driven approach prioritises long-term outcomes, such as lower energy intensity, improved productivity, reduced production costs and stronger market positioning. The latter will determine whether Bulgarian industry successfully adapts to evolving European and global conditions.The technologies required for this transition already exist. Industrial electrification, waste heat recovery, alternative fuels, carbon capture, digital optimisation systems, energy storage and on-site renewable generation all provide proven pathways to reduce emissions while improving efficiency. The challenge is not technological readiness, but the ability to mobilise financing in support of economically rational investments.

This is where the National Decarbonisation Fund can play a decisive role.

If designed with a clear focus on competitiveness and efficiency, the Fund can become more than a policy instrument. It can serve as a strategic financial platform for industrial transformation - rather than operating primarily as a grant-distribution mechanism, it should deploy a broader mix of instruments, including concessional loans, guarantees, blended finance and targeted grants. These tools can support projects that are economically viable but constrained by high upfront costs or long payback periods.

At the same time, the Fund should evolve beyond its current emphasis on energy efficiency in buildings. Renovation remains important, particularly in addressing energy poverty and inefficient housing stock, but Bulgaria's competitiveness challenge extends far beyond buildings.

Tackling Bulgaria's structural inefficiencies

Bulgaria remains one of the most energy-intensive economies in the EU. Greenhouse gas intensity of GDP stands at approximately 748 gCO2-eq/EUR compared to an EU average of around 215 gCO2-eq/EUR. This gap reflects structural inefficiencies across industry, transport, buildings and resource use. It increases vulnerability to energy price volatility and weakens overall competitiveness.

Addressing this requires a broader approach to decarbonisation financing.

The scope of the National Decarbonisation Fund should expand to include industrial decarbonisation, electrification of production, e-mobility, resource efficiency, circular economy solutions and industrial modernisation. Investments in industrial equipment, electrified fleets, charging infrastructure, digital energy management systems and advanced manufacturing technologies can reduce structural energy intensity while strengthening productivity.

Resource efficiency should become an equally important pillar. In sectors such as cement, construction materials, metallurgy, manufacturing and logistics, improving material use, reducing waste, increasing recycling and developing industrial symbiosis can significantly lower both costs and emissions. In many cases, reducing resource consumption generates economic benefits equal to or greater than direct energy savings.

A broader and more flexible Fund would allow Bulgaria to address structural inefficiencies more effectively. Financing decisions should be guided not only by emissions reduction, but also by economic indicators such as cost savings, productivity gains, payback periods, operational resilience, and long-term competitiveness.

The cement industry as a test case

In practice, the most impactful projects are those that simultaneously reduce emissions and improve efficiency. A clear example is the cement industry - one of the most energy-intensive and difficult-to-abate sectors.

Cement production is unique because emissions arise both from energy use and from the chemical process of clinker production. Even highly efficient plants generate significant process emissions, making decarbonisation inherently complex.

At the same time, cement is strategically important for infrastructure, housing, and industrial development. Maintaining competitive domestic production is not only an environmental issue, but also one of economic resilience, industrial sovereignty and supply chain security. Excessive reliance on imports from regions with lower environmental standards would undermine both European industry and climate objectives.

For this reason, cement decarbonisation should not be treated as a compliance exercise. Once again - a compliance-driven strategy would focus on meeting emissions targets at minimal short-term cost while a competitiveness-driven strategy redesigns production systems to optimise efficiency, costs and resilience over the long term.

The use of alternative fuels, such as refuse-derived fuels, biomass and industrial waste, is already one of the most mature and economically viable pathways. Beyond reducing emissions, these fuels lower exposure to volatile fossil fuel markets and improve cost predictability, which is particularly valuable in Bulgaria's context.

Waste heat recovery presents another major opportunity. Cement production generates large amounts of excess heat, much of which remains unused. Capturing and reusing this energy can significantly improve efficiency and reduce overall energy demand.

Electrification of selected processes can further enhance performance, especially when combined with digital optimisation systems. AI-based process energy management platforms allow plants to optimise operations, reduce heat losses, improve maintenance, and minimise energy waste in real time. While individual gains may seem incremental, together they can substantially reduce operating costs.

Renewable energy integration is also becoming increasingly important. On-site photovoltaic systems can reduce exposure to volatile electricity prices and improve long-term energy stability. Combined with storage and smart load management, they strengthen energy security while lowering operational costs.

Over time, technologies such as green hydrogen and carbon capture will also play a role. Hydrogen can partially replace fossil fuels in high-temperature processes as renewable electricity production expands and costs decline. Carbon capture may be essential for addressing unavoidable process emissions from clinker production.

Although these technologies are not yet fully cost-competitive, their viability is improving as innovation accelerates. Industrial competitiveness should therefore be assessed not only in terms of current costs, but also in the context of future market conditions.

Additional opportunities exist through clinker substitution and the development of lower-carbon cement products (blended cement). Reducing clinker content by using supplementary materials lowers emissions while also reducing energy demand and costs. These approaches demonstrate that environmental and economic objectives are often aligned.

When implemented together, these measures fundamentally change the economics of production. They reduce energy costs per unit, lower exposure to carbon pricing, improve resilience to volatility and increase long-term asset value.

In this sense, decarbonisation becomes a driver of competitiveness rather than a cost centre.

Financing industrial modernisation

However, such an integrated transformation requires sophisticated financing. Projects involving multiple technologies, longer horizons and operational redesign often struggle to secure funding, even when economically sound. This underscores the importance of a broadened National Decarbonisation Fund.

The Fund should be capable of structuring tailored financing solutions and leveraging private capital at scale. Public resources alone will not be sufficient; their role should be to reduce risk, improve bankability and catalyse private investment.

An equally important issue is the use of revenues from European carbon pricing mechanisms. As the EU Emissions Trading System evolves, Bulgaria will receive increasing revenues linked to carbon emissions. These should not be treated as short-term compensation or redistribution funds, but as strategic investment capital for long-term industrial transformation.

When channelled through well-designed financial instruments, carbon revenues can finance projects that improve efficiency, reduce structural costs, modernise production and strengthen competitiveness.

Ultimately, aligning decarbonisation with competitiveness is both achievable and necessary.

The transition to a low-carbon economy will reshape industrial structures across Europe. Countries that approach this transition strategically - linking policy, technology, financing and industrial modernisation to economic outcomes - will strengthen their position. Those focused only on compliance risk losing industrial capacity and falling behind.

For Bulgaria, the direction is clear - industrial decarbonisation represents a strategic economic transformation vehicle capable of repositioning the country toward a higher-value, innovation-driven and more competitive economic model. By accelerating industrial modernisation and efficiency, the transition strengthens long-term economic resilience, enhances investment attractiveness, improves strategic autonomy and enables Bulgaria to contribute more effectively to Europe's sustainable industrial and technological leadership.

Sector: Transport

In contrast to the drops seen in the energy supply and industrial sectors, Bulgaria's transport emissions stood out after increasing by 66.9% to 10.9 MtCO2-eq over the 1990-2024 period. This made domestic transport the only sector to have increased its footprint compared to 1990 levels, accounting for over a quarter of aggregate gross GHG emissions by 2024, compared to a modest 6.5% at the beginning of the period.

The trajectory of transport emissions reflects a sharp 46.5% drop in 1991, likely linked to the economic contraction and reduced mobility at the beginning of the post-socialist transition period. Thereafter, emissions fluctuated by a small degree, but rose on the aggregate from the late 1990s to the 2000s, especially in the latter part of this period, reaching 8.6 MtCO2-eq in 2008. This points towards an expansion of vehicle use, freight activity and road transport demand. Aside from a temporary decline around 2009-2013 and a dip in 2020 due to pandemic-related mobility restrictions, transport emissions resumed growth and reached their highest level in 2024, at 10.9 MtCO2-eq. The fourfold increase in the share of transport emissions from 6.5% in 1990 to 25.1% in 2024 was driven both by rising emissions and contractions in other major sectors.

In addition to expanding vehicle use and freight activity, the structure of Bulgaria's vehicle fleet and its reliance on internal combustion engines (ICE) also explain the sector's decarbonisation challenge. Emissions from road transportation accounted for 90.7% of all domestic transport emissions in 1990, rising to 96.7% by 2024. On average, road transport emissions accounted for roughly 94% of all transport emissions during the period under review. Consequently, the electrification of Bulgaria's vehicle fleet is the primary linchpin of the transport sector's decarbonisation.

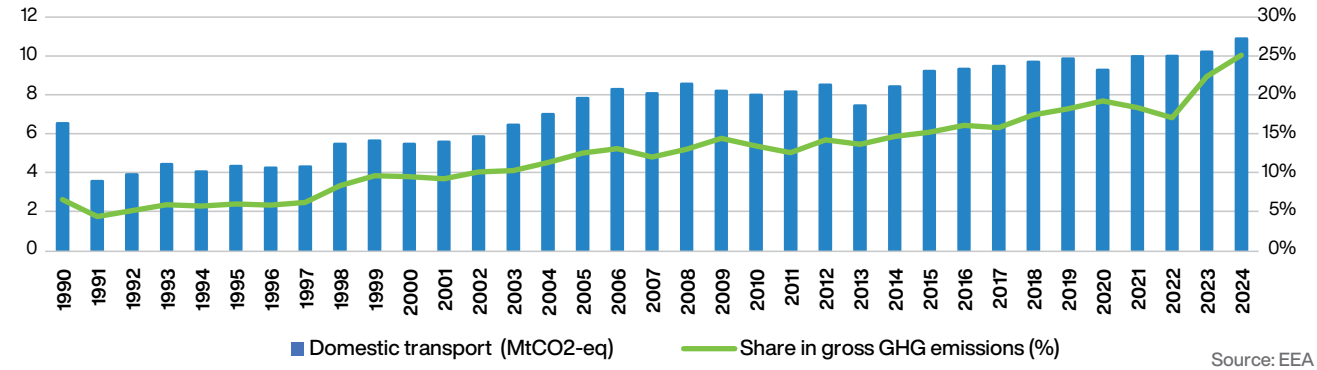
By 2024, only 2.3% of the country's passenger car park was represented by battery electric vehicles (BEV), while plug-in hybrids (PHEV) and hybrid electric vehicles (HEV) claimed 1.4% and 5%, respectively, according to the European Automobile Manufacturers' Association (ACEA). Meanwhile, ICE vehicles represented 87.6%, with petrol at 49.2% and diesel at 38.4%. Electrification was even less developed across other vehicle segments. ICE-based vehicles claimed 96.2% of Bulgaria's van fleet, 96.8% of its trucks and 90% of its buses.

While EV penetration is still in its infancy in Bulgaria, recent car sales data published by ACEA sketch a positive trend. In 2025, BEV sales soared by 62% on the year to 2,420 units, while PHEVs and HEVs registered annual hikes of 21.2% and 103.5% to 566 and 2,045 units, respectively. New petrol car registrations climbed by a comparatively modest 6.2% year-on-year to 38,875, while diesel vehicle sales fell 19.2% on the year to 5,313. Despite the diminishing consumer appetite for ICE vehicles, these still dominate sales in absolute values, with petrol and diesel cars cumulatively having accounted for 89.4% of total car sales in 2025. In contrast, BEVs only accounted for 4.9%, HEVs for 4.13%, while PHEVs sliced a modest share of 1.1%.

The electrification of Bulgaria's car fleet also hinges on rapid charging infrastructure deployments. In 2020, the country only tallied 609 charging points, according to the European Alternative Fuels Observatory (EAFO). By the end of 2025, these surged over 24 times to 14,616, consolidating the case for EVs and further incentivising consumer demand.

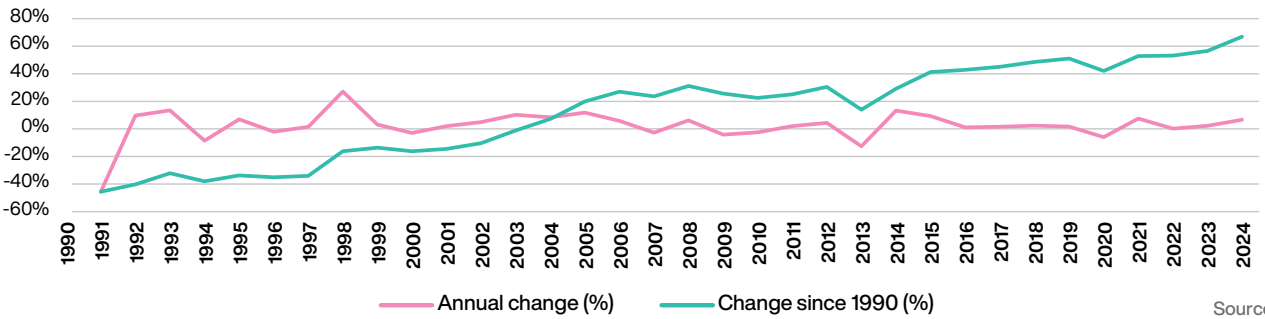
Bulgaria's future emissions reductions are increasingly dependent on decarbonising transport, as the sector's carbon footprint is declining at a slower pace than that of other major emitting sectors. Further progress will require measures that directly address road transport, including vehicle efficiency, electrification, reduced dependence on fossil fuels, public transport, modal shift and improved freight logistics.

Fig 15. GHG emissions in domestic transport



Source: EEA

Fig 16. Change in domestic transport GHG emissions (%)



Source: EEA



Why Bulgaria's EV market is growing without major purchase subsidies

Arch. Lyubomir Stanislavov,
Executive Director and Board Member of ACB and the EACN

Automotive Cluster Bulgaria (ACB) represents one of Bulgaria's fastest-growing economic sectors, uniting manufacturers, suppliers and service organisations across the automotive industry. ACB promotes synergies among its members, enhancing their competitiveness in local and global markets. It is an active member of the European Automotive Cluster Network (EACN).

Arch. Lyubomir Stanislavov is Executive Director and Board Member of ACB and the EACN. He is an officially appointed member of the European Commission's Expert Group on Automotive Research and Innovation (EURIAS), nominated to its Electric Vehicle Technologies and Digital and Connected Vehicles subgroups. He actively works to attract leading suppliers and manufacturers, promoting investment and sustainable development in Bulgaria's automotive sector, and is the founder of the Automotive Forum Bulgaria international conference.

Bulgaria is quietly emerging as one of Europe's most structurally favourable markets for electric vehicle adoption — not because of generous purchase subsidies, but because of a combination of inherited infrastructure advantages, low operating costs and a rapidly evolving market landscape.

Infrastructure built ahead of demand

One of the most important — yet often overlooked — factors is Bulgaria's electricity grid capacity. For historical reasons rooted in large-scale infrastructure investment during the socialist era, the country developed a transmission system capable of supporting electricity flows far above current domestic demand. As technologies became more energy efficient over the decades, overall electricity consumption declined, leaving a significant share of capacity underutilised.

This surplus capacity represents a meaningful long-term advantage. It provides a ready-made foundation for mass electrification, the expansion of public charging infrastructure, the development of data centres and other energy-intensive industries. While many European countries are now facing the costly challenge of upgrading overloaded power systems, Bulgaria already possesses much of the infrastructure required to support accelerated electrification.

This advantage is already visible in the country's charging network. Bulgaria currently has approximately one public charging point for every ten electric vehicles, placing it among Europe's best-served markets relative to the size of its EV fleet. For drivers, this density helps reduce one of the main barriers to adoption: concerns over charging availability and range anxiety.

The economics of ownership

Residential electricity prices in Bulgaria remain among the lowest in the European Union. Households charging vehicles overnight on lower night tariffs can reduce energy costs to around ten per cent of the equivalent cost of petrol or diesel travel. For households and small and medium-sized enterprises, these lower running costs create a strong economic incentive that is immediately visible in monthly expenses, even without direct government subsidies.

Additional financial advantages reinforce this trend. Ownership tax on electric vehicles is effectively zero within a tax environment that is already comparatively light by EU standards. In Sofia and several other major cities, EV owners also benefit from free parking in central urban zones, creating additional day-to-day savings.

Affordable new entrants reshape the market

Another important driver is the rapid arrival of new automotive brands, particularly from China. These manufacturers are entering the Bulgarian market with competitively priced electric models, some of which are available below EUR 20,000. For the first time, new electric vehicles are becoming accessible to a much broader segment of consumers rather than remaining limited to higher-income households or early adopters.

This price point is particularly important in Bulgaria, where average wages remain below the EU median. Combined with low charging costs and favourable tax treatment, lower vehicle prices are helping electric mobility become an increasingly practical choice for mainstream consumers.

In conclusion, these factors create conditions in which the transition towards electric mobility in Bulgaria is driven primarily by economic considerations. The combination of lower operating costs, available infrastructure, relatively cheap electricity and an expanding range of more affordable vehicles is contributing to growing interest in electric vehicles and hybrids. Overall, these factors are contributing to a steady increase in the adoption of electric vehicles and hybrids in Bulgaria.

Sector: Buildings

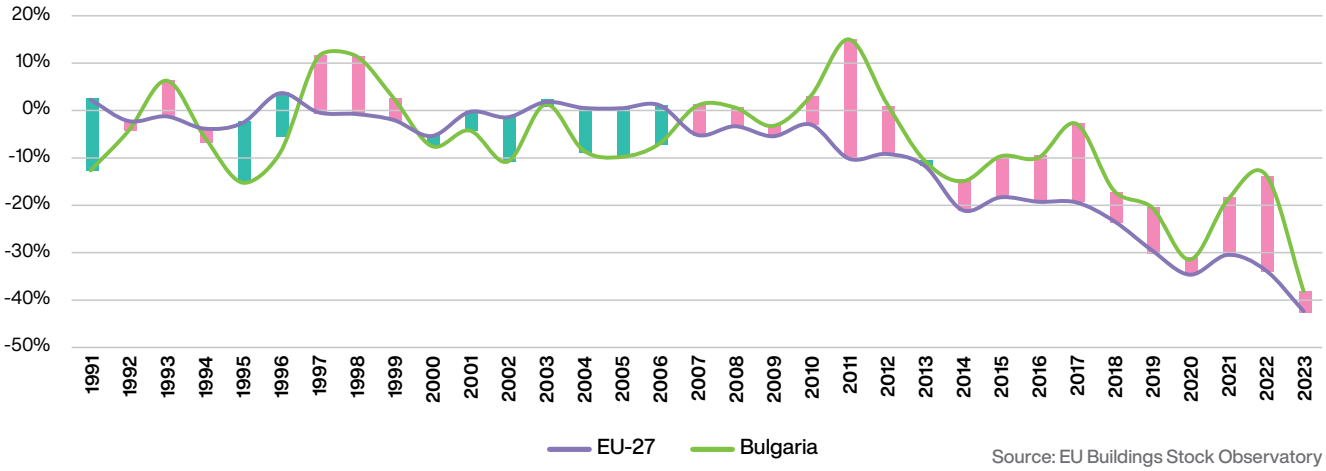
Residential and commercial buildings only accounted for 1.8% of Bulgaria's gross GHG emissions, as the EEA's accounting approach outlined in the aforementioned sectors assigns the energy-related climate impact of buildings to other upstream sectors, such as energy supply. Direct building emissions mainly reflect fuels burned on site, in residential units and service-sector buildings. Meanwhile, emissions from electricity and heat consumed in buildings are counted under public electricity and heat production. Consequently, the sector's reported emissions appear low, while part of the buildings-related footprint is embedded in the energy supply sector.

