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OVERVIEW OF THE BULGARIAN NATIONAL ENERGY TRANSITION TARGETSBY SECTORS

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Abstract

The publication presents an overview of the national energy targets by sectors, emphasizing the goals of energy transition by analysing the national legislation, strategic documents and action plans in Bulgaria. A brief introduction is presented on the current energy data, what actions in terms of energy efficiency, savings and decarbonisation have been implemented so far and their impact. The publication analyses the government's action plans to move to a low-carbon economy by implementing short-term and long-term measures in the different economic sectors. For the purposes of the analysis, the energy consumption sectors are defined according to the guidelines of the Sustainable Energy Development Agency for the development of municipal plans and programs to promote the use of energy from renewable sources and bio-fuels and energy efficiency, as well as the guidelines for developing a Sustainable Energy and Climate Action Plans of the Covenant of Mayors, as follows: Buildings, Industry, Transport and Agriculture sectors.
This review will serve for further analysis and assessment of energy transition scenarios. The expected impact from the implementation of the national plans for achieving the European targets is analysed.

Key words*: energy transition, energy targets, energy strategies, sustainable energy and climate plan.*

INTRODUCTION

Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems. Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen (IPCC, 2014). The urgent need to reduce greenhouse gas emissions, as outlined in the climate objectives of the Paris Agreement, necessitates deep decarbonisation of the energy sector, which will require a fundamentally different approach to previous strategies that sought to stabilize or halve emissions (IRENA, 2000).
The EU is committed to reducing greenhouse gas emissions to 80–95 % below 1990 levels by 2050 in the context of necessary reductions by developed countries as a group (European Commission, 2011), defining the great goal to be a climate neutral continent or to reach energy transition until 2050. All 27 EU countries have committed themselves to making the Union the first climate-neutral continent by 2050. To achievethis, they have committed themselves to reducing emissions by at least 55% by 2030 compared to 1990 levels (European Union, 2021).
A number of Bulgarian researchers work have been identified in the field of energy efficiency increasing and energy transition in buildings (Komitov et al., 2020; Valchev & Mihaylov, 2020; Zlateva at al., 2020; Iliev at al., 2021) and various installations and processes in the industrial sector (Georgieva at al., 2018; Georgieva at al., 2019; Penkova & Mladenov, 2020; Kolev at al., 2017; Rasheva at al., 2020).

EUROPEAN STRATEGIC ENERGY FRAMEWORK

The Clean Energy for All Europeans package with new rules being adopted in the first half of 2019 marks a significant step towards the creation of the Energy Union and delivering on the EU's Paris Agreement commitments. This package includes 8 different legislative acts

empowering European consumers to become fully active players in the energy transition, and include:

- A revised Energy Performance of Buildings Directive (EPBD, 2018/844, which establishes a clear path towards a low and zero-emission building stock in the EU by 2050). Buildings are responsible for around 40% of energy consumption and 36% of CO_2 emissions in the EU, making them the single largest energy consumer in Europe. By making buildings more energy efficient, the EU can more readily achieve its energy and climate goals. The Energy Performance of Buildings Directive (EU 2018/844) outlines specific measures for the building sector to tackle challenges, updating and amending many previous rules (Directive 2010/31/EU) (Clean energy for all Europeans package. Retrieved from https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en).
- A recast of the Renewable Energy Directive (2018/2010, which ensures that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least 32%).
-An amendment of the Energy Efficiency Directive (EED amendment, 2018/2012, to ensure that the Union's 2020 headline targets on energy efficiency of 20% and its 2030 headline targets on energy efficiency of at least 32.5% are met).