When viewed from the wider lens of energy demand, buildings are an indispensable part of the decarbonisation puzzle. From this perspective, the buildings sector is a substantial contributor to GHG emissions, accounting for approximately a third of both the EU's and Bulgaria's energy-related emissions in 2023. These emissions cover both fossil fuels used directly in buildings, mainly for heating, as well as electricity and heat consumed for appliances, cooling, water heating and other building services.

In 2020, Bulgaria's building stock tallied 2.87 mln units, of which nearly 97% were residential and the remaining 3% dedicated to services, including health, educational, hotels and restaurants, offices and trade buildings. At the EU-level, the building stock was not as residential-heavy, with service buildings accounting for 9%. Bulgaria's buildings spanned 305 mln sq m, with 75% claimed by residential units and the remaining 25% by the service sector. In contrast, residential units spanned 68% of the EU's aggregate floor area. Of the 32% share held by building emissions in Bulgaria's energy-related emissions, nearly 20% was accounted for by the residential sector, with the services segment at 13.4%, virtually mirroring the distribution at the EU level.

Across the current 27 EU member states, emissions from energy use in buildings fell by approximately 42% between 1990 and 2023, spurred by efficiency standards, strides in electrification and a cleaner power mix. Milder climate conditions have also reduced winter heating needs, curbing emissions further. Bulgaria's emissions contracted at a marginally slower pace of 38% over the same period, but the drop reflected a more volatile trajectory. This included sharp annual swings with rebounds above or near the 1990 baseline in the late 1990s and early 2010s, followed by a sharper decline in the late 2010s and early 2020s. The global COVID-19 pandemic also delivered a sharp fall in 2020, while the subsequent rebound in 2021 and 2022 suggests that this effect was partly temporary. By 2023, Bulgaria saw the largest buildings-related GHG emissions drop compared to 1990 levels, likely reflecting a combination of factors such as lower heating demand, energy-price effects, fuel switching, efficiency gains and increasing changes in the energy mix.

Fig 17. Change in GHG emissions from buildings over 1990



Source: EU Buildings Stock Observatory

Beyond efficiency gains and fuel-switching, decarbonisation in the buildings sector also hinges on social considerations and the residents' ability to shoulder related costs. In 2025, 17.2% of Bulgaria's population had arrears on utility bills, while 16.1% were unable to keep their home adequately warm during cold periods, according to Eurostat statistics on income and living conditions (EU SILC) data. Moreover, in 2023, 8.4% lived in dwellings with leaking roofs, damp walls, or rotten windows, frames, or floors. By contrast, in 2024, at the broader EU level, only 6.9% were behind on utility bills, while 9.2% were unable to keep their house adequately warm. However, a larger share of 15.6% of EU citizens were reported to live in units with leaking roofs, damp walls or rotten frames in 2023.

Decarbonisation across the buildings sector is central to the EU's climate policy architecture. The Green Deal, Renovation Wave Strategy and the revised 2024 Energy Performance of Buildings Directive (EPBD) aim to cut emissions, improve energy efficiency, decarbonise heating systems and accelerate rooftop solar deployment. Together with the Energy Efficiency, the Renewable Energy and the ETS directives, the EPBD sets the regulatory architecture aimed at reducing emissions from the EU's building stock. The new ETS2 mechanism will put a carbon price on fuels used in buildings from 2028, creating an incentive to switch to cleaner energy sources and bolster efficiency. At the same time, ETS2 revenues will be allocated through the Social Climate Fund to help vulnerable homes manage the transition.



The Evolving Role of LEED: From Green Building Certification to a Decarbonisation Framework

Vessela Valtcheva-McGee,
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The following material is authored by Vessela Valtcheva-McGee, a leading figure in the European green building sector, on behalf of GBCI Europe.

About GBCI Europe

Green Business Certification Inc. (GBCI) is the premier organisation independently recognising excellence in green business industry performance and practice globally. GBCI Europe, based in Munich, was established to provide localised support for the region's rapidly expanding sustainable real estate market.

While the US Green Building Council (USGBC) develops the LEED rating systems, GBCI is the body responsible for the rigorous third-party verification and credentialling that ensures these standards are met. In Europe, GBCI works to align global frameworks like LEED with regional priorities, including the EU Taxonomy and the European Green Deal, helping to drive the transition towards a circular, net-zero economy.

About the Author

Vessela Valtcheva-McGee is the Director of Market Development for Central and Eastern Europe (CEE) at GBCI Europe. With over 20 years of international experience, she is a distinguished expert in sustainable development, policy and professional education.

- Expertise: Vessela is a LEED Fellow—the highest professional accolade awarded by GBCI—and holds advanced credentials including LEED AP BD+C, BREEAM International Assessor and EDGE Auditor.

- Leadership: She is a founding member and former President of the Bulgarian Green Building Council (BGBC) and has been instrumental in the World Green Building Council's Europe Regional Network.

- Education: She holds a Master of Architecture from the Savannah College of Art and Design and a post-graduate diploma in Business Sustainability from the University of Cambridge.

- Global Impact: Throughout her career, Vessela has managed the certification of high-profile projects across Europe, the US and Asia. She has also lectured on sustainability at prestigious institutions including Harvard and UC Berkeley.

For the better part of three decades, the **Leadership in Energy and Environmental Design (LEED)** plaque has been a symbol for best practices and high performance in the built environment. To the casual observer, that silver, gold or platinum plaque on a lobby wall signalled a "green" building—a structure that saved water, used recycled carpets and perhaps boasted a few more windows and better views than its neighbours.

However, as the global climate crisis intensifies, the framework is undergoing a profound metamorphosis. LEED is no longer just a "green" certification —focused on resource efficiency— it is rapidly evolving into a sophisticated **decarbonisation framework** designed to drive the built environment towards net-zero emissions.

When LEED was first introduced by the US Green Building Council (USGBC) in the 1990s, the primary objective was to reduce the negative impacts of buildings on the environment. At the time, "green building" was a holistic but somewhat broad concept. It covered everything from indoor air quality and water conservation to the use of recycled materials.

While each generation update raised the bar, the LEED rating system functioned largely as a checklist of "best practices." A building could achieve a high rating by excelling in water efficiency or site selection, even if its carbon footprint remained significant. The industry's understanding of "sustainability" was focused on the building's operational efficiency—how much energy it used—rather than its total contribution to global warming.

Today's reality is more demanding. With the building sector responsible for nearly **40% of global energy-related carbon emissions**, the industry has realised that being "resource-efficient" is no longer enough. To meet the targets set by the Paris Agreement, buildings must transition from being passive consumers of energy to active participants in a decarbonised economy.

The introduction of LEED v4 and its incremental update, v4.1, marked the beginning of this transition. These versions introduced more stringent requirements for energy performance and, crucially, began to address the "hidden" carbon in materials.

As LEED evolves into a decarbonisation tool, it focuses on four primary "fronts" of carbon reduction. In the past, LEED rewarded energy efficiency. Now, the focus is on **Operational Carbon**, which accounts for the emissions generated during the daily use of the building. The new framework prioritises:

- **Electrification:** Moving away from on-site fossil fuel combustion (like gas boilers) in favour of heat pumps and electric systems.
- **Grid Harmonisation:** Rewarding buildings that can interact with the power grid, storing energy when renewables are abundant and reducing demand during peak hours.
- **Renewable Energy Integration:** Shifting from "buying offsets" to on-site generation or direct investment in new renewable capacity.

Embodied Carbon: The Invisible Footprint

Measuring the invisible **embodied carbon** footprint is perhaps the most significant shift in LEED's evolution. Embodied carbon refers to the emissions associated with the mining, manufacturing, transport and installation of building materials like steel, concrete and glass. LEED encourages:

- **Whole-Building Life Cycle Assessment (WBLCA):** A mathematical approach to calculate the total carbon impact of a structure from "cradle to grave."
- **Material Transparency:** Using Environmental Product Declarations (EPDs) to select low-carbon alternatives.
- **Building Reuse:** The "greenest" building is the one that already exists. LEED now provides significant pathways for retrofitting existing structures rather than demolishing them.

LEED recognises that a building's location dictates the carbon footprint of its occupants. The framework aims to reduce the Scope 3 emissions associated with commuting by rewarding alternative transport which shifts commuters away from relying on the individual automobile.

While reduction is the priority, LEED v5 acknowledges that reaching absolute zero is difficult for certain heavy industries. It is beginning to integrate standards for high-quality carbon removal and nature-based solutions, ensuring that any remaining emissions are meaningfully balanced.

To provide a clear target for the industry, the US Green Building Council introduced LEED Zero. This isn't just an incremental improvement; it is a verification of performance. It requires buildings to prove, through twelve months of data, that they have achieved a net-zero balance in carbon, energy, water or waste.

Pillar	Objective
Carbon	Net-zero emissions from energy and occupant transport.
Energy	Achieving a source energy use balance of zero.
Water	Balancing potable water use with alternative sources.
Waste	Diverting 90% or more of waste from landfills.

The Bottom Line: A "Carbon-First" Philosophy

With the launch of LEED v5, the transition to a decarbonisation framework is complete. Unlike previous versions where carbon was one category among many, v5 was created with a carbon-first philosophy.

This new version aligns more closely with the 1.5-degree climate pathway, requiring buildings to demonstrate actual, measured performance rather than just "design intent." It also integrates social equity and climate resilience, acknowledging that a truly sustainable building must protect its occupants from the extreme weather events that carbon emissions have already made inevitable.

The evolution of LEED has forced a shift in the global supply chain. Because LEED-certified projects demand low-carbon steel and concrete, manufacturers are incentivised to innovate. In the UK and Europe, LEED often works alongside BREEAM, but its specific focus on carbon metrics has made it a preferred tool for multinational corporations looking to align their global real estate portfolios with Net Zero Carbon (NZC) commitments.

LEED has moved beyond being a "green" badge. It is now a sophisticated financial and environmental de-risking tool. By focusing on decarbonisation, LEED ensures that buildings remain assets rather than "stranded liabilities" in a world that is rapidly legislating against carbon.

The journey from "doing less harm" to "doing total good" is complex, but the framework's evolution provides a roadmap. As we move towards 2030 and 2050, the role of LEED will be defined not by how many points a building scores, but by how many tonnes of carbon it keeps out of the atmosphere.



Part III: FMCG & Retail deep dive

Decarbonising consumer value chains

As one of the sectors of the Bulgarian economy that has been most often in the spotlight in the last year, fast-moving consumer goods (FMCG) and retail is also in the forefront of decarbonisation. As a fundamental driver of corporate competitiveness and capital access, the latter is no longer optional for Bulgarian FMCG and retail vendors and has evolved into a necessity required to mitigate supply chain risks and unlock long-term operational efficiencies.

The sheer size, indirect role in the economy and social importance of the sector make it a defining element of the decarbonisation landscape in Bulgaria. Data from the marketing research company NielsenIQ shows that in 2025 the retail spending in Bulgaria had the second highest share of private consumption in the EU after Croatia, of 46.3%, i.e. the average consumer spent every second euro in this sector. **The Bulgarian FMCG market had a total value exceeding EUR 6.3 bln, excluding tobacco products, and EUR 9.2 bln, if they are factored in. This corresponds to an annual growth of 9.9%.** The strong growth of the FMCG market was primarily driven by the performance of food and beverages, which grew by 8.6% y/y, while non-food products followed with 7.6%. Furthermore, food and beverages recorded a 3.7% annual increase in volumes, which supported by the 0.2% volume recovery in non-food products, made Bulgaria the third fastest growing FMCG market in the EU in terms of volume after Romania and Greece. Modern formats, such as hypermarkets, supermarkets and discounters, gained share again, while traditional stores continued losing positions. According to Euromonitor International data quoted by FAS Sofia, part of the US Embassy in Bulgaria, modern retail channels accounted for 67% of the total market, effectively marginalising traditional retail channels. Small stores under 40 sq m grew at a much slower rate and even recorded a decline in volumes in some categories.

This increasing market concentration inadvertently serves as a powerful catalyst for the green transition in the FMCG and retail sector. Since FMCG in Bulgaria is dominated by a relatively small number of modern trade players that dictate the rules in the market, their accelerated integration of ESG criteria into the core operational and capital allocation strategies has an effect that spills over the rest of the market participants who want to stay competitive. Thus, the push for decarbonisation has evolved into a critical metric of financial viability and competitive market positioning. The regulatory and capital market environment in Bulgaria increasingly penalises high-carbon operations by supporting companies moving to cut emissions and adopt green technologies. For instance, the European Investment Bank (EIB) has a facility specifically targeting green transition investments, while the Bulgarian Stock Exchange (BSE) launched a dedicated ESG rating system, powered by LSEG Data & Analytics, signaling to public companies that future capital access will heavily depend on sustainable performance.

Furthermore, despite the reduced administrative burden on smaller firms resulting from the European Commission's 2025 Omnibus simplification package for Corporate Sustainability Reporting Directive (CSRD) compliance, Bulgarian SMEs in the FMCG sector continue to face increasing indirect pressure driven by the trickle-down effects of Scope 3 emissions reporting requirements imposed by large retail chains. They are contractually forcing their decarbonisation targets down the supply chain. Thus, meeting the strict environmental requirements of the leading retail players has turned into a prerequisite for maintaining shelf space for the rest of the actors in the sector. Consequently, decarbonisation efforts at the top of the retail sector necessitate and accelerate the green transition across the entirety of Bulgaria's consumer economy.

Decarbonisation in the FMCG and retail sector is particularly important against the backdrop of severe energy market volatility and geopolitical conflicts. This unpredictable environment catalysed a massive expansion in behind-the-meter renewable energy generation. Specifically, commercial photovoltaic installations have proliferated across retail portfolios as companies seek to hedge against grid price fluctuations and secure energy independence. As an example of the general trend, two of the frontrunners in the retail sector – Lidl Bulgaria and Kaufland Bulgaria, have emphasised on the installation of photovoltaic systems on the roofs of their stores, including all newly built ones, as a central element of their decarbonisation strategies, along with the renovation of refrigeration equipment and other measures to increase energy efficiency.

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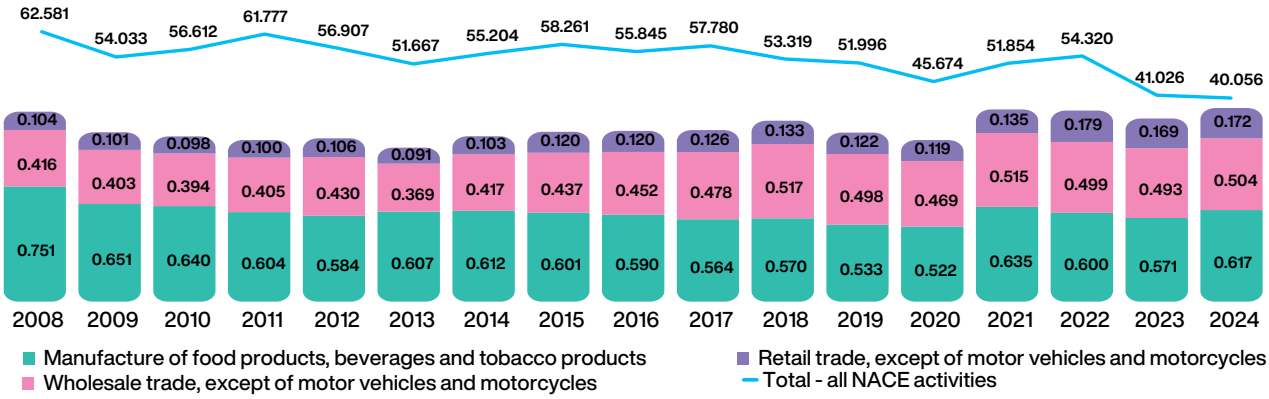
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Greenhouse gas emissions and intensity

The retail paradox: economic expansion masks carbon efficiency gains

The FMCG and retail sector, encompassing the manufacture of food, beverages and tobacco products, as well as wholesale and retail trade excluding motor vehicles and motorcycles, is not among the significant sources of greenhouse gas (GHG) emissions in Bulgaria. Eurostat data shows that in 2024 the sector generated a combined GHG footprint of 1.292 million tonnes, equal to 3.2% of the total GHG emissions of the Bulgarian economy. This level of GHG emissions puts FMCG and retail behind all other major sectors of the economy except construction and also behind the activities of households in absolute terms. Relative to the EU average of 4.3%, Bulgaria's FMCG and retail is responsible for a smaller part of the overall GHG emissions of the economy.

Fig 18. Greenhouse gas emissions by activity (in million tonnes)

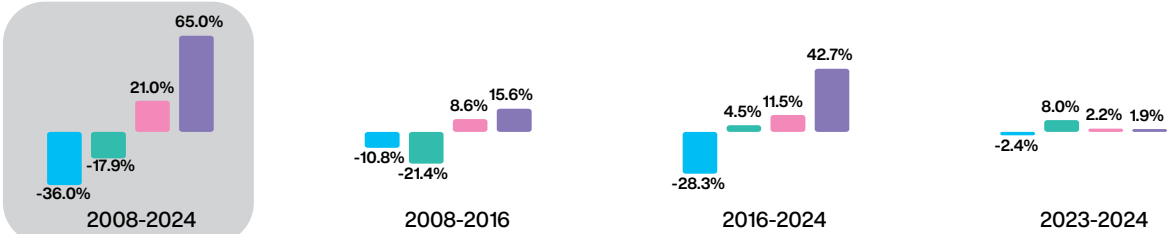


Source: Eurostat

Viewed in a historical perspective, the 3.2% share of FMCG and retail in total emissions in 2024 is the highest on record for the country. This rise is largely the result of an aggressive decarbonisation drive across the wider Bulgarian economy, which has cut its total carbon footprint by more than a third since 2008, paired with a stable level of GHG emissions in FMCG and retail throughout the analysed period. Bulgaria's EU accession in 2007 and subsequent compliance with regulations like the allocation of emission allowances and the required integration of green energy sources into the national energy mix successfully forced dramatic footprint reductions in heavily polluting sectors of the economy, such as energy, transportation and heavy industry. Meanwhile, less emissions-heavy sectors, such as food and beverages production, retail and wholesale, were largely left outside the primary scope of these reduction mandates, retaining a baseline of persistent, hard-to-abate emissions. The increase in the share of FMCG and retail in total GHG emissions happened entirely after 2017, when it stood at 2.0%, same as in 2008. The divergence between the trajectories of FMCG and retail and overall emissions of the economy became particularly evident after 2022. In that year, GHG emissions reduction was temporarily put on hold, as the Russian invasion in Ukraine caused a short-lived resurgence of coal power generation. Since then, the energy sector's GHG emissions plummeted by nearly 50% year-on-year in 2023 to a record low. This unprecedented drop fundamentally shifted Bulgaria's emissions profile, leaving the stable emissions of the FMCG and retail sector to account for a larger piece of the pie.

Within the sector itself, the dynamics are highly uneven. The manufacture of food products, beverages and tobacco has consistently been responsible for around half of the GHG emissions throughout the analysed period, although its share of the sector's emissions dropped to 48% in 2024 from 59% in 2008. Thus, the manufacturing part of the sector cut its absolute GHG emissions by 17.9% compared to 2008 levels. Conversely, the retail branch presented a paradox. While being the least polluting segment, it exhibited the most negative decarbonisation trend in absolute terms, as its total emissions surged by 65% since 2008, including a major 27.4% hike in the last three years alone. This trajectory stands in sharp contrast to retail's behaviour at EU level, which slashed its absolute GHG emissions by 39.2% since 2008 and 14.5% since 2021.

Fig 19. Changes in GHG emissions by economic activity

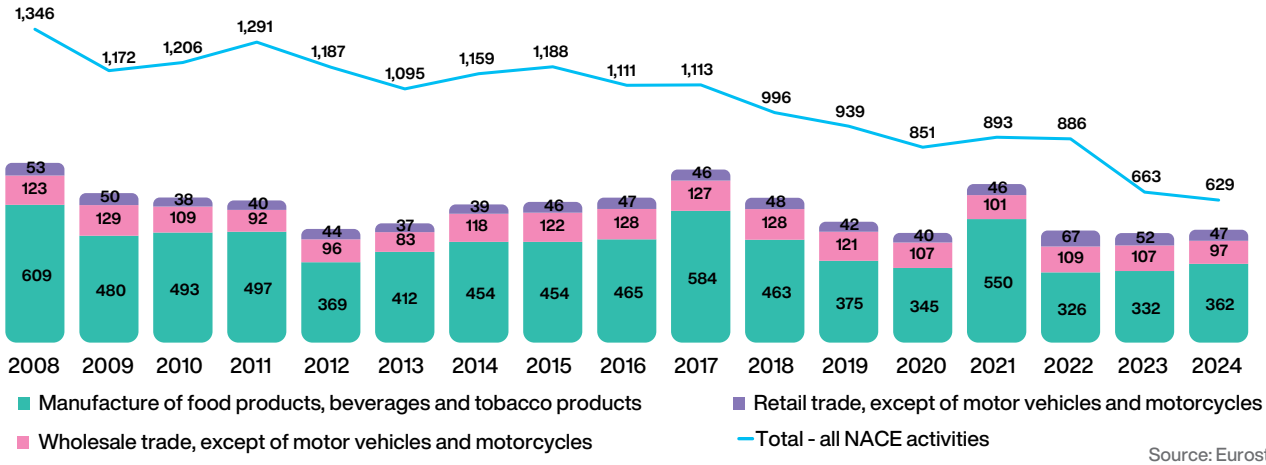


Source: Eurostat

However, a deeper look at GHG emissions intensity, which measures emissions per EUR of gross value added (GVA), reveals the reason underlying the decarbonisation paradox of Bulgarian retail. While its absolute emissions soared during the analysed period since 2008, the sector's emissions intensity actually decreased from 53 grams per EUR in 2008 to 47 grams per EUR in 2024, which comes to show that the 65% rise in emission volumes is not a sign of deteriorating environmental standards, but rather a direct byproduct of massive economic expansion within the modern trade sector. Driven by robust domestic demand, retailers have opened new large-scale hypermarkets, logistics hubs and retail parks. This continuous physical scaling naturally drove up absolute energy consumption and GHG emissions. As of 2024, Bulgarian retailers produced more total GHG emissions, because their market footprint grew exponentially, but they were more carbon-efficient.

Regarding GHG emissions intensity, the broader FMCG and retail sector stood considerably below the average for the Bulgarian economy. According to Eurostat, while in the general economy the intensity was 629 grams of GHG emissions per EUR in 2024, the values in FMCG and retail were in the range between 362 grams per EUR for food products manufacturing and 47 grams per EUR for retail.

Fig 20. Greenhouse gas emissions intensity by activity (grams per euro, chain linked volumes 2020)

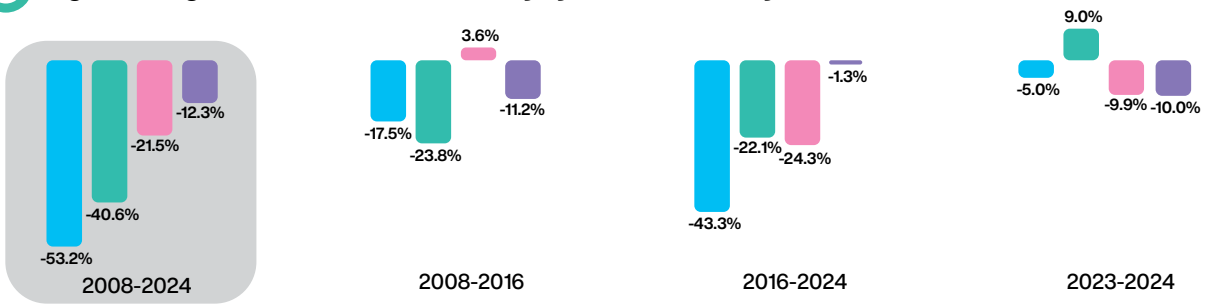


Source: Eurostat

Despite the recent volatility in retail's emissions intensity curve, it performed better than the EU average for the entire period until 2021 and became less carbon-efficient only in the last three years, mostly due to the sudden peak in 2022, while EU retailers continued to improve their ecological performance.

In contrast, the manufacture of food and wholesale have consistently reported higher GHG emissions intensity than the respective EU average, as did the Bulgarian economy as a whole.

Fig 21. Changes in GHG emissions intensity by economic activity



Source: Eurostat

In historical perspective, the GHG emissions intensity of the sector in Bulgaria behaved in a similar fashion to its carbon footprint in absolute terms. While the country's general economy more than halved its GHG emissions per GVA unit, retail cut only 12.3% of its 2008-level intensity. The manufacture of food products and wholesale achieved considerably stronger results, but still failed to match the progress of the overall economy, improving their carbon intensity by 40.6% and 21.5%, respectively, in the period 2008-2024. Again, as is the case in absolute terms, the divergent decarbonisation path of the FMCG and retail sector and the economy as a whole is primarily a result of the aggressive decrease in the carbon footprint of the most polluting sectors, such as energy and heavy industry.

Looking ahead, the 2026 conflict in the Middle East, apart from creating economic hurdles via the historic energy supply shock it triggered, is expected to act as a long-term catalyst for decarbonisation in the FMCG and retail sector. The crisis redefined decarbonisation from an environmental goal to a critical matter of energy security for companies. To hedge against unpredictable fossil fuel and grid prices, retail companies are heavily incentivised to double down on their energy independence strategies, particularly the expansion of behind-the-meter photovoltaic installations on store roofs. In addition, the spike in conventional fuel costs provides economic rationale for retailers to transition their commercial delivery fleets to electric and zero-emission vehicles. Both trends are expected to accelerate in the long term, helping bring GHG emissions of the sector down.



From Packaging to Procurement: How Circularity Can Decarbonise FMCG and Retail

Boyan Rashev,
Founder of Mind your future

Boyan Rashev holds both a bachelor's and a master's degree in Environmental and Resource Management from Germany. In 2007, together with his wife, he founded denkstatt, which they turned into the most successful sustainability consulting firm in Bulgaria. Over the years, he has gained extensive experience in finding the intersection between economy, society and environmental protection while working with industries and institutions of all kinds. He has long shared his views publicly and is today among the most influential voices on these topics in Bulgaria. During the COVID crisis, he successfully ventured into the vast world of investments. Thanks to this, he can now afford to work on his personal cause – the analytical platform MindYourFuture.org. Through it, Boyan seeks to bring common sense and rational optimism into the public dialogue, with the ambition to change the environment, the mentality and the governance of Bulgaria.

What role does the circular economy play in the FMCG and retail sectors and how can it actually help decarbonise them?

The circular economy is not just "recyclable packaging". It means redesigning FMCG so that fewer virgin materials, fewer losses and fewer kilometres are needed. In food, production and waste are major GHG levers, as food systems account for a large share of global emissions.

How can FMCG and retail companies reduce their Scope 3 emissions when the majority of them come from suppliers, raw materials, packaging, logistics and consumer behaviour - factors that are often beyond their direct control?

Scope 3 is the core battle. Companies cannot control farms, packaging suppliers or consumers directly, but they can control contracts, assortments and incentives: supplier climate clauses, verified farm-level data, low-carbon ingredients, recycled or reusable packaging, shorter cold chains, fuller trucks, electrified urban delivery, food-waste reduction and nudging consumers towards lower-impact products. SBTi expects companies to cover at least 67% of Scope 3 emissions where Scope 3 is material. However, it is very difficult for most suppliers, especially SMEs, to satisfy corporate demands. These demands can create tension and strain business relationships.

How can companies in the sector balance the need for decarbonisation with the realities of the FMCG market - low margins, price sensitivity among consumers and intense competition?

The hard part is economics. FMCG has thin margins and Bulgarian consumers remain highly price-sensitive. Therefore, the winning measures are those that reduce both carbon and cost: energy efficiency in stores and warehouses, solar rooftops, refrigeration upgrades, less food waste, lighter packaging, route optimisation, reusable transport packaging and better demand forecasting. If there is no adequate return, it will not be done for long. Premium "green" products alone will not decarbonise the sector.

In your opinion, which decarbonisation measures in the FMCG and retail sectors have the strongest tangible impact and which ones merely create the impression of sustainability without significantly reducing emissions?

The strongest real impacts are cutting food waste; shifting agricultural sourcing, especially meat, dairy and high-deforestation commodities; using low-carbon electricity; improving refrigeration efficiency; reducing packaging rather than focusing only on recyclability and optimising logistics. In Bulgaria, this means modernising cold chains, using PV on retail roofs, improving municipal recycling systems and preparing for the EU Packaging and Packaging Waste Regulation, which applies from August 2026. Most large companies are already doing this.

Weak measures include vague carbon-neutral labels based on offsets, tiny recycled-content changes, "biodegradable" packaging without collection infrastructure, symbolic paper substitutions with a higher total footprint and campaigns that shift responsibility to consumers while procurement remains unchanged.

The sector can decarbonise, but only if circularity becomes a purchasing, design and logistics strategy - not a marketing slogan. Progress is slow, but it is happening.

Emissions profile: Scope 1, 2 and 3

The emissions profile of the Bulgarian retail sector is characterised by relatively low Scope 1 and 2 emissions and much more pronounced and complex indirect Scope 3 emissions embedded within the companies' supply chains. Tracking these emissions has become highly systematised among the leading market players since 2021, driven by binding commitments to the Science Based Targets initiative (SBTi). Broadening the lens to the entire Bulgarian economy, the EIB Investment Survey 2025 revealed that 81% of businesses, up from 79% a year earlier, have actively taken steps to reduce GHG emissions, although this still trails the EU average of 92%. Most often these actions targeted direct operational emissions with more than half of the surveyed companies choosing to invest in energy efficiency, waste minimisation and recycling.

Businesses taking steps to reduce GHG emissions:

81% for Bulgaria

92% for the EU

(Source: EIB Investment Survey 2025)

Within the FMCG and retail sector, the companies at the top of the market hierarchy set the tone. According to the global Net Zero Tracker platform, which monitors the 2,000 largest publicly-traded companies in the world by revenue, the largest retailers operating in Bulgaria have locked in stringent group-level net-zero targets to be met by 2050, with some of them like the owner of Billa, REWE Group, targeting absolute climate neutrality by 2040. Interim GHG reduction benchmarks were established by 2030. The corporate decarbonisation frameworks are not limited to direct operations - beyond full coverage of their Scope 1 and 2 emissions, more than half of the tier-one retailers explicitly incorporate Scope 3 emissions into their formal decarbonisation plans.

While large multinational retailers operating within the country, such as the Schwarz Group, encompassing Lidl, Kaufland and Metro, have the capital and institutional capacity to rapidly adapt, the ripple effects of their adaptation are primarily felt across their Scope 3 emissions network, which comprises thousands of Bulgarian SMEs operating in the agricultural, logistics and FMCG manufacturing sectors. Therefore, decarbonisation at the retail level compels the entire supply chain to modernise its environmental footprint. Because international retail chains are legally obliged to report their value chain emissions, they contractually impose stringent ESG reporting requirements on their suppliers, regardless of the supplier's size. This translates into a de facto mandatory ESG compliance, involving auditing their energy usage and guaranteeing the sustainable provenance of raw agricultural materials among others, faced by local agricultural producers and FMCG manufacturers that want to maintain purchasing contracts with large retailers. The major challenge for the retailers is to support local supply chains and ensure widespread compliance without triggering a collapse of their domestic sourcing base. Market surveys indicate that Bulgarian SMEs cite prohibitively high capital costs of deploying data capture software, lack of internal ESG expertise among management and regulatory uncertainty as the major operational risks associated with these mandates. In 2024, to prevent possible widespread supply chain attrition, the Confederation of Employers and Industrialists in Bulgaria (KRIB) established the ESG Committee with more than 50 founding members from various sectors of the Bulgarian economy and public sector, including several FMCG companies. This committee, alongside efforts by the Association of Modern Trade, has provided capacity-building seminars and technical assistance programmes to bring Bulgarian SMEs up to the required reporting standards.
In another attempt to tackle downstream Scope 3 emissions, Bulgarian retailers have been increasingly deploying consumer-facing decarbonisation tactics, such as eco-labeling to nudge consumer behaviour toward low-carbon alternatives. While the domestic market for sustainable FMCG goods remains niche, at less than 1% share in most product categories like dairy products, growth has been strong in the double digits, according to sporadic data from the major retailers Lidl and Kaufland. Their consumer-facing decarbonisation efforts include targeted promotion of sustainable, certified alternatives, such as bio, vegan and high-protein items, particularly plant-based protein.

Major corporate emissions reduction initiatives in Bulgaria's FMCG and retail sector

As the undisputed market leaders in the Bulgarian retail sector, the two Schwarz Group companies, Lidl Bulgaria and Kaufland Bulgaria, have established decarbonisation frameworks that act as a primary catalyst for industry-wide compliance. Operating under the Schwarz Group's global mandate, **Lidl Bulgaria has the objective to become a net-zero enterprise by 2050, supported by an interim target to reduce direct Scope 1 and 2 GHG emissions by 70% by 2030 against a 2019 baseline.** As of 2024, the discounter had completed its transition to 100% green energy consumption in its own stores, logistic centres and office buildings, as far as its Bulgarian operations are concerned. At the end of its 2022-2023 reporting period, Lidl Bulgaria had installed proprietary photovoltaic systems across 39 individual retail and logistics locations. The retailer's most profound impact stems from its Scope 3 value chain mandates. Acknowledging its climate footprint originates upstream, Lidl contractually requires that by 2026 its largest suppliers responsible for 75% of the group's product-related Scope 3 emissions must establish their own climate targets in accordance with SBTi methodology. Furthermore, the company aims to slash Scope 3 emissions from agriculture, forestry and land use change by 42.4% and from energy and industry by 35% by 2034 compared to 2022.

Sharing the Schwarz Group's net zero by 2050 commitment, Kaufland Bulgaria aims to reduce its operational carbon dioxide emissions by 80% by 2030, compared to 2019 levels. It has also mandated that suppliers responsible for 80% of product-related emissions set SBTi-aligned targets by 2026. The company has procured 100% of its electricity used in its headquarters, logistic centre and stores from renewable sources since the commencement of the 2022 fiscal year. In its latest sustainability report, Kaufland Bulgaria quantified its environmental impact, reporting the procurement of over 400,000 MWh of green electricity,

which prevented the release of more than 150,000 tonnes of carbon emissions by 2022. Furthermore, 94% of the retailer's stores in Bulgaria are EDGE-certified and feature LED lighting and natural refrigerants in addition to photovoltaic systems. Parallel to Lidl, Kaufland has set Scope 3 emission targets, aiming to reduce 42% of the emissions generated during the cultivation of products and 35% of the emissions generated during processing, transport, use and recycling by 2034. The company pioneers green logistics - Kaufland Bulgaria is the only company in the German hypermarket group in which over 85% of deliveries are made with vehicles powered by natural gas, whilst expanding a national network of fast-charging stations for electric vehicles.

As a representative of the wholesale segment, Metro Bulgaria also targets climate neutrality, by 2040 in accordance with METRO Group's global mandate. It claims to have achieved a 45.6% reduction in its absolute Scope 1, 2 and 3 emissions globally since 2011. Between 2019 and 2022, Metro Bulgaria invested EUR 7.8 mln in efficiency innovations, followed by an additional EUR 6.2 mln allocated for the 2023–2025 period. These investments are projected to permanently eliminate 8,516 tonnes of carbon emissions and save 11.6 million kWh of electricity annually. Actions to reduce GHG emissions include among others the phase-out of freons in favour of natural refrigerants, saving 1,560 tonnes of carbon dioxide annually, and advanced systems capturing residual heat from refrigeration units to warm store spaces and water supplies, eliminating further 2,285 tonnes of carbon dioxide per store. A major commitment under Metro Bulgaria's sustainability policy is the increased use of renewable energy. To bolster energy independence, the company installed rooftop photovoltaics in its Blagoevgrad, Pleven and Veliko Tarnovo stores, covering between 20% and 30% of their annual consumption, while also equipping nine stores with electric vehicle charging infrastructure.

Billa Bulgaria has announced that, as of end-2024, it produced 15% of the energy needed for the functioning of its stores and logistic network from its own sources. The Bulgarian arm of REWE Group invested nearly EUR 2 mln in the installation of photovoltaic systems and batteries on its premises and another EUR 2.5 mln were planned for 2025. Additionally, in the beginning of 2025 the company launched its programme for the installation of 25 fast-charging stations for electric vehicles at its stores in nine Bulgarian cities and towns.

To prove that aggressive ESG strategies are not the exclusive domain of multinational retailers, leading locally-owned retail player Fantastico Group reported a 23% increase in its proprietary renewable energy production capabilities in its 2024 sustainability report. Furthermore, the company claims to have reduced its total electricity consumption by 5% annually. Another manifestation of consumer-facing decarbonisation is the promotion of locally sourced products. Sourcing domestically drastically shortens supply chains, thereby reducing transportation-related carbon emissions while simultaneously appealing to consumer desires to support the local economy.

Energy use in stores, warehouses and logistics

According to the 2025 EIB Investment Survey, 54% of Bulgarian firms have invested in measures to improve energy efficiency and 44% in onsite or offsite renewable energy generation. While these figures still trail the EU average, they signal a rapid acceleration in the decarbonisation efforts of companies in Bulgaria. Within the retail sector, this shift is profound - retailers have transcended their traditional roles as passive energy consumers to become prosumers. To circumvent state-level inefficiencies and grid transmission bottlenecks, major retail chains are deploying behind-the-meter solar systems specifically designed for self-consumption.