The objective and scope of the Clean Energy for all Europeans scenarios is to analyse the feasibility of the 2030 climate targets. The scenarios mainly envision a decarbonisation compatible with the 2°C climate target by modelling "the achievement of the 2030 climate and energy targets as agreed by the European Council in 2014 (the first scenario with a 27% energy efficiency target and the second with a 30% energy efficiency target) ".With the EU reference scenario as a starting point, the following, more ambitious, EUCO scenarios aim to assess a very specific range of climate and energy targets, those being: - reduction of overall GHG emissions compared to 1990: 40% until 2030 and 80-85% until 2050; - emissions reduction from ETS sectors: 43% in 2030 and 90% in 2050 compared to 2005; - non-ETS emissions reduction: 30% in 2030 compared to 2005; - energy efficiency: reduction of primary energy demand by 27% - 30% in 2030 compared to 2007.

The Energy Transition Roadmap 2050 scenarios focus on sustainability, competitiveness and security of the EU energy system. The main drivers and decarbonisation routes noted in the Energy Roadmap are built around four key technological developments: energy efficiency, renewable energy, nuclear energy and carbon capture and storage, which form a roadmap consisting of seven energy transition scenarios until 2050. These scenarios include assumptions on a wide portfolio of technologies, the role of consumers and investors and outlooks of existing regulatory frameworks (Hainsch et al., 2022).

The green transition is one of the EU's main ambitions to tackle the global challenge of mitigating the adverse effects of climate change. That is why in December 2019, the President of the European Commission Ursula von der Leyen presented the European Green Deal, which aims to make Europe the first climate-neutral continent by 2050 (Council of Ministers of the Republic of Bulgaria, 2020).

The European Green Deal is a response to the climate challenges as well. It is a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use (European Commission, 2019).

To meet the EU's energy and climate targets for 2030, EU countries need to establish a 10-year integrated National energy and climate plan (NECP) for the period from 2021 to 2030. Introduced under the Regulation on the governance of the energy union and climate action (EU/2018/1999), the rules required the final NECP to be submitted to the Commission by the end of 2019.

All Parties to the Paris Agreement are invited to communicate, by 2020, their mid-century, long-term low greenhouse gas emission development strategies. The Regulation on the governance of the energy union and climate action (EU/2018/1999) sets out a process for the Member States to prepare these strategies and new strategies every 10 years thereafter. The long-term strategies should be consistent with Member States' integrated national energy and climate plans for the period 2021-2030.

BULGARIAN STRATEGIC ENERGY FRAMEWORK

The state policy in the field of energy efficiency and renewable energy sources (RES) is implemented by all national and local authorities through developing and adopting National and Municipal energy efficiency programs, as well as National and Municipal programs to promote the use of energy from renewable sources and bio-fuels, who both has to be in line with the objectives of the above mentioned acts and are developed taking into account the strategic objectives and priorities of the specific regional development plans of the respective regions.

The sustainable energy development policies in Bulgaria are defined in the following main energy acts - the Energy Efficiency Act and the Energy from Renewable Sources Act, which are requiring the development of a number of national documents, which has to be followed by all regional governments, namely:

1) National action plan for energy efficiency;

2)National plan for net zero energy buildings (NZEBs) - Regional governments are obliged to deploy NZEBs according to the National Plan for Nearly Zero Energy Buildings 2015-2020, which aims to turn the concept of nearly-zero energy buildings into a practically viable alternative to the future construction of new buildings in Bulgaria, as well as to deploy a proven cost-effectiveness approach in the renovation of existing buildings for the various sub-buildings categories. On the other hand, municipalities are also developing plans to increase the number of NZEBs, which most probably have to deploy photovoltaic's (PVs), to reach the 2030 climate change targets. All these strategies are in line with the clear direction for the complete decarbonisation of the European building stock until 2050.

3) National Strategy for Adaptation to Climate Change - outlines the strategic framework and priorities for adaptation to climate change until 2030.