Bulgarian businesses investment focus

54% invested in improvement of energy efficiency

44% invested in own renewable energy generation

(Source: EIB Investment Survey 2025)

Modern retail relies heavily on continuous, high-load energy consumption for refrigeration, heating, ventilation and air conditioning (HVAC) systems and lighting. Retailers install photovoltaic systems typically ranging in capacity from 200 kW to 1 MW to utilise the predominantly flat roofs of modern supermarket and hypermarket formats and distribution logistics centres. These installations are sized to offset daytime operational loads rather than to export surplus power back to the national grid. The expanding physical footprint of the retail sector also supports this boom of self-consumption rooftop solar systems. In the first half of 2026, the total stock of modern retail park space in Bulgaria exceeded 709,000 sq m, outpacing total shopping mall area for the first time, with further 155,000 sq m under construction. The shift from vertical shopping malls to expansive retail parks provides optimal, large-scale surface areas for utility-scale commercial solar installations, embedding decarbonisation into the future of Bulgarian retail real estate. As far as the logistics operations of retailers are concerned, beside accelerated usage of solar installations on warehouse rooftops, such as the 806 kW system that covers 40% of the electricity needs of Billa Bulgaria's logistic centre in Stara Zagora among others, decarbonisation has been progressing through the electrification of commercial fleets and transport networks, as evidenced by the 85% of Kaufland's delivery fleet consisting of trucks powered by natural gas.

Packaging, waste and circularity

Circularity is becoming a crucial aspect of the FMCG and retail sector's operations. A key measure of circularity in the economy is the **circular material use rate, which shows the percentage of materials that come from recycled waste. In 2024, this rate in the EU, including textiles, plastics, metals and paper, was 12.2%. Bulgaria, however, ranked in the lower half among the 27 EU countries, with a circularity rate of just 5%.** This rate is less than half the EU average and far behind the leader - the Netherlands with 32.7%. These figures indicate the urgent need of improvement, but also the high growth potential of the Bulgarian economy and the retail market in particular, when it comes to employing circular practices, minimising waste and optimising packaging.

According to the 2025 EIB Investment Survey, Bulgarian firms remain less likely to invest in waste minimisation and recycling than their EU counterparts, with only 52% of respondents having done so versus the EU average of 77%. The gap, however, narrowed significantly compared to the previous year, when 43% of the Bulgarian and 74% of the EU-based surveyed companies reported investments in waste minimisation and recycling.

While Bulgaria generates significant waste - around 615,000 tonnes of food waste, or 93 kg per person on average in 2022, according to the Bulgarian Food Bank and Eurostat - retail accounted for only a fraction of it. Retail and distribution generated between 6% and 8% of this waste, far less than households, which accounted for 43% to 53%. On the packaging front, the waste collection and recovery organisation Bulecopack reported recycling nearly 62,000 tonnes of packaging waste in 2024, representing a 69.5% recycling rate of the waste placed on the market by its members. Beyond food and beverage packaging, circularity mandates are reshaping the non-food retail sector, particularly apparel. The textile industry is estimated to generate approximately 100,000 tonnes of waste annually in Bulgaria. The Bulgarian Association for Circular Textiles reported that over 8,000 tonnes of textile waste were separately collected in 2024, a notable increase from the previous year, with 70% of them prepared for reuse or recycling.

Despite these sectoral efforts and visible progress in circularity figures, the Bulgarian retail sector stands in front of a major challenge - the implementation of a national deposit return scheme (DRS). Under the requirements of the EU Single-Use Plastics Directive and the overarching Packaging and Packaging Waste Regulation 2025/40, which entered into force in February 2025 and will generally apply from August 2026, all EU Member States are federally mandated to achieve a 90% collection rate for all single-use plastic and metal beverage containers by 2029. In 18 EU Member States there is already such DRS in operation as of early 2026, but Bulgaria is one of the few countries in the bloc where DRS has not been implemented and legislation is not adopted yet. In the ongoing public discussions, it was confirmed that the future system will cover plastic, metal and glass containers from 0.1 to 3 litres, including water, soft drinks, beer and cider. Preliminary industry studies project that setting up the system will require an initial capital investment of EUR 100 mln, borne by the beverage industry, with a consumer deposit fee estimated at EUR 0.10.

After a 10-month regulatory freeze amid political uncertainty in the country, in January 2026 steps were made to move the legislation process forward, through a highly controversial draft amendment to the Waste Management Act (WMA) submitted to the Bulgarian Parliament. The draft mandated that producers would charge distributors a deposit, passed to the consumer and refunded via automated reverse vending machines or manual collection points at retail sites. While the retail and FMCG sectors support the DRS concept, with large retail chains already piloting voluntary reverse vending machines, they opposed the envisaged governance structure led by the state-managed enterprise National Deposit Operator, claiming that absolute state control would contradict established best practices in EU, where DRS is efficiently managed by a non-profit independent legal entities led by beverage producers and retailers. In a new draft, posted for public discussion in end-April 2026, Bulgaria's caretaker government changed the form of management of the future DRS in line with the established EU approach.

Major waste and circularity initiatives in Bulgaria's FMCG and retail sector

In a situation of legislative uncertainty over the future Bulgarian DRS, modern retail chains and FMCG producers have started deploying their own circularity and waste reduction initiatives to build consumer habituation ahead of national mandates. The market leader Lidl Bulgaria operates reverse vending machines in its stores and reported over EUR 120,000 donated by customers to charity via returned PET bottles and aluminum cans in the 2024 fiscal year. The company has committed to utilising 30% recycled PET in its proprietary water bottles. In 2022, Lidl surpassed its goal of achieving 20% less plastic by 2025 ahead of schedule and in 2023 it set a new goal to reduce plastic in its own packaging by 30% by 2025 and by 35% by 2027 compared to 2017 levels.

Since the launch of Kaufland Bulgaria's storefront recycling stations in 2023, the retailer reports collecting over 39 million plastic bottles and aluminum cans and paying out nearly EUR 1 mln in the form of eco-vouchers. Additionally, the company collects more than 400 tonnes of textiles annually via parking lot containers and has gathered and recycled more than 300,000 used coffee capsules returned by customers.

The locally-owned Fantastico Group has demonstrated the effects of digital transformation on waste management. By investing in electronic shelf labels, the retailer eliminated the consumption of 1.8 million physical paper labels, substantially reducing its direct material waste.

FMCG manufacturers have also joined the waste minimisation trend. Coca-Cola HBC Bulgaria has defined a 100% packaging collection goal. Since 2022, the company's mineral water plant in Bankya has not sent household waste to landfill. Instead, mixed household waste is transported to the Sofia Municipality Mechanical-Biological Treatment Plant, where separation, preparation for recycling and recovery is implemented. Additionally, Coca-Cola HBC Bulgaria's Kostinbrod soft drinks plant reduced the weight of the 1.25-litre PET bottles to 31 grams from 34 grams, translating into saving 75 tonnes of plastic materials and 165 tonnes of carbon dioxide emissions on an annual basis. The company's latest sustainability report cites the reduction of 23% of the total waste from production operations compared to 2019 and the increase in the share of recycled waste by 17%. In 2021, Coca-Cola HBC Bulgaria reported collecting 65% of the packaging placed on the market, which saved 190,000 cu m of water, 78,614 MWh of energy and 8,520 tonnes of carbon dioxide emissions.



My Yard and My Smallholding

Valentina Uzunova,
President of the Chamber of Energy Auditors

Private smallholdings are among the most underestimated models for small-scale decarbonisation, energy efficiency, circular economy practices and the revival of Bulgaria's gardening tradition. Decarbonisation is usually linked with large industrial projects, expensive technologies and heavy infrastructure. Yet a more natural bottom-up approach exists, in which households reduce their carbon footprint through the way they produce, consume and manage resources.

When a family produces some of its own food, transport emissions, packaging needs, long logistics chains, food waste and dependence on industrial resources are reduced. In Bulgaria, this model has particular value because yards, small plots, family gardens, home-production traditions and a living connection to the land still exist. Successful decarbonisation should therefore not be industrial alone. It should also be human, local and community-based.

The Bulgarian yard has traditionally combined gardens, fruit trees, home production, composting, food storage, neighbourly support and prudent resource management. Returning to this model does not mean going backwards, but restoring the sustainable balance between people, nature and the local community. A personal smallholding provides clean food, movement, physical activity, a healthier lifestyle, a connection between generations and greater local resilience.

In this context, it is important to restore the reputation of Bulgarian gardeners, who were long known in Europe for high-quality vegetable produce, environmentally friendly practices, rational use of small areas, labour culture and sustainable production. Their experience was based on family labour, respect for the land, the rhythm of the seasons, local knowledge and reasonable use of resources. Reviving this culture can become a national cause and a European example of sustainable production.

The personal smallholding is also an energy issue. When food is produced locally, the need for transport, fuel costs, logistics costs and the overall energy footprint are reduced. Small-scale energy efficiency begins at home, in the yard and within the local community, not only in large systems.

A strong advantage of the smallholding is its link with the circular economy. In the traditional rural model, the concept of "waste" barely existed because everything was part of a natural cycle. Kitchen waste can be composted; leaves and grass used for mulching; plant residues returned to the soil; rainwater collected and reused and biomass turned into a resource. In this way, the yard becomes a small household circular economy: soil, production, consumption, biowaste, compost and soil once again. This reduces household waste, landfilling, waste-collection emissions and the need for chemical fertilisers, while improving soil fertility.

The next step is cooperation between neighbours through local rural communities under the shared name "Our Home". They can combine shared composters, shared equipment, local markets, cooperative sale of produce, joint biowaste collection, cold-storage facilities, local renewable energy systems and small energy communities. Surplus produce can be offered under the shared brand "Produce from Our Home". This builds a local economy, social connection, energy resilience and real small-scale decarbonisation.

Smallholdings can gradually integrate renewable energy sources such as photovoltaic systems, solar irrigation, LED lighting, energy-efficient pumps, local cooling and produce storage as well as battery systems. With support from the Ministry of Agriculture and municipalities, pilot energy communities can be created in small settlements.

The Agricultural Academy can play a key role through high-quality planting material, restoration of traditional Bulgarian varieties, scientific expertise, demonstration yards, training and practical consultations. Traditional varieties are valuable because they are adapted to the local climate, require fewer resources, have excellent flavour and form part of the national identity. In this way, science can once again reach "my yard and my smallholding".

A national "Our Home" programme, coordinated by the Ministry of Agriculture, the Agricultural Academy, municipalities and local communities, could unite pilot energy communities, farmers' markets, home composting, restoration of traditional varieties, support for family yards, local food systems and educational centres. For households, this means vegetable and fruit gardens, composting, rainwater collection, seasonal produce and energy-efficient solutions. For communities, it means local markets, cooperative sale and shared renewable energy systems. For municipalities, it means biowaste programmes and integrated policies connecting agriculture, energy efficiency and the circular economy.

True sustainability begins at home, in the yard, in the garden, among neighbours and within the local community. The personal yard should not be seen as a hobby or a remnant of the past, but as part of national climate policy, a basis for a circular economy, a tool for restoring rural areas and a model for local food and energy resilience. The Bulgarian garden itself may prove to be among the most natural solutions for sustainable decarbonisation.

Part IV: Energy transition enablers

Electrification in the context of energy security

Electrification is a crucial element of decarbonisation because it allows for a country's gradual retreat from its reliance on fossil fuels. It also helps reduce energy imports. As a result, electrification is widely regarded as an important pathway towards greater energy security and independence. This is of particular importance during times of geopolitical instability and rising tensions in Eastern Europe and the Middle East.

Following the energy crisis triggered by Russia's invasion of Ukraine in early 2022, the EU has increasingly promoted electrification as a key mechanism for reducing fossil fuel imports and improving energy security. This viewpoint only became stronger four years later with the start of the war in Iran and the obstruction of shipping traffic through the Strait of Hormuz. As stated for Bloomberg TV Bulgaria by Dimitar Enchev, co-founder and CEO of CWP Europe which is one of the largest renewable energy developers in Southeastern Europe, **Europe is "energy poor" since it does not have enough petroleum and natural gas to meet its demand, hence its reliance on imports.** What it can bet on, however, is the generation of wind, solar, hydro and nuclear power. The other option, coal, is expensive and incompatible with the environmental goals of the EU.

All of this is valid especially for Bulgaria.

Bulgaria's electrification potential is substantial, particularly in the transport sector, where one of the main priorities is the modernisation of the railway infrastructure. Bulgaria's NRRP envisages the supply and maintenance of railway rolling stock, including 35 single-deck electric multiple units, seven double-deck electric multiple units, 20 single deck electric "push-pull" trains and 18 electric shunting locomotives, along with the supply of on-board equipment for 108 electric locomotives and multiple units. As of June 2026, Bulgaria has contracted the Skoda Group to manufacture and supply 25 four-car electric trains worth over EUR 500 mln, inclusive of 15 years of comprehensive maintenance, and the Alstom-led BULEMU consortium to deliver 35 electric interregional trains valued at EUR 720 mln, again inclusive of 15 years of maintenance.

Like all other member states, Bulgaria is awaiting the publication of the **EU's Electrification Action Plan**, which aims to accelerate the cost-effective and system-friendly electrification of energy consumption across the bloc's transport, industry and building sectors. The plan is expected to address key barriers to electrification and identify priority policy actions. Although its publication was initially scheduled for early 2026, it has been repeatedly delayed. According to the European Commission's latest agenda, the plan is now expected to be presented on **July 22, 2026**, as part of a broader "energy package", which will also include measures related to network charges.

On its own, electrification will not necessarily reduce emissions. In fact, it could even lead to an increase if electricity is generated mainly from high-emitting sources. To deliver decarbonisation benefits, the additional electricity demand must be met by low-carbon sources, preferably renewable energy. Power purchase agreements (PPAs), whether physical or virtual, are currently a key market-based mechanism enabling businesses and other organisations to match growing electricity consumption with renewable generation. By providing long-term revenue certainty, these contracts also play a critical role in enabling renewable energy projects to reach financial close and proceed to construction.

PPAs as energy transition enablers

Following years of unprecedented expansion, in 2025 the global corporate PPA market experienced a 10% contraction from the previous year's record, according to BloombergNEF, primarily driven by policy risks and the escalating frequency of negative power prices. In its European Market Review of Auctions and Corporate PPAs 2025, SolarPower Europe confirmed that Europe aligned with the global trend. The booming growth in 2023 and 2024 in search of price stability after the Russian invasion of Ukraine was followed by a cooldown in PPA volumes, reflecting increasing grid congestion, curtailments and falling price expectations. Renewables market intelligence provider Pexapark reported that the **European PPA market had contracted by 31% in deal count and 26% in volume in the first half of 2025 compared to the prior year.** Data revealed a clear polarisation between mature, highly decarbonised markets, such as Germany and France, and countries that still rely heavily on gas-fired generation and face comparatively high wholesale electricity prices. The first group saw PPA volumes plummet, while the second group reported a robust growth. Together with Italy and Poland, **Bulgaria is a representative of the second group and stands out as a dynamic PPA market, mostly propelled by continuing strong solar pipeline and record-breaking BESS deployment in 2025 and 2026.**

A key element of the Bulgarian PPA landscape is the rise of hybrid and cross-border PPAs. As the Bulgarian market is not immune to the broader European structural challenge of energy oversupply during peak daylight hours, hybridisation of PPA contracts is becoming a defining trend. Pairing solar generation with localised BESS allows independent power producers to offer corporate off-takers round-the-clock clean energy supply contracts, ensuring better long-term project bankability. While solar-plus-storage agreements are still relatively scarce on a global scale, the deals involving BESS have accelerated in Europe since 2024 and **in September 2025 Bulgaria became one of a handful of markets to report a first-ever hybrid solar-plus-storage PPA.** At the time, Austria-based renewable power producer Enery announced a 15-year contract with Teva Pharmaceutical Industries, which was the first of its kind in Central and Eastern Europe (CEE). Another multi-technology off-take model with an increasingly promising future in Bulgaria is the solar-

plus-wind hybrid PPA. Independent power producers with diversified regional portfolios, such as Rezolv Energy, have announced the possibility to structure PPAs that blend solar assets in Bulgaria with wind capacity in Romania, providing corporate off-takers with a smoother and more reliable generation curve.

The Bulgarian PPA market saw its first major contracts in 2022 and 2023, catalysed by the telecommunications sector, which acted as the first mover in securing long-term clean energy contracts. In 2022, A1 Bulgaria signed a 10-year solar PPA with the clean energy investment group Renalfa. Sourced from a 33 MW photovoltaic plant in southern Bulgaria, the deal guaranteed the telecom an annual supply of 20 GWh of electricity. In 2023, telecom Yettel and network provider CETIN Bulgaria signed a decade-long PPA with Electrohold. Backed by a newly constructed 123 MW solar plant, this was one of the country's first 10-year contracts executed entirely under freely negotiated market prices, setting a precedent for asset bankability and accelerating the corporate-driven renewable energy procurement momentum across the broader Bulgarian economy.

In September 2024, **Ardagh Glass Packaging-Europe** (AGP-Europe) signed a 12-year virtual PPA contract with Prague-based **Rezolv Energy**. Under the agreement, Rezolv Energy will provide 110 GWh of renewable electricity per year, sourced from its St. George solar photovoltaic project in Bulgaria to AGP-Europe for its glass manufacturing operations across Europe. The PPA took effect upon the project's commercial commissioning in April 2026. The underlying asset, situated on a 165-hectare brownfield site at the former Silistra airport in northeastern Bulgaria, comprises a 225 MW solar park delivering an average of 313 GWh annually, which means that AGP-Europe will consume more than a third of its output. From AGP-Europe's angle, the deal is an example of the hedging strategy for blending geographically and technologically distinct generation profiles, where this solar PPA complements a previously secured Swedish wind power contract, ensuring consistent renewable power supply throughout the year. Conversely, AGP-Europe served as a primary financial anchor of the St. George solar project - a demonstration of the attractiveness of the Bulgarian clean energy sector even for companies without physical operations in the country.

An even larger solar PPA, ranked as the third largest in Europe in June 2025, when it was announced, is the deal between Romania's oil and gas group **OMV Petrom** and **Enery** over the acquisition of a 50% stake in the 400 MW Gabare photovoltaic project in northern Bulgaria. As part of the physical PPA deal, OMV Petrom will acquire 50% of the future electricity output of the solar park for a 10-year period between January 2027 and December 2036. The park, one of the largest solar projects in Bulgaria, will have an estimated annual production of 600 GWh, which translates into annual procurement of 300 GWh of clean energy by OMV Petrom. The two parties also consider the development of up to 600 MWh of battery storage. OMV Petrom and Enery plan to invest a total of EUR 200 mln in the Gabare solar project by 2027, including from external financing.

A new trend emerged in the Bulgarian corporate procurement landscape in 2026 – the entry of wind-based PPAs. In March 2026, Sofia-based automotive aluminium profiles producer **Etem Gestamp**, a joint venture of Greece's Viohalco Group and Spanish automotive components manufacturer Gestamp, signed a 10-year virtual PPA with **Rezolv Energy**, under which Etem Gestamp will buy wind energy from the 461 MW Vifor project in Romania's Buzau County for its operations in Bulgaria. This was the first cross-border onshore wind PPA to be publicly announced in Bulgaria.

In May 2026, **CWP Europe** signed a preliminary partnership agreement with Bulgarian cement producer **Heidelberg Materials Devnya** for the development of Bulgaria's largest wind farm. CWP Europe announced it would invest more than EUR 300 mln in the construction of the wind farm, but did not disclose its planned capacity. Upon completion, the wind farm is planned to supply part of its output to the cement plant in Devnya under a physical PPA, thus creating a circular economy model, where the carbon-neutral cement of Heidelberg Materials Devnya is used in the construction of the turbine foundations, while the farm generates renewable electricity for the cement plant.

As a natural consequence of the exponential deployment of BESS in Bulgaria in the last two years, storage is increasingly finding its place on the PPA market. Hybrid PPAs, where solar and BESS are wrapped in a single contract, help off-takers secure flexibility from a hybrid asset, smoothing out the intermittency. The trend toward long-term agreements that provide a reliable hedge against wholesale price volatility and generation profile mismatch has its pioneer in the face of the 15-year hybrid PPA signed by **Teva** and **Enery** in September 2025. Under the deal, which is reportedly the longest signed in Bulgaria to date, Teva will secure 60 GWh of green energy annually to support the decarbonisation of its two Bulgarian plants in Dupnitsa and Troyan, in line with the corporate goal to reduce their emissions by 46.2% by 2030. The virtual PPA involves the construction of a 122 MW solar park and the installation of two battery storage systems with a combined capacity of 200 MWh near Haskovo in southern Bulgaria. The total annual output of the park is estimated at 200 GWh.

Another Bulgarian deal involving BESS was unveiled in December 2025. More specifically, **Enery** signed a virtual PPA with Switzerland-based energy and commodities company **Vitol** to secure long-term income for its 150 MW BESS in the southern town of Nova Zagora. The developer also obtained green financing from local DSK Bank for the project with a total capacity of 601.8 MWh. It was commissioned in May 2026 and is currently the largest battery energy storage system in CEE.

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The PPA, redesigned: how TOKI makes renewable procurement more accessible

TOKI, part of Renalfa Solarpro Group, is a wholesale power trader, retail supplier and green energy aggregator in Southeast Europe. The company provides electricity supply, trading, balancing, aggregation, Power Purchase Agreement (PPA) and battery optimisation services for businesses, renewable producers and prosumers. TOKI helps companies access renewable electricity, improve cost predictability and take a more active role in the energy transition.

Why flexibility matters now?

Decarbonisation is already a competitiveness issue for a broad range of businesses. EU sustainability reporting rules and rising supply-chain expectations are making energy sourcing more visible in procurement, financing and customer relationships. This directly affects energy costs, financing conditions, customer trust and access to supply chains. Yet the instruments used by large corporate buyers often remain too complex for smaller companies. Conventional PPAs usually require large volumes, long commitments and dedicated legal or procurement capacity.

TOKI developed its flexible short-to-medium-term model to close that gap: to make renewable electricity procurement practical, transparent and easier to adopt.

What makes the model different?

Profile-based matching. Instead of relying on a fixed one-to-one or one-to-many structure, TOKI matches renewable producers and business consumers based on their generation and consumption profiles, contract needs and risk appetite. This creates more flexible routes to structure renewable energy agreements across different buyer profiles, including SMEs that are often excluded from conventional PPAs.
TOKI manages the operational layer: profiling, matching, sleeving, balancing, settlement and reporting, turning renewable production into a supply structure that fits the buyer's needs. Each client receives a clear sourcing solution while market complexity stays within TOKI's managed portfolio.

How does it work?

TOKI's experts analyse the customer's consumption profile, contract needs, risk appetite and sustainability objectives, then identify the renewable production profile that best fits those needs. They then structure an agreement that can cover all or part of the customer's electricity use with renewable energy, depending on the desired balance between demand, production and commercial priorities.

On the supply side, TOKI works with one or several renewable producers and manages the balance between production and consumption. The customer does not need an internal trading team or direct exposure to sleeving, allocation and balancing complexity. Since 2024, TOKI has executed nearly 100 such agreements, demonstrating the operational efficiency of the model.

What are the commercial benefits?

For business consumers, the value is immediate. A flexible PPA can hedge part of the electricity bill and reduce exposure to short-term volatility. It also gives smaller companies access to green electricity without the scale or complexity of a bespoke long-term PPA.

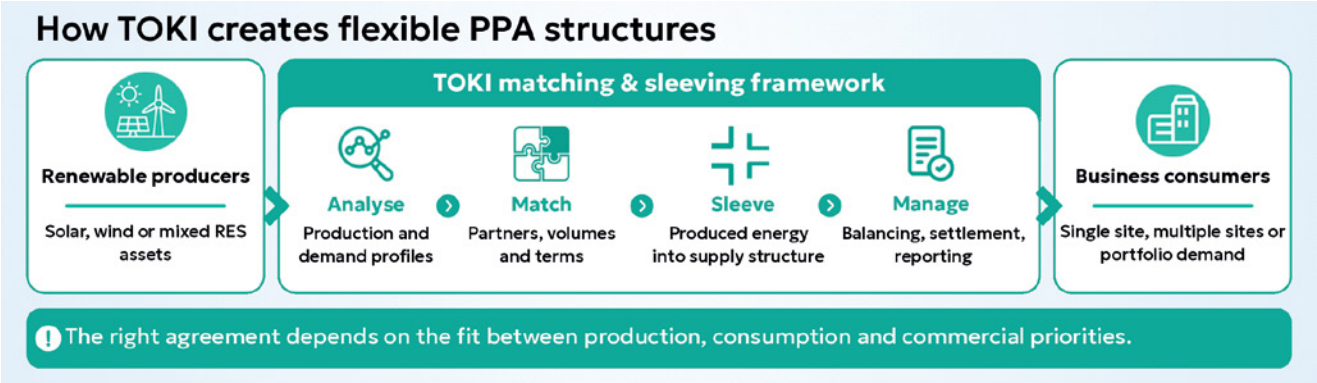
Just as importantly, it creates credible proof of action. Customers, lenders and partners increasingly ask how companies manage their environmental impact. A structured renewable electricity agreement gives businesses a practical answer.

Why it matters for Bulgaria's energy transition?

Bulgaria's energy transition will not be delivered by large industrial consumers alone. It also depends on manufacturers, hotels, logistics companies, retailers and service businesses that need simple tools with direct commercial value.

Flexible PPAs can help turn decarbonisation from a compliance topic into a procurement decision. They support renewable producers, improve cost planning for consumers and connect more companies to the country's growing clean-energy market.

For TOKI, this is the next phase of energy supply: greener, smarter and easier to use. Electricity is no longer just a monthly bill. Managed well, it becomes a strategic resource for competitiveness, resilience and growth.



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VPPs as an asset class in aid of decarbonisation

From capacity to flexibility

Bulgaria's main linchpin for decarbonisation is the energy transition. **Not only does the energy supply sector hold the largest GHG footprint, accounting for a third of gross emissions, but decarbonisation strides in industrial processes and transport also depend on clean electrification.** The first phase of the green power transition centred on additions in renewable capacity generation, where Bulgaria has performed strongly, mainly on the back of a solar boom. The considerable momentum of PV capacity has unveiled flexibility as the next required focus of the green transition, as the mismatch between peak midday generation and overall demand led to a surge in negative wholesale electricity prices and mounting curtailment risks. To this end, Bulgaria's response has been swift, positioning itself as a major BESS market.

The value of aggregation and coordination

Despite BESS capacity advancing at breakneck speed, batteries alone do not constitute a flexibility strategy. The power system's value proposition lies in dispatchability and real-time coordination between generation, storage, demand and market signals. Thermal, nuclear and renewable energy plants are tangible assets integral to the power system, but **flexibility has an intangible property delivered through software, algorithms and contracts.** Consequently, the next layer of Bulgaria's clean electrification challenge will be more about arranging physical capacity than adding it. **Here, virtual power plants (VPPs) play a crucial role by digitally aggregating distributed energy resources (DER), such as prosumer renewable generation assets, BESS, EV charging points, heat pumps and operating them as a single flexible portfolio.** Instead of treating each asset as a standalone unit, VPPs pool and coordinate their value, enhancing grid flexibility, integrating more renewable generation and broadening revenue streams through various services.

VPPs can be framed by the type of assets they aggregate. Supply-side VPPs pool decentralised generation assets such as solar, wind, small hydro or biogas plants, so that their output can be forecast, dispatched and traded collectively, thereby reducing fragmentation and variability. Demand-side VPPs are focused on the consumption end of the system, coordinating how electricity is used, instead of increasing supply. Flexible loads such as industrial processes, EV charging, heat pumps, refrigeration or heating, ventilation and air conditioning (HVAC) systems can be adjusted accordingly in response to price signals or grid constraints. Hybrid VPPs are the more versatile model, combining both approaches and adding storage to absorb surplus production and move demand to low-price periods, while coordinating generation with market opportunities.

Bulgaria's emerging VPP landscape

Unlike established Western European markets, Bulgaria's VPP landscape is nascent. In January 2025, energy software company **CyberGrid** announced that **EVN Bulgaria**, the Bulgarian arm of the Austrian energy group EVN, qualified as an aggregator to participate in balancing markets. **CyberGrid's** CyberNoc platform functions as a VPP that enables data exchanges between EVN, its assets and the TSO, facilitating trade and monetisation of EVN's flexibility in the manual Frequency Restoration Reserve (mFRR) energy market. The VPP provides round-the-clock automation and updates, real-time monitoring and a scalable architecture for integrating additional flexible assets. The connected assets include Albena Resort and EVN Toplofikacia's combined heat and power plant in Plovdiv.

Electrohold Trade, part of Electrohold Bulgaria, has also entered a partnership with German energy technology company **The Mobility House**, ushering in battery storage commercialisation similar to the logic of a VPP, albeit not branded as such. Under the agreement, Electrohold will use The Mobility House's aggregation and trading software to optimise a portfolio of co-located solar PV and BESS assets in Bulgaria, with a projected capacity of around 1 GW AC and 2.5 GWh, respectively.

Asset hybridisation coupled with large-scale BESS and portfolio optimisation activities is also VPP-adjacent. Austrian developer **Renalfa IPP's** Razlog project in southwestern Bulgaria combines a 33 MWp PV plant with a utility-scale BESS. The battery is managed by **KER Toki Power**, whose aggregator platform enables participation in capacity and balancing markets. While not explicitly a VPP operator, the project serves as an example of how hybrid renewable assets can move beyond passive generation towards system services.

For Bulgaria, VPPs could accelerate electrification by turning flexible consumption into a marketable resource. While the country's growing BESS fleet has provided a partial answer to the flexibility demands stemming from rapid solar deployment, VPPs provide a scalable architecture. As electrification penetrates sectors such as transport, industry and heating, asset coordination is crucial as behind-the-meter assets, EVs, charging infrastructure, industrial processes and heat pumps can be tethered to market and grid signals. From this vantage point, VPPs are a decarbonisation tool that also enhances energy security by enabling the optimal use of clean power and reducing exposure to volatility and congestion.

Ellatzite-Med AD: Transformation Begins with Technology

Energy management, digitalisation and decarbonisation as foundations for long-term sustainability



The mining industry in Europe and Bulgaria is often placed at the centre of debates on decarbonisation, energy intensity and ESG requirements. In practice, however, the sector's sustainable transformation does not occur through strategy papers and regulatory frameworks alone, but through concrete technological solutions embedded at the very core of production processes.

In recent years, technology has become the primary lever through which mining companies respond simultaneously to market pressures, energy uncertainty and growing demands for transparency and sustainability. Equipment electrification, production digitalisation and advanced environmental solutions are no longer "innovative projects," but essential drivers of efficiency, reliability and competitiveness.

Against this backdrop, the example of Ellatzite-Med AD, part of GEOTECHMIN Group, demonstrates how targeted investments in new technologies can form the backbone of energy management, decarbonisation and readiness for ESG and CSRD reporting. Rather than beginning with declarative goals, the company has grounded its transformation in machinery, processes and data—where real impact is generated.

Technological Transformation in Mining Operations

Over the past two decades, the company has implemented a consistent program of technological modernisation, fundamentally reshaping both its energy profile and operational productivity.

A key pillar of this transformation is the introduction of fully electric Hitachi EX2600-E excavators, which currently account for around 45% of the mine's total material extraction. This shift has significantly reduced direct (Scope 1) emissions, lowered dependence on diesel fuel and improved long-term cost predictability. In the near term, the company plans to commission an additional electro-hydraulic excavator from the same manufacturer.

Alongside electrification, Ellatzite-Med has also invested in a next-generation diesel excavator with approximately 10% lower fuel consumption than comparable machines. This is the high-tech Hitachi EX2600-7 LD - the first unit from the brand's seventh series deployed in Europe.

This balanced approach reflects a pragmatic transformation strategy: where full electrification is not yet optimal, the company adopts the most efficient technologies currently available.

A significant step forward has also been made through the implementation of an **automated mining management system** covering the entire equipment fleet. This has delivered:

- an 18.9% increase in overall productivity;
- minimised downtime and inefficient waiting periods;
- improved coordination across extraction, transport and unloading;
- elimination of redundant task execution.

The impact goes beyond operational gains. Higher efficiency translates into lower energy and resource intensity per unit of output - an essential factor for both cost control and carbon footprint reduction.



Technology investments also extend to environmental performance beyond energy and emissions. The company has introduced advanced systems for treating mine wastewater, enhancing control, reliability and environmental compliance. This reinforces the understanding that sustainability in mining is multidimensional and cannot be reduced to CO_2 alone.

A flagship project from the company's long-term water management strategy is the high-tech wastewater treatment plant commissioned in February 2026, built using German EnviroChemie technology. Based on the modular Enviromodule system, the facility provides fully automated mechanical and chemical treatment of water containing heavy metals and suspended solids. This third industrial water treatment plant at the mine has a capacity of 100 litres per second, with the possibility of expansion to 250 litres per second through additional modules.

In-House Energy Generation



A natural extension of the company's technological transformation is the development of its own renewable energy generation capacity. In 2023, Ellatzite-Med commissioned a small solar power plant with a capacity of approximately 1 MWh, now an integral component of its energy mix.

This project delivers both operational and strategic benefits:

- partial reduction in exposure to electricity market volatility;
- contribution to lower Scope 2 emissions;
- enhanced long-term resilience of production.

Toward Strategic Energy Management

Investments in equipment, digitalisation and energy-efficiency projects have laid the groundwork for a more mature and integrated approach to energy management. The company has maintained an ISO 50001-compliant energy management system for over a decade, providing a robust framework for monitoring, analysis and continuous improvement. More than 30 energy-saving measures have been implemented, resulting in annual savings of approximately 25,000 MWh of electricity.

Where these efforts were once carried out as stand-alone initiatives, today - under rising energy price pressures and tightening regulation - energy management has evolved into a strategic function closely linked to investment planning and risk management.

From Inventory to Strategy: Emissions Management and CSRD Readiness

The completion in 2025 of the company's first comprehensive greenhouse gas inventory marks a pivotal step forward. Data on Scope 1 and Scope 2 emissions, along with relevant Scope 3 categories, now provide a solid basis for planning and prioritising mitigation measures.

Building on this foundation, the company is currently developing a structured emissions management plan - conceived not as a formal reporting exercise, but as a practical management tool to guide operational decision-making and future ESG and CSRD disclosures.

As a second-wave CSRD company, Ellatzite-Med is using this transition period not for box-ticking compliance, but for structuring and integrating an already ongoing transformation.

From Technology to System

The case of Ellatzite-Med demonstrates that sustainable transformation in industry does not begin with reporting - it begins with technology, processes and energy infrastructure. These are the foundations upon which effective energy management, meaningful decarbonisation and credible ESG reporting can be built.

This phased, pragmatic and technology-driven approach outlines a realistic pathway for other companies in the sector. In an environment defined by high energy costs, regulatory pressure and long investment cycles, competitiveness will increasingly depend on the ability to integrate technology, energy and sustainability into a unified management system.





The role of renewables in decarbonisation

Renewable energy has become a fundamental pillar of Bulgaria's decarbonisation strategy. In a world of extreme geopolitical tensions, the development of own renewable energy sources is critical for ensuring energy security and curbing price volatility. Bulgaria is moving fast in its clean energy transition and has effectively reshaped the structure of its national power system. Although the share of renewable energy in gross final energy consumption remained broadly stable at 23.2% in 2024 - almost unchanged from its 2020 level - the underlying structural shift is evident in the rapid pace of solar deployment. Driven by the expansion of photovoltaics, the share of renewables in total installed power generation capacity rose to 58% in 2025, up from 42% only three years ago.

Bulgaria installed over 1.5 GW of new photovoltaic capacity in 2025, marking the third consecutive year of gigawatt-scale additions and pushing cumulative solar capacity in the country to 6.1 GW. However, the lack of balance in development of new capacities between technologies led to a surge in negative wholesale electricity prices and curtailment risks. To mitigate these risks and stabilise the grid, large-scale storage integration has become an urgent priority. Bolstered by the National Infrastructure for Storage of Electricity from Renewable Sources (RESTORE) programme, funded via the National Recovery and Resilience Plan, which approved financing for over 14 GWh of battery energy storage systems (BESS) in total, Bulgaria became one of Europe's three most attractive markets for investments in co-located battery storage together with Germany and the UK, according to the European Co-location Markets Attractiveness Report 2026 by Aurora Energy Research. **Bulgaria reported the commissioning of 2.5 GWh of new BESS capacity in 2025 alone, emerging as the fastest growing and third-largest BESS market in the EU.** In addition to the BESS boom, pumped hydro storage was recognised as a top priority in order to achieve energy system flexibility.

Not all renewable energy sources have been part of the sector's success story in Bulgaria. Wind energy development has experienced a prolonged stagnation, with Bulgaria being among the very few European countries that have failed to commission a single new wind farm in over a decade. Complex administrative barriers, regulatory uncertainties and localised public opposition have been blocking deployment so far, but positive signs have appeared on the horizon with the start of construction works on the first new projects in the northeast of the country in the first half of 2026.



Nobody Can Turn the Tap on Wind and Solar

Nikola Gazdov,
Chairman of APSTE

The Association for Production, Storage and Trading of Electricity (APSTE) is an industry organisation supporting the development and market integration of renewable energy and storage technologies in Bulgaria and SEE. APSTE brings together technology providers, businesses, policymakers and local stakeholders to promote innovation, shape supportive regulation and accelerate the transition to a secure, low-carbon energy system.

Nikola Gazdov is an entrepreneur with 18 years of experience in renewable energy. He is Chairman of APSTE and co-founder of RE-Source Southeast, a regional hub of the RE-Source Platform dedicated to advancing renewable corporate sourcing across Southeast Europe. Nikola is part of the National Associations Committee at SolarPower Europe and an active member of several working groups at WindEurope. On the business front, he is Director at Element Power, a renewable energy development platform active across Southeast Europe, and CEO of Renergy, a technical advisory firm.

Renewables are growing rapidly in Bulgaria. How important are they becoming for decarbonisation?

Their role is already substantial and growing very quickly. In 2020, Bulgaria had around 1 GW of installed solar capacity and zero battery storage. Today, it has nearly 7 GW, plus roughly 9 GWh of batteries.

This spring, solar generation alone exceeded Bulgaria's electricity consumption during certain hours, while at the same time, over 1 GW of battery storage was charging. That would have sounded like science fiction only a few years ago. The significance goes beyond emissions reductions. Renewables are changing the economics of the power system itself. Combined with storage, they are turning Bulgaria from a market worried about oversupply into a market increasingly capable of exporting flexibility and balancing capacity across the region.

Bulgaria still relies heavily on coal. How do you see the country's decarbonisation path?

The transition will not be linear and coal will not disappear overnight. It still plays an important role during winter periods and regional market stress. But the direction of travel is becoming very clear. Every solar project and every battery installed reduces the hours during which coal and gas determine market prices. What is changing now is not only the generation mix, but the underlying economics of the system.

Decarbonisation in SEE will happen less through administrative pressure and more because renewables and storage are increasingly becoming the cheaper and more competitive solution.

Bulgaria became the EU's third-largest battery storage market in 2025. What explains that momentum?

The market itself created the incentive.

As solar capacity expanded rapidly, midday electricity prices started collapsing. Batteries became the obvious solution — absorbing cheap electricity during the day and releasing it during evening peak hours when prices are higher.

What surprised many people was the speed. 2025 was a record-breaking year for battery storage deployment in Bulgaria, but the data shows that 2026 has already surpassed it. The effect becomes visible within weeks, not years — this year Bulgaria went from net importer during peak hours to net exporter in the space of a few months. Every battery that came online immediately started affecting market behaviour, buying cheap regional solar during the day and selling into the evening peak.

Long term, batteries will become a core pillar of the electricity system as they make large-scale renewable generation manageable, flexible and commercially viable.

Has the conflict in the Middle East strengthened the business case for renewables and storage?

It has and the argument is becoming harder to ignore. The war in Ukraine already demonstrated how dangerous dependence on imported fossil fuels can become in times of geopolitical turmoil. Current tensions in the Middle East are reinforcing the same lesson. Geopolitical crises around major fuel transit routes quickly translate into volatility in European electricity prices.

Renewables and storage reduce that exposure directly. Oil tankers must pass through the Strait of Hormuz. Gas depends on pipelines and geopolitics. Nobody can turn the tap on wind and solar. That is why the discussion is no longer only about climate policy. It is increasingly about strategic resilience, industrial competitiveness and security of supply.

Is there tension between energy security, competitive electricity prices and decarbonisation?

Increasingly, they support each other. Cheap domestic renewable generation improves competitiveness. Storage improves flexibility and system stability. And renewables strengthen energy security by reducing dependence on imported fuels and external supply chains that can be disrupted, weaponised or simply priced out of reach.

For decades, Southeast Europe depended heavily on coal, imported gas and oil products. The recent crises showed that the problem is not only price volatility. It is also the physical security of supply.

Nobody can sanction the sun. No conflict closes access to a Bulgarian wind or solar farm.

The main challenge now is political and regulatory: faster permitting, stronger interconnections and market frameworks that do not obstruct investment. The technology is ready. The economics work. SEE may be discovering that the fastest path to energy security is no longer fuel storage, but electricity storage.

The next phase of Bulgaria's green transition - from capacity to system integration

The progress of the green transition in Bulgaria is also reflected in the sharpened ambition to align with the EU's 2030 climate goals. The country's updated National Energy and Climate Plan (NECP), submitted to the European Commission in early 2025, set the target share of renewables in gross final energy consumption at 34.96% by the end of the decade, a significant upgrade from the 27.09% envisioned in the 2019 draft. For the electricity sector specifically, the bar was set even higher, aiming for a 49.34% renewables share. According to Eurostat, renewables accounted for 23.21% of Bulgaria's gross final energy consumption in 2024. While this represents a marginal increase from the 23.15% recorded in 2023 and a more visible improvement over the 2021 and 2022 figures, when the share was below 20%, it underscores the need for accelerated deployment to bridge the remaining gap to the 2030 target.

A deep dive by sectors reveals widely divergent trajectories. The electricity sector demonstrated the most robust growth, with renewable electricity reaching a share of 33.84% in 2024, sharply up from 29.70% in 2023 and 20.36% in 2022. Yet, Bulgaria trailed the EU average share by a notable 13.6 pp gap, significantly wider than the overall gross energy consumption gap of 2 pp. The transport sector remained a laggard, with renewables forming a modest 8.20% share of gross final energy consumption, registering virtually no progress over the past three years and sitting below the EU average of 11.20%. Conversely, heating and cooling represented the only sector in which Bulgaria has consistently outperformed its EU peers, achieving a 34.19% share of renewables in gross final energy consumption in 2024, comfortably above the EU average of 26.74%.

23.21%
Share of renewable energy in gross final energy consumption (2024)

34.96%
Target share of renewable energy in gross final energy consumption (2030)

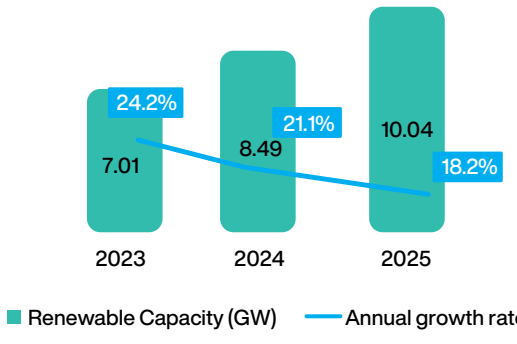
33.84%
Share of renewable energy in gross final electricity consumption (2024)

49.34%
Target share of renewable energy in gross final electricity consumption (2030)

The underlying driver of the electricity sector's green progress is the unprecedented expansion in physical infrastructure. According to data from transmission system operator ESO, Bulgaria's total installed power capacity expanded within three years to 17.286 GW, excluding BESS, in 2025 from 13.505 GW. This rapid growth was almost entirely fueled by renewable energy, particularly solar photovoltaics.

Installed renewable capacity, including solar, hydro and wind, climbed at much faster annual rates than the overall, from 7.01 GW in 2023 to 8.49 GW in 2024, before reaching 10.04 GW in 2025. Thus, within two years renewables transformed from a minority contributor to the dominant force in the national grid, responsible for 58% of the total installed power capacity.

Fig 22. Total renewable capacity and annual growth rates



Note: PSHPP Chaira is included in the overall installed renewable power capacity.
Source: ESO

This renewable capacity boom has tangibly altered Bulgaria's actual power generation mix. Electricity output from renewable sources jumped to 10.767 TWh in 2025 from 8.253 TWh two years earlier. Solar generation alone surged to 6.409 TWh in 2025, up from 3.335 TWh in 2023, resulting in photovoltaics covering 16.5% of Bulgaria's 2025 gross electricity consumption of 38.876 TWh.

Bulgaria's ability to meet its 2030 renewable energy targets depends on pivoting from raw capacity addition to complex system integration. The first phase of the green transition was executed through rapidly building solar generation capacity. What remains to be done is to integrate these resources into the energy system by enhancing grid readiness and flexibility, which could turn Bulgaria into a regional energy hub for renewable power generation, energy storage, balancing and system services, provided that regulatory development is accelerated to meet the needs of the highly dynamic market.



Bulgaria's Wind Power Reset: A New Phase for Decarbonisation

Miglena Stoilova,
Chair of BGWEA

The Bulgarian Wind Energy Association (BGWEA) represents Bulgaria's wind energy sector, bringing together most wind power companies across the value chain and accounting for a significant share of the country's installed wind capacity. BGWEA advocates for the sustainable and economically viable development of wind energy by working to improve the legislative, regulatory and policy framework while promoting research, knowledge-sharing and wider renewable energy development in support of Bulgaria's energy transition.

Miglena Stoilova is a leading renewable energy executive in Bulgaria and a recognised authority in the sector. As Chair of BGWEA, she actively contributes to the direction of sustainable energy development in the country. Over the past 17 years, she has led the activities of major international companies, including Enel and Public Power Corporation, supporting market liberalisation and the decarbonisation of the electricity sector.

After more than a decade of limited development, Bulgaria's wind sector appears to be entering a new phase. What has changed and why is now the right time to restart its growth?

The first phase of wind energy development in Bulgaria took place between 2005 and 2013. It was largely driven by regulatory support mechanisms, most notably long-term contracts and preferential feed-in tariffs for renewable electricity. These measures created an initial investment impulse, although wind technologies at that time were not mature enough to develop sustainably under fully market-based conditions.

Over the past decade, the sector has undergone a fundamental global transformation. Around 80% of global wind power production is now generated at lower estimated costs than coal or gas, which has driven a sharp increase in installed capacity worldwide. This has changed the investment logic and made it possible for new projects to be developed without subsidies, on a fully competitive market basis.

Wind energy received an additional boost after the European energy crisis triggered by the disruption of Russian pipeline gas supplies. European policy became more focused on accelerating domestic renewable and price-stable energy sources that reduce import dependence and mitigate the economic impact of geopolitical risks.

After more than a decade of stagnation, with almost no new wind capacity built, Bulgaria's wind sector is now entering a new development cycle. This phase is supported by several mutually reinforcing factors. First, the European regulatory framework is shifting towards faster investment processes. Initiatives such as the Net Zero Industry Act, REPowerEU, the Renewable Energy Directive III (RED III) and permitting reforms aim to shorten administrative timelines, improve grid access and create a more predictable environment for investors. Second, market logic in the European Union increasingly favours low-carbon and low-risk energy assets, with renewables seen not only as a decarbonisation tool but also as a driver of industrial competitiveness and energy security. Third, technological maturity now enables better system integration through battery energy storage systems (BESS) and advanced grid solutions, reducing previous constraints related to variability.

In this context, wind energy is no longer a peripheral or subsidised source. It is a structural component of the future energy mix, aligned with a new paradigm in which reliability, cost predictability and system flexibility are the key criteria. The combination of European regulatory support, declining technology costs and growing demand for secure, low-emission and price-stable energy creates a significant opportunity for Bulgaria. Used strategically, it can help position the country as an active participant in the regional energy transition and a competitive producer of sustainable electricity within the European Union.

What role can wind energy play in the decarbonisation of Bulgaria's economy, particularly for industries whose carbon footprint is largely linked to the electricity mix?

Wind energy has a key role in the decarbonisation of energy systems because it has the lowest life-cycle emissions among electricity generation technologies, from component manufacturing to operation and decommissioning. This applies not only in comparison with conventional sources but also relative to other renewable technologies, including solar, hydro and geothermal energy. In the context of the European Union's climate targets and the need for sustained CO_2 reduction, wind power is becoming one of the core structural elements of the low-carbon transition.

Within the EU, wind energy is already the second-largest source of electricity for consumers, accounting for 19%, immediately after nuclear power. This highlights its systemic importance and its ability to contribute significantly to the decarbonisation of the energy mix.

For Bulgaria, wind energy can play a particularly important role in decarbonising the economy, including energy-intensive sectors where electricity cost and carbon footprint

are key determinants of competitiveness. Representatives of major Bulgarian industrial companies emphasise that the high emissions factor of the country's electricity mix is one of the main drivers of overall industrial carbon intensity. In some cases, up to 75% of total corporate emissions are indirect, linked to electricity purchased from the grid, while around 25% originate from direct industrial processes.

Increasing the share of wind energy in the electricity mix directly reduces the emissions factor of electricity, creating a multiplier effect across the economy. This reduces the carbon footprint of industry and strengthens competitiveness under increasingly strict EU regulations and mechanisms such as the Carbon Border Adjustment Mechanism (CBAM). A higher share of wind power also reduces dependence on coal-fired generation and imported fuels, improving energy security and lowering price volatility for industrial consumers.

Certain industrial sectors still face structural limits to direct electrification, including fertiliser, cement and glass production, where high-temperature and complex chemical processes cannot easily be replaced by electricity. These sectors require low-carbon gaseous energy carriers to replace direct fossil fuel combustion. Wind energy can be a crucial enabler of their decarbonisation because green hydrogen requires abundant and low-cost renewable electricity for electrolysis. In this sense, wind power provides the foundation for a hydrogen economy and deep industrial decarbonisation.

BGWEA members are currently developing projects with a total potential of around four GW at various stages of development. Some of these projects could realistically be commissioned by 2030, provided that key regulatory and grid access barriers are addressed. This would increase the share of wind energy in the national electricity mix and help stabilise it at a low-carbon level.

What are the main barriers to accelerating wind projects in Bulgaria and which policy or regulatory changes are most urgently needed?

The main barriers to faster wind energy development in Bulgaria are administrative complexity, insufficient market liberalisation and limited grid readiness in regions with high wind potential.

In the current regulatory and institutional context, project planning, assessment and approval processes remain significantly delayed. Due to incomplete transposition of parts of EU legislation and limited administrative capacity in certain institutions, the total timeline for obtaining all necessary permits often exceeds four to five years. In countries such as Germany, these processes take around 17-18 months. Such delays create substantial barriers to investment activity, increasing development costs by up to 10-20% of total project value. They also reduce predictability and increase regulatory risk, which affects the final cost of electricity and slows the energy transition.

From an infrastructure perspective, a key challenge is the limited transmission capacity in parts of the country where the best wind resources are concentrated. This creates a need for upfront investment in grid expansion, substation modernisation and more flexible load management systems.

It is also essential to establish a more predictable and long-term market framework that reduces investment risk and stimulates new wind investment. In this context, Contracts for Difference (CfDs) are particularly important. These mechanisms are already widely used across several European countries to accelerate wind energy investment. CfD schemes reduce price risk through competitive auctions, lower electricity generation costs and enhance sector competitiveness. At European level in 2025, more than 22 GW of new onshore wind capacity was procured through such mechanisms. In the United Kingdom, recent auction results delivered prices around 40% lower than the cost of new gas-fired generation. A similar development is visible in Romania, where CfD schemes supported by the EBRD enabled successful auctions delivering over one GW of wind projects at highly competitive prices of around EUR 70/MWh.

Another sustainable market mechanism is Power Purchase Agreements (PPAs), although these remain limited in Bulgaria because of non-market interventions that reduce incentives to sign them. Key barriers include the continued revenue cap on electricity producers, which remains in force through 2026, and compensation schemes for non-household consumers, which weaken business interest in long-term PPA contracts. Together, these factors undermine the development of stable, long-term market mechanisms.

Removing these barriers and accelerating the deployment of CfD and PPA mechanisms would have a direct economic impact by reducing electricity generation costs, lowering investment risk and accelerating the deployment of new wind projects.

What should a balanced low-carbon energy mix for Bulgaria look like?

Bulgaria's low-carbon energy mix should include a balanced combination of wind, hydro and solar energy, complemented by storage systems such as pumped-storage hydropower plants and batteries. Wind power contributes significant volumes of clean electricity, particularly at night and during winter, when solar generation is more limited. This combination reduces the need for carbon-intensive energy sources and supports both supply security and price stability.

Such an integrated energy system guarantees sustainability and economic competitiveness. It is important to note that the cost of returning electricity from batteries to the grid is significantly higher than the low-cost generation provided by wind and solar. Batteries are therefore roughly two to three times more expensive than direct wind generation. However, their value does not lie in low electricity production costs but in the flexibility and system stability they provide. Batteries smooth fluctuations, cover peak demand and enable more efficient use of renewable electricity.

An optimally balanced wind-solar-battery model captures the benefits of complementary generation profiles, reduces the frequency and depth of supply shortages without requiring large-scale storage volumes and makes renewables competitive with baseload generation in terms of system profile while delivering cheaper, zero-emission electricity.



Wind energy: reviving the sector

After a strong start in the late 2000s and early 2010s, when the whole currently operational capacity was installed, wind was relegated to the weak spot of the Bulgarian renewable energy sector. Despite the country's promising wind resources, wind power deployment in Bulgaria has endured stagnation for over a decade.

As of May 2026, the total installed wind power capacity amounted to 715 MW, still unchanged since the end of 2025, when it accounted for 4.1% of the overall installed power capacity in the country, down from 4.5% in 2024 and 4.9% in 2023. Wind's share in the renewables portfolio has also constantly been narrowing due to the aggressive expansion of solar capacities and fell to 7.1% in 2025 from 10.1% in 2023. Power generation from wind mirrored this decline, dropping to 1.263 TWh in 2025, compared to 1.377 TWh in 2024 and 1.584 TWh in 2023, and covering 3.2% of domestic electricity consumption, according to ESO data. Thus, the wind power output fell short of the revised NECP 2025 projections of 1.567 TWh. NECP projections become even more ambitious over a five-year horizon, with onshore wind capacity expected to reach 1.99 GW and wind power generation seen at 4.140 TWh by 2030, which would mean tripling wind's current figures.

This standstill places Bulgaria in stark contrast to the broader EU trends. WindEurope data shows that the EU added 15.1 GW of new wind capacity in 2025, with wind now meeting 19% of the bloc's overall electricity demand. Many SEE countries have significantly outpaced Bulgaria – most notably Greece, which increased its wind capacity by 340 MW last year alone and covers 21% of its demand via wind. Meanwhile, Croatia and Romania meet 17% and 11%, respectively, of their power consumption with wind. Serbia also overtook Bulgaria in terms of installed wind power capacity by adding 199 MW to reach a total of 807 MW.

Installed wind capacity in Bulgaria (2026):

715 MW

Wind projects pipeline (2026):

4,000 MW

The reasons for the lack of newly commissioned wind farms in Bulgaria in the last 10 years include overlapping regulatory, administrative and infrastructural bottlenecks, as reported by the Association for Production, Storage and Trading of Electricity (APSTE) and the Bulgarian Wind Energy Association (BGWEA). Developing wind projects is an inherently complex and time-consuming process that requires extensive environmental assessments, spatial planning and grid coordination. While the revised EU Renewable Energy Directive (RED III) mandated the designation of acceleration areas to streamline permitting, Bulgaria's transposition of these provisions has been heavily delayed. Furthermore, market predictability remains a critical obstacle. While long-term PPAs are the standard mechanism for unlocking wind investments globally, restrictive domestic frameworks, such as Article 100(4) of the Energy Act, effectively prohibit wind farms from offering long-term products.

Despite the challenges, the wind sector has shown signs of revival and Bulgaria is estimated to possess a pipeline of over 4 GW in mid- and late-stage wind projects, with expectations that the first new capacities will break ground in 2026 and come online by 2027. According to BGWEA, at least 3 GW of the current pipeline could realistically be commissioned by the end of the decade.

As of April 2026, two wind farms, both in northeastern Bulgaria near the coastal town of Balchik, were announced as being in development. **The 70 MW Strazhitsa project, developed by local company Tessa Green Energy, will cost EUR 100 mln and is expected to begin operation by the end of 2027**, adding about 10% to the country's currently available wind capacity. According to Bulgarian news outlet Capital, the wind farm will be built with a combination of own and loan financing, with a EUR 86 mln loan already secured from the Eurobank Bulgaria group. The project has all necessary permits, including a licence from the Energy and Water Regulatory Commission for the production of electricity since October 2025, and is under construction. The projected annual electricity production of the wind farm is 220 GWh.

Again as of April 2026, Bulgaria's DMT Prime announced the approaching start of construction of a 72 MW wind farm, located near the villages of Kremena and Trigortsi in the area of Balchik. The Sofia-based company is acting as owner's engineer on the project owned by United Group, which will consist of 15 turbines, each with a capacity of 4.8 MW. Additionally, a 40 MW project near Nikopol at the Danube is in the design and permitting stage. The project is developed through a joint venture between DMT Prime and Electricity and construction is planned to start in 2027, while commissioning is expected in late 2027 or early 2028. In addition to its two most advanced projects, DMT Prime announced a pipeline of more than 500 MW of developments, including a 150 MW project near Kavarna at the Black Sea coast, as well as developments near the towns of Razgrad and Radomir.

Windkraft Simonsfeld AG, parent company of Windkraft Simonsfeld BG, celebrates 30 years of renewable energy leadership

Austrian renewable energy producer Windkraft Simonsfeld AG, the parent company of Windkraft Simonsfeld BG, is celebrating its 30th anniversary this year. This birthday marks three decades of growth from a small regional wind power initiative into one of Austria's leading renewable energy companies.



Founded in the mid-1990s in a small village called Simonsfeld, the company started with just two wind turbines. Today, Windkraft Simonsfeld employs more than 150 people, operates 94 wind turbines in Austria, two wind turbines in Bulgaria and a photovoltaic power plant in Slovakia, producing around 653 million kWh of clean electricity annually — enough to supply approximately 163,200 households. The company has also become one of Austria's largest citizen participation energy companies, with around 2,700 shareholders investing in the energy transition

One of the milestones of course was the international expansion: Since entering the Bulgarian market in 2008, the company has operated the Neykovo wind park near Kavarna in northeastern Bulgaria since 2009, contributing to the country's renewable energy production and supporting regional decarbonisation efforts.



Markus Winter, CTO of Windkraft Simonsfeld, underlines the company's long-term commitment to renewable energy development in Southeast Europe: "Our Bulgarian operation reflects the group's broader strategy of investing in stable, long-term renewable energy assets across Central and Southeastern Europe. Bulgaria remains an important market for renewable energy development due to its favourable wind conditions and growing focus on energy diversification and sustainability. We see strong potential for renewable energy development in Southeast Europe and want to continue contributing our expertise and experience."

Under the anniversary motto "30 years are only the beginning", Windkraft Simonsfeld says the milestone is not only a reason to celebrate past achievements, but also to focus on the future of Europe's energy transition.

"The geopolitical developments in Europe and the Middle East show how vulnerable our energy system is and how important a stable domestic energy supply has become," said Markus Winter.



During the anniversary celebrations at the company headquarters in Ernstbrunn, representatives from politics including the Austrian president Alexander Van der Bellen, business and the renewable energy sector, highlighted the importance of regional clean energy production for Europe's energy independence and economic development.

With three decades of experience and a growing international footprint, Windkraft Simonsfeld says it aims to continue expanding renewable energy generation and supporting Europe's transition towards a more secure and sustainable energy system.

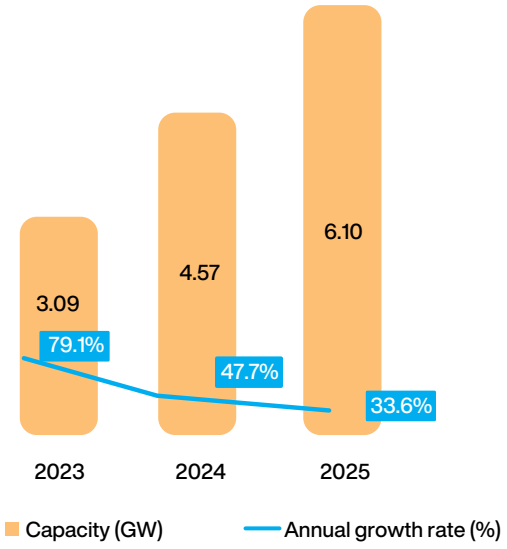


Solar energy: the dominant force in capacity growth

Bulgaria has fundamentally redefined its energy landscape over the past few years, evolving rapidly into a major SEE solar powerhouse. The country has witnessed an explosive surge in photovoltaic deployment, which not only changed the balance of the system and displaced traditional power generation to a large extent, but also triggered a secondary revolution in battery energy storage systems.

Installed photovoltaic capacity effectively tripled over the past five years and doubled only within the period 2023-2025. In the last year, solar experienced a 33.6% hike in installed capacity, bringing the total to 6.104 GW. A year earlier, it stood at 4.568 GW, following an even stronger annual growth of 47.7% from the just over 3 GW operational in 2023. In absolute terms, solar added 1.536 GW in 2025 – by far the largest increase of any energy source. Consequently, solar energy accounted for 35.3% of Bulgaria's total installed power capacity. Solar is no longer just the largest source of new capacity, but also the largest technology in the entire Bulgarian energy system by share. Within the green power fleet, solar's dominance is overwhelming, representing 60.8% of total renewable energy capacity as of 2025. Two years earlier, it accounted for less than half of the overall renewable capacity in the country.

Fig 23. Solar capacity and annual growth rates (GW)



Source: ESO

The fast expansion, however, didn't end in 2025. ENTSO-E's transparency platform shows that, as of mid-May 2026, installed solar capacity in Bulgaria has further grown by more than 400 MW to a total of 6.505 GW. The cumulative solar capacity was projected to reach 7 GW by mid-2026, according to APSTE. For the next few years, the association expects the market to continue expanding at a more moderate pace of 450–750 MW annually.

The ongoing momentum is showcased by the most significant capacity addition of early 2026 - the St. George Solar Park in Silistra, commissioned by the independent power producer Rezolv Energy in May 2026. The facility became one of Bulgaria's largest solar parks with an installed capacity of 225 MW. With a total investment of EUR 255 mln, the plant was built on the 165-hectare site of the former Silistra airport. Designed to operate for at least 30 years, the facility will generate approximately 313 GWh of electricity annually. The project's financial and technical structure reflects the new maturity of the Bulgarian market, integrating both corporate VPPA and co-located storage. More than 30% of the generated power will be supplied to Ardagh Glass Packaging-Europe under a 12-year VPPA. The park is also co-located with a 90 MW battery energy storage system, financed under the NextGenerationEU programme.

The recent explosive growth of solar capacities was propelled predominantly by private, market-driven initiatives, underpinned by targeted grant schemes. Under the NRRP, Bulgaria approved 249 proposals for renewable energy and battery storage projects for a total of EUR 268.9 mln, to be completed by March 2026. The first call, targeted at projects with individual capacity between 200 kW and 2 MW, was expected to deliver 435 MW of solar capacity and 176 MW of BESS, while the second call for larger projects envisaged the deployment of 2.660 GW of solar capacity and 1 GW of batteries. This trend was backed by corporate PPAs and both local and international lenders who assessed positively the long-term viability of the Bulgarian solar market. However, this abundant solar generation reshaped the market - as the 6 GW of solar capacity flooded the grid, wholesale electricity prices were pushed down sharply and the market witnessed sustained periods of zero and even negative electricity prices during midday hours in the summer and even spring and autumn months. This unlocked the next massive wave of green investments – in battery storage.

Battery storage: from emerging market to European frontrunner

Energy storage is a key enabler of the transition to an electricity system based on renewables, which, besides reducing emissions, are becoming increasingly affordable and ever more important for energy security. Rapid declines in battery costs have accelerated deployment globally in recent years. In Bulgaria, battery storage has been experiencing exponential growth after 2024, turning the country into a leading global market relative to its size and a regional balancing player. Bulgaria also has an 864 MW pumped-storage hydropower plant, although part of its turbines are currently out of operation and there are plans to further develop this technology.

In 2025, Bulgaria was the fastest-growing battery storage market in the EU, according to data from SolarPower Europe. It added 2.5 GWh of new grid-connected capacity, compared to only about 200 MWh in 2024, representing a year-on-year growth rate of more than 1,200%. This placed Bulgaria as the third-largest battery storage market in the EU last year, behind Germany with 6.6 GWh of annual installations and Italy with 4.9 GWh, but ahead of the Netherlands and Spain. Bulgaria represented 9% of newly installed battery storage capacity in the EU in 2025 and 4% of the bloc's cumulative installed battery storage fleet.

Growth is concentrated in the grid-scale segment, while distributed storage is relatively unexploited because of highly regulated electricity markets.

According to statistics from Bulgaria's Electricity System Operator (ESO), the country reached 1,382 MW of installed battery energy storage systems in 2025. **Data from the ENTSO-E Transparency Platform shows that this rose to 3,318 MW as of May 2026, underscoring how quickly the market is expanding.** The rapid build-out is expected to continue in the coming months. For comparison, the European country with the most energy storage capacity - Germany - has 14,025 MW based on ENTSO-E data, while neighbouring Romania has 493 MW.

3,318 MW
as of May 2026

In Bulgaria, the boom is driven by a confluence of factors, with a strong impetus from an EU-funded programme under Bulgaria's National Recovery and Resilience Plan (NRRP).

The market itself has strengthened the investment case for battery storage through the surge in solar generation and resulting periods of negative midday prices. A low-burden framework, including easy permitting and the absence of double charging for storage, has helped storage projects spring up quickly.

Over 13,000 MWh of total battery energy storage projects in Bulgaria have been backed under the RESTORE programme of the NRRP and the RESTORE 2 expansion measure.

RESTORE, financed with EUR 603 mln from the Recovery and Resilience Facility, aimed to support the installation and commissioning of 3,000 MWh of grid-scale electricity storage facilities. Aid was offered for up to 50% of costs. In April 2025, the scheme awarded 82 projects totaling 9,712.89 MWh, more than three times the targeted capacity and around EUR 587.5 mln in investment. The website of the energy ministry currently shows that grants for 81 projects have been approved.

The scheme was expanded with RESTORE 2, which targeted projects with at least 1.9 GWh of usable energy capacity at the level of the electricity grid. In December 2025, the programme selected more than 4 GWh of projects for support with total grant funding of EUR 117 mln. The average grant requested per project was less than EUR 36,000 per 1 MWh.

In 2024, Bulgaria also held a tender for co-location projects under the NRRP where 3,095 MW of renewable energy and 1,176 MW of energy storage projects were successful.

Aurora Energy Research has identified Bulgaria in a May report as one of Europe's most attractive markets for co-location investment, ranking it joint second alongside Great Britain behind Germany. As advantages for Bulgaria, it pointed at strong subsidies, a robust pipeline and favourable economics.

In a recent interview with Bulgarian weekly newspaper Capital, the country's new energy minister Iva Petrova attributed the success of the RESTORE scheme to a combination of market stimuli, right timing and the more classic design of the scheme offering CAPEX support. She said that the funding of nearly EUR 1 bln under RESTORE and the renewables-with-storage scheme is yet to be paid out because disbursements only take place after projects are switched on. This will create a challenge for the ministry due to the need to quickly carry out monitoring, verification and payments. The minister noted that as more battery capacity comes online, the price spreads will start to narrow, making it increasingly important for batteries to move beyond price arbitrage into balancing markets, system services and other grid-support products, which will require a review of the technical and regulatory rules.

In comments in March, Nikola Gazdov, Chairman of the Association for Production, Storage and Trading of Electricity (APSTE), said that price cannibalisation in the battery storage sector is not expected over the next three to four years, as price volatility is likely to persist and Bulgaria, along with Greece and Romania, continues to expand solar capacity.

Bulgaria has accordingly become home to some of the largest battery energy storage projects in Europe.

In May 2025, **Advance Green Energy** inaugurated a 124 MW/496.2 MWh battery energy storage installation at the Balkan industrial park in Lovech, a town in central northern Bulgaria. The project, constructed in six months, is funded under the RESTORE programme. It is connected to Bulgaria's first licensed closed distribution network.

In October 2025, Vienna-based developer and independent

power producer **Renalfa IPP** announced the commissioning of a 65 MW/260 MWh battery energy storage system as part of its Tenevo hybrid renewable project in southeastern Bulgaria. The Tenevo project is planned to pair 238 MWp of solar with a total of 315 MW/760 MWh of battery storage.

In January 2026, UK-based independent power producer **ContourGlobal** officially opened a 202 MW/500 MWh battery energy storage system in the Stara Zagora region, at a site within the Maritsa East 3 coal-fired power plant. The company said the EU-financed project was already participating in both the day-ahead and intraday national electricity markets. A second phase of a further 202 MW was under development at the same site.

The late spring, particularly the month of May, was very busy when it comes to the launch of newly-installed facilities. Austria-based renewable power producer **Enery** commissioned its 150 MW/601.8 MWh Nova Zagora battery energy storage system in the town of Nova Zagora, southeastern Bulgaria, touted as the largest operational battery in Central and Eastern Europe (CEE). The standalone system will be run under a virtual power purchase agreement with Swiss-Dutch energy and commodities trader **Vitol**. Financing was provided by local lender DSK Bank AD, part of Hungarian financial services provider OTP Group.

The same month, **Eurohold Bulgaria** and **360 Energy** commissioned a 36 MW/72 MWh battery energy storage system at the Maglizh solar farm in south-central Bulgaria, turning the 161 MWp power-generating facility into a hybrid park.

On the very first day of June, **Sunterra RE** announced the commissioning of batteries at three solar parks, thus concluding Phase 2 of its BESS investment programme. Consequently, the firm now operates 150 MW/450 MWh in Galabovo, 150 MW/506 MWh in Kaloyanovo and 97 MW/320 MWh in Karlovo.

Bulgaria has in addition become active in the battery manufacturing sphere. Sofia-based **IPS** in October 2025 cut the ribbon on a 3 GWh semi-automated battery production facility in Bulgaria's capital, expecting to reach 5 GWh of annual battery production capacity at the site in 2026. The company aims to have 15 GWh of production capacity by the end of 2027.

The influx of battery storage systems is changing the way the whole system is operated. Most of the new capacity is connected to the medium-voltage and 110 kV grids, which leads to periods of higher load on these grids and exhaustion of transformer capacity, ESO Executive Director Kiril Georgiev has commented, adding that the operator has taken steps to increase the transformer capacity in the transmission network and expects them to deliver results by the end of 2026.

According to a draft of ESO's 10-year plan, published in March 2026, 7,610 MW with a capacity of roughly 25,000 MWh are expected to be connected in the 2026-2035 period based on investment plans and concluded agreements. Most of these are expected to be added in 2026 and 2027 – 4,724 MW and 1,597 MW, respectively.

Pumped storage: ensuring grid flexibility

While the merchant-driven boom in solar and BESS has dominated recent headlines, another critical component of Bulgaria's energy system requires attention - pumped hydro storage (PHS). While highly effective for short-term system balancing and intraday price arbitrage, BESS has its inherent limitations when it comes to providing long-term grid balancing services. PHS serves as the ultimate water battery, ensuring the needed long-duration capabilities and the physical grid inertia essential for the stability of the renewables-heavy network.

2.5 GW
of new pumped hydro storage in Bulgaria by 2050
(Source: Bulgaria's NECP)

The necessity of PHS is anchored in Bulgaria's long-term energy strategy. According to the scenario with additional measures outlined in the country's NECP, Bulgaria targets the installation of 3.7 GW of cumulative storage capacity by 2050.

Utility-scale battery storage is projected to cap at roughly 1.28 GW, a value that has already been far surpassed as of early 2026. **The remainder, or about 2.5 GW, is planned to come from new pumped hydro storage infrastructure.**

Although at a much slower pace than BESS, the momentum has picked up for PHS as well since 2025. As of April 2026, the then acting minister of energy announced that the state had identified ten new sites available for PHS facility development. State-owned National Electricity Company (NEK), a subsidiary of the Bulgarian Energy Holding (BEH), is the owner and operator of the three currently existing PHS plants in the country and is also spearheading the development of the new large-scale projects.

Bulgaria's current PHS capacity is concentrated entirely in the mountainous southern region, specifically the Rhodope and Rila mountains. The **Belmeken-Sestrimo-Chaira** hydropower complex includes two of the three facilities - the Belmeken and the Chaira pumped storage hydroelectric plants. Belmeken was rehabilitated in 2024 and consists of five units with 373.5 MW in generation capacity. Two of the units are reversible, enabling 104 MW of pumping mode capacity.

Chaira has historically been the energy system's largest balancing asset and the largest PHS plant in the region, boasting a nominal capacity of 784 MW in pumping mode and 864 MW for power production. Following an unprecedented

accident in 2022, the plant was taken offline, triggering a phased, multi-year restoration process for all four hydro units. Upon completion, the refurbishment would extend the plant's continuous operation time in power generation mode from 8.5 to 22 hours. However, this has not been without commercial hurdles, as a highly anticipated EUR 124 mln tender collapsed in January 2026, adding temporary uncertainty to the timeline. As of May 2026, only the second unit of the plant is operational, after it was brought back online in late 2024. Repair works were finalised on the third unit, with final grid tests clearing the way for re-activation in the first half of 2026. The first unit is slated for a 2028 return, while public procurement documentation for the fourth unit is close to completion. Beyond repairing the original Chaira plant, NEK also plans the construction of a new adjacent plant – Chaira 2, which would feature variable frequency hydropower units, allowing for superior efficiency at partial loads and a radically faster response time to the fluctuations in renewable power generation, thus expanding the broader system's capability for real-time grid balancing.

Bulgaria's third existing PHS system is **Orphey**, installed inside the Vacha dam, which consists of four turbines with a total capacity of 164.8 MW. One of them functions reversibly, providing a pumping capacity of 47.4 MW.

The most strategically important near-term project is the **Yadenitsa** project, which envisages a tunnel connecting the existing Chaira dam with a newly built dam also part of the Belmeken-Sestrimo-Chaira cascade, thus increasing the active water volume used by the PHS plant threefold. The EUR 250 mln project was included in the list of projects of common interest of the EU for 2025. NEK announced structuring a full financial package, combining state guarantees with potential grants under the Connecting Europe Facility, alongside ongoing negotiations with international financial institutions. Full investment readiness and ground-breaking are targeted for the first half of 2026.

The largest assets in Bulgaria's future PHS fleet are the proposed **Batak** and **Dospat** PHS plants, each of which would provide 800 MW in generation mode and 730 MW in storage mode. The cost of each of the two plants is estimated at EUR 900 mln. Both were included by the European Commission in a list of 235 strategic projects of common interest for the completion of the European internal energy market. This does not guarantee automatic financing of the projects, but gives Bulgaria the opportunity to apply for funding through European financial instruments. An alternative option for financing these projects is via a public-private partnership or a concession. The two assets are targeted to enter commercial operation by 2032. As of April 2026, the schemes were in the pre-project preparation stage, with the main focus being on geological and hydrogeological surveys, working technical analyses and environmental assessments.

Another large-scale project is the construction of the **Turnu Magurele-Nikopol** hydroelectric complex on the Danube, which is being developed jointly by NEK and the Romanian state-owned enterprise Hidroelectrica. This run-of-the-river project is projected to have a total installed capacity of 840 MW, generating over 4 TWh of electricity annually. The project is still in early stage, with NEK and Hidroelectrica preparing an application for European grant funding for the feasibility and technical studies. Beyond its status as an EU cross-border renewable energy project, the complex would serve a vital geopolitical function with its dual-use potential by providing new road and rail transport connectivity across the Danube, potentially facilitating military mobility.





Part V: Financing decarbonisation

Investments and incentives

Bulgaria's transition toward a decarbonised economy is driven by a combination of domestic environmental spending and an influx of EU capital. The primary metric for tracking the resources deployed by the government, the corporate sector and households to mitigate environmental degradation - the National Expenditure on Environmental Protection (NEEP), shows that the burden of financing these environmental initiatives has recently shifted from the state to the private sector, driven by market forces, such as corporate ESG reporting efforts and peer pressure from EU supply chains.

The bulk of the financing supporting Bulgaria's decarbonisation efforts comes via various EU mechanisms. Across the 2021–2027 funding cycle, the total EU capital pipeline dedicated to Bulgaria exceeds EUR 16 bln, encompassing EUR 10.7 bln allocated through Cohesion Policy funds designed to align structural economic disparities and an additional EUR 5.6 bln in grants dispensed via the Recovery and Resilience Facility (RRF) as part of the National Recovery and Resilience Plan (NRRP). Significantly skewed towards financing green technologies, this multi-layered funding structure effectively discounts the cost of capital for investments in decarbonisation across the public and private sectors.

Cohesion Policy 2021-2027

Within its 2021-2027 Cohesion Policy, the European Commission approved the allocation of EUR 10.7 bln for Bulgaria, representing 2.9% of the total cohesion budget for all member states, according to the EC. Of this total amount, EUR 2.4 bln has been allocated to climate programmes, including via the European Regional Development Fund (ERDF). In particular, EUR 600 mln were mandated to drive the share of renewable energy in gross final energy consumption up, alongside comprehensive initiatives to reduce primary energy demand and greenhouse gas emissions across the public building stock. ERDF funding is also heavily targeted toward the circular economy, financing infrastructure to ensure the recycling of 70% of all packaging waste. These investments also address acute climate vulnerabilities, aiming to reduce the share of the population at risk from natural disasters, such as floods and wildfires, by at least 35%.

€ 2.4 bln

allocated to Bulgaria for climate-related programmes within the EU Cohesion Policy 2021-2027

Moreover, as an integral part of EU's Cohesion policy instruments, the Just Transition Fund (JTF) provides EUR 1.4 bln to ensure a socially and economically sustainable transition of the impacted coal-dependent territories in Bulgaria to make better use of renewable energy. It aims to absorb and mitigate the socio-economic shocks associated with the accelerated phase-out of lignite coal mining and thermal power generation. The European Commission formally approved Bulgaria's territorial just transition plans, which envisaged a total transformational investment programme, providing strictly targeted financing to the three primary beneficiaries – the NUTS 3 level districts of Stara Zagora, Kyustendil and Pernik, alongside an extended labour force catchment area encompassing ten municipalities in the neighbouring Sliven, Yambol and Haskovo regions. Stara Zagora is the epicenter of this transition, historically reliant on the Maritsa East complex. The JTF mandates the ecological rehabilitation of 2,190 hectares of heavily degraded open-pit mining land, repurposing it for utility-scale renewables and advanced industrial zones, while funding the reskilling of over 15,000 displaced workers to become capable of servicing the incoming green infrastructure.

By the end of 2025, targeted grant procedures were launched to distribute this liquidity. They include EUR 242.9 mln for socio-economic and mine transformation, which complements a EUR 75 mln programme specifically for industrial and logistics parks. An additional EUR 153.4 mln targets energy communities and public buildings, focusing on deep retrofits for energy-poor households. The measure for solar and storage support of SMEs has a budget of EUR 72.6 mln and provides direct capital expenditure grants for the installation of localised photovoltaic arrays coupled with behind-the-meter BESS to allow commercial entities to decouple from the volatile wholesale electricity market and achieve self-consumption resilience. To support deep decarbonisation technologies, the JTF has allocated a budget of EUR 134.5 mln to construct green hydrogen production and transportation infrastructure centered in Stara Zagora.

Recovery and Resilience Facility

The European Commission's Recovery and Resilience Facility (RRF) is another major mechanism for funding decarbonisation activities in Bulgaria. Its aim to make EU economies more sustainable, resilient and prepared for the green and digital transitions is in line with Bulgaria's vision of reducing the energy intensity of its economy and integrating cleaner sources in its energy mix. Although in a broader sense multiple RRF pillars contribute to various extents to decarbonisation, most climate-related measures are within the Green Transition pillar. It is NRRP's single largest component with approximately EUR 3.1 bln of funding. Furthermore, Bulgaria's updated NRRP includes a new REPowerEU chapter, injecting an additional EUR 479 mln specifically to accelerate renewable energy deployment, grid-scale storage and broader electricity market liberalisation.

The most transformative initiative operating under the NRRP is the National Infrastructure for Storage of Electricity from Renewable Sources (RESTORE) programme, which has fundamentally altered the trajectory of Bulgaria's grid stability. It has been designed to subsidise the capital expenditure required for standalone BESS and the market response to it has been explosive. By heavily subsidising the initial fixed costs, the Bulgarian state has effectively de-risked the operational phase for private capital. Once commissioned, these immense storage facilities operate on merchant models, leveraging the high volatility of the Independent Bulgarian Energy Exchange (IBEX) to execute highly profitable wholesale and balancing market arbitrage.

Modernisation Fund

Operating in parallel is the EU's Modernisation Fund, established to support 13 lower-income member states in the modernisation of their energy systems and the improvement of energy efficiency. Eligible projects are related to the uptake of renewable energy, energy efficiency, energy storage, energy networks, as well as social support enabling a just transition in carbon-dependent regions. Established for the period 2021-2030, the fund is financed by revenues from the auctioning of 2% of all EU ETS allowances between 2021 and 2030, an additional 2.5% between 2024 and 2030, as well as allowances transferred by member states from solidarity, growth and interconnection objectives. To date, Bulgaria has been the beneficiary of disbursements amounting to EUR 264.7 mln, deployed across eight critical infrastructure projects:

➔Rolling out of 450,000 smart meters, including necessary infrastructure – approved in 2023 with a confirmed financing amount of EUR 30 mln;

➔Integration of Metering Data Management (MDM) system, allowing data storage and management for 2,300,000 smart metering devices – approved in 2023 with a confirmed financing amount of EUR 9 mln;

➔Modernisation and development of the information systems and physical infrastructure of a licensed distribution network operator with the purpose of accelerated electrification and decarbonisation of energy consumption and production – approved in 2023 with a confirmed funding amount of EUR 30 mln;

➔Modernisation, digital transformation and development of the information systems and physical infrastructure of the electricity distribution grid in Southeast Bulgaria to enable smart grids for accelerated electrification of transport, storage deployment, decarbonisation and decentralisation of energy consumption and production in distribution grids – approved in 2023 with a confirmed funding amount of EUR 95.7 mln;

➔Bulgarian Grid REinforcement ENABLing Full-Fledged Clean Energy Rollout - GREENABLER – approved in 2024 with a confirmed funding amount of EUR 65 mln;

➔Investment support for Modernisation and Distribution in district heating networks – approved in 2025 with a confirmed funding amount of EUR 20 mln, the scheme aims to modernise district heating systems by increasing energy efficiency and incorporating smart elements to improve system operation and reduce heat losses;

➔Investment support for high-efficiency hydrogen ready CHP systems – approved in 2025 with a confirmed funding amount of EUR 15 mln;

➔Investment support for heating and/or cooling from renewable sources – approved in 2025 with a confirmed funding amount of EUR 15 mln.

Access to sustainable finance

Bulgaria's adoption of the euro as its official currency from the beginning of 2026 catalysed a reduction in the country's sovereign risk premiums, immediately visible in the yield on the five-year government bond contracting from 3.5% in May 2025 to 2.8% by January 2026. Thus, the euro adoption serves as a watershed for the Bulgarian economy, permanently altering the risk profile of domestic green assets and unlocking access to deeper pools of institutional liquidity previously constrained by currency exchange risks.

Green bond regulations

While European funds and state grants provide the initial capital for decarbonisation, the long-term viability of Bulgaria's green transition depends on the depth, liquidity and sophistication of its private sustainable finance markets. A defining legislative milestone in the maturation of this ecosystem occurred in July 2025, when the National Assembly adopted amendments to the Public Offering of Securities Act, aligning Bulgarian domestic securities law with the Regulation (EU) 2023/2631, formally establishing the European Green Bond (EuGB) standard within the jurisdiction. Prior to this, green bond issuance in Bulgaria existed in a regulatory gray area, heavily reliant on voluntary international guidelines. The amended act introduced mandatory pre-issuance and post-issuance disclosure templates, curtailing the systemic risk of greenwashing. Thus, the state laid the groundwork for large-scale capital deployment into domestic green infrastructure. In parallel, issuers in the Bulgarian market also increasingly align with the updated 2025 Green Bond Principles (GBP) published by the International Capital Market Association (ICMA), which now include detailed guidance on Green Enabling Projects. Concurrently, the Sustainable Finance Disclosures Regulation (SFDR) enforces strict sustainability disclosure obligations on financial advisers and product manufacturers toward end-investors, further institutionalising ESG metrics across the Bulgarian financial services sector. Furthermore, the Bulgarian National Bank (BNB) mandated the strict application of the European Banking Authority's guidelines on the management of ESG risks (EBA/GL/2025/01) effective January 2026, forcing a structural recalibration of corporate risk and credit assessments across all domestic lending institutions.

National Decarbonisation Fund

The National Decarbonisation Fund, formerly known as Energy Efficiency and Renewable Sources Fund (EERSF), is a legal entity that manages the financial resources received by Bulgaria from the Global Environment Facility (GEF) mostly through the International Bank for Reconstruction

and Development (IBRD). The Fund's main environmental objective is to support the identification, development and financing of viable renewable energy projects, resulting in substantial reduction of greenhouse gases. It provides direct loan financing to diverse beneficiaries including municipalities, corporate clients and individuals at annual interest rates between 4% and 6%, maximum term of 10 years, minimal self-participation requirement of 10% and ticket sizes ranging from EUR 15,000 to EUR 1.5 mln. As of end-2025, the National Decarbonisation Fund had a total of 218 financed projects in its portfolio, of which 50% developed by municipalities, 37.5% by corporate clients and 12.5% by other institutions, such as hospitals, universities, etc. The total financing provided was EUR 36.9 mln and covered 73% of the projects' total value.

Multilateral development banks

Multilateral development banks play a crucial role in expanding sustainable finance in Bulgaria. The European Investment Bank (EIB) Group recorded a dramatic acceleration in its Bulgarian operations in 2025, with total financing jumping 72% y/y to reach a record EUR 646 mln. This capital mobilisation is projected to unlock approximately EUR 2.2 bln in total cascading investments, equivalent to roughly 1.9% of Bulgaria's GDP. Within this portfolio, more than 30% of the total financing was strictly ring-fenced for climate action and environmental sustainability projects. The EIB's operations span multiple levels of the Bulgarian economy. At the macro-advisory level, EIB technical units are embedded within the Ministry of Energy to facilitate the decarbonisation of the Maritsa East complex. At the corporate lending level, in September 2025, the EIB extended a five-year EUR 200 mln loan to German copper producer Aurubis, of which EUR 120 mln is dedicated specifically to expanding the copper refining capacity at its plant in Bulgaria, aiming to increase cathode production by 50%. This is a highly strategic investment, recognising that copper is a critical mineral required for European electric vehicle manufacturing and renewable grid expansions. Furthermore, via the European Investment Fund (EIF), the EIB agreed to extend the JEREMIE initiative until 2035, providing EUR 160 mln starting in 2026 to support deep-tech, technology transfer and AI scale-ups in the green sector.

Similarly, the European Bank for Reconstruction and Development (EBRD) has introduced bespoke debt instruments into the local corporate market. In a pioneering transaction in March 2026, the EBRD extended a EUR 20 mln loan to another Bulgarian copper producer - Sofia Med. This was EBRD's first transaction in Bulgaria to replicate a formal Sustainability-Linked Loan (SLL) structure, linking the cost of capital to verified environmental KPIs of the borrower, specifically mandating aggressive increases in secondary recycled copper content and enhancements in water efficiency.

Commercial banks

The Bulgarian commercial banking sector has systematically pivoted toward sustainable lending portfolios. Analyses of the banking sector's latest balance sheets indicate readiness to utilise green bonds and green loans as primary tools for accumulating financial resources to deploy into direct climate mitigation projects. For example, UniCredit Bulbank published its comprehensive ESG Product Guidelines in late 2024, explicitly designed to enforce a homogenous classification of green and sustainability-linked loans and prevent the related risks of greenwashing and social washing.

Simultaneously, state-backed banks have been pushing sustainable finance down to the municipal and SME level. The Bulgarian Development Bank (BDB), operating in coordination with the Ministry of Energy and the Electricity System Operator, has launched decentralised zero-upfront-cost solar power programmes targeted at municipalities, schools, hospitals and small businesses. Under this model, the installations become the legal property of the beneficiary after an eight-year amortisation period. To finance this undertaking, the Ministry of Energy has signaled its intent to issue sovereign or quasi-sovereign green bonds, blending retail-level decarbonisation with international capital markets.

Competitiveness and risk management

For the Bulgarian corporate sector, decarbonisation has rapidly transcended traditional concepts of corporate social responsibility and turned into a vital instrument for maintaining competitiveness and managing existential regulatory and market-based risks. In this context, businesses face a dual challenge formed by the implementation of the EU's Carbon Border Adjustment Mechanism (CBAM) and the severe price volatility inherent in the integrated regional wholesale electricity market. The transitional phase of CBAM, which ran from October 2023 to end-2025, required importers merely to report the embedded emissions of their goods and detail any carbon price effectively paid in third countries. However, beginning in 2026, the mechanism entered its definitive operational phase, legally compelling importers not only to accurately audit the embedded carbon footprint of their inbound goods but to actively offset these emissions by surrendering purchased CBAM certificates. This tightening border tax mechanism coincides with the accelerated wind-down of free carbon allowances within the internal EU Emissions Trading System (ETS). The CBAM phase-in is synchronised with the ETS phase-out to entirely abolish free emissions quotas by 2034. For a highly carbon-intensive economy like Bulgaria, this dual regulatory squeeze threatens to drastically inflate operational overheads of local heavy industry actors producing cement, steel, fertilisers and base metals, potentially eroding the cost-competitiveness of their exports.

To counteract the escalating carbon liabilities and defend shrinking profit margins, Bulgaria's heavy industry and large commercial enterprises have started to adopt risk management strategies, most notably through the procurement of clean energy via corporate PPAs. Because Bulgaria still relies on a grid mix that includes expensive, price-setting fossil fuels, wholesale electricity prices on the IBEX can be comparatively high and highly volatile. Corporate PPAs provide a financial hedge allowing corporate off-takers to lock in a fixed, predictable cost of electricity over long horizons. Simultaneously, by procuring this energy directly from a renewable asset, the off-taker acquires the Guarantees of Origin necessary to report zero-emission energy consumption in their ESG audits, thereby drastically reducing their exposure to ETS pricing and ensuring compliance with the CBAM. However, raw intermittent solar output is no longer a sufficient hedge. To secure their competitive footing in the long term, corporate stakeholders operating in Bulgaria must demand BESS-integrated PPAs to completely eliminate exposure to negative price cannibalisation and enable true 24/7 clean energy supply.

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Methodology

The Decarbonisation in Bulgaria: Powering low-carbon transition market intelligence report analyses the developments in terms of decarboniation, ESG and renewable energy in the Bulgarian economy up to May 2026. The analysis was prepared between May and June 2026.

The analysis is structured in five major chapters:

- Decarbonisation landscape
- Sectoral transition
- Special focus on FMCG and retail
- Energy transition enablers
- Financial case

The first chapter of the report presents the latest regulatory developments relevant to decarbonisation and ESG, while also tracking GHG emissions trends and assessing Bulgaria's progress towards decarbonisation targets within the broader EU policy framework. Data were collected from the European Environment Agency's (EEA) GHG Data Viewer, which reflects inventories reported under the United Nations Framework Convention on Climate Change (UNFCCC) and/or the EU Governance Regulation.

In the second chapter, the analysis highlights key sectors responsible for GHG emissions in Bulgaria. The energy, industry, transport and buildings sectors are examined individually due to their key role in Bulgaria's decarbonisation trajectory. For the energy supply, industry and transport sectors, the data reflect EEA figures based on UNFCCC and/or EU-regulated reporting. For buildings, a broader approach was used to capture both direct and indirect emissions, reflecting the fact that buildings account for around one-third of energy-related emissions in both Bulgaria and the EU. To this end, data were collected from the European Commission's EU Building Stock Observatory.

A key focus is set on the FMCG and retail sector with a deep dive in the decarbonisation of consumer value chains, Scope 1, 2 and 3 emissions, packaging, waste and circularity. Two metrics, published by Eurostat, are employed in tracking the sectoral emissions trends, including air emissions accounts and emission intensity, calculated as GHG emissions per unit of gross value added.

The fourth chapter of the analysis presents electrification as a key to energy security and analyses market tools such as PPAs and VPPs. It also provides a detailed overview of Bulgaria's renewable energy landscape, comparing the country's progress toward the EU's renewable energy target in gross final consumption for 2030, examining capacity growth across technologies and evaluating the role of energy storage in supporting further renewable integration. The overview of installed renewable energy capacity and the breakdown by source are based on data from Bulgaria's Electricity System Operator (ESO) and the European Network of Transmission System Operators for Electricity (ENTSO-E), project-level disclosures and news outlets. Pumped hydro storage capacity is included in the overall hydro capacity, as per ESO data.

The Financial case chapter deals with the availability of investment incentives, the absorption of European and domestic capital and the maturation of domestic sustainable finance. Financing mechanisms supporting decarbonisation are also reviewed through the lens of EU fund allocations and disbursement data.



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