4) National plan for improvement of the energy characteristics of the heated and/or cooled state-owned buildings;

5) National long-term investment promotion program for the implementation of measures to improve the energy performance of buildings - support the renovation of the national building stock of residential and non-residential buildings by 2050. The document defines the strategic vision and priorities of the country to achieve energy efficient and de-carbonized building stock by 2050. In accordance with Directive (EC) 2018/844, the strategy has developed a roadmap with indicative milestones for 2030, 2040 and 2050 regarding the renovation of residential and non-residential buildings in the Republic of Bulgaria. The indicative target for the period 2021-2030 is the renovation of residential and non-residential buildings with a total area of over 22 million m^2, as the expected savings in energy consumption are estimated at 2,917 GWh/year and carbon emissions - 1,306 $ktCO_2$/year until 2030. The strategy envisages policies and measures for long-term development in terms of increasing the energy efficiency of the building stock in the country.

6) Annual reports on the implementation of national energy efficiency action plans.

7) Integrated plan in the field of energy and climate of the Republic of Bulgaria 2021-2030 (NECP) - defines the main goals of the country to stimulate low-carbon economic development, development of competitive and secure energy and reduce dependence on imports of fuels and energy. In order to fulfil the goals set in NECP, complex actions are needed in all areas of socio-economic relations. This is particularly true of economic sectors, where the potential of existing industries to enter new technologies must be used to the full, ensuring a smooth and equitable transition to a climate-neutral circular economy, such as the hydrogen economy.

In this regard, NECP envisages consumption of green hydrogen produced through the use of energy from renewable sources, incl. electricity produced from wind and solar energy. As a basis for the development of hydrogen capacities in Bulgaria, NECP has set a goal by 2030 to develop a pilot project for hydrogen production with a total installed capacity of 20 MW.

8) National Recovery and Sustainability Plan - The main objective of the Recovery and Sustainability Plan is to facilitate economic and social recovery from the crisis caused by the COVID-19 pandemic. The green transition occupies a leading position in the Bulgarian

Recovery and Sustainability Plan, concentrating 45.8% of the total projected costs, with a minimum set of 37% of the European Commission regulation. In this way, Bulgaria contributes to the implementation of the pan-European goals for gradual decarbonisation. In addition, efforts are focused on three main areas:
- Creating conditions for the accelerated introduction of renewable energy sources and hydrogen;
- Enhanced action to increase the energy efficiency of the economy;
- Sustainable mobility.
9) Strategy for sustainable energy development of the republic of Bulgaria until 2030 with a horizon until 2050 - reflects the state's vision for the development of the energy sector by 2030, with a horizon of 2050, in line with the current European framework of energy policy and global trends in the development of new energy technologies. The strategy clearly reflects trends, measures and policies in the field of energy security, energy efficiency, the liberalization of the electricity and gas markets and their integration into the common European energy market, the development and implementation of new energy technologies. These policies are also reflected in the Integrated Plan in the field of energy and climate of the Republic of Bulgaria 2021-2030, with a horizon of 2050.

OVERVIEW OF THE NATIONAL TARGETS FOR ENERGY TRANSITION AND CURRENT ENERGY DATA

In order to ensure a coordinated and coherent EU-wide approach and implementation of the Energy Union strategy Bulgaria has elaborated its National energy and climate plan (NECP). The plan sets out the main goals and measures for the implementation of the national energy and climate policies, which are in the context of the European legislation, principles and priorities for energy development. Bulgarian energy priorities, set in the NECP can be summarized as follows:
- Enhancing energy security and diversifying energy supply;
- Development of an integrated and competitive energy market;
- Development of RES capacities, according to the available resources, network capacity and national specifics;
- Improving energy efficiency (EE) by developing and implementing new technologies to achieve modern and sustainable energy;
- Protecting consumers by ensuring fair, transparent and non-discriminatory conditions for the use of energy services.
Based on the Bulgarian NECP, in 2030, Bulgaria plans to achieve a reduction in primary energy consumption of 27.89% and a reduction of 31.67% in the final energy consumption, compared to the PRIMES 2007 benchmark. It also intends to reach a share of 27.09% in the share of RES in gross final energy consumption by 2030, to reach 30.33% share of renewable electricity, as well as to reach a share of 42.60% of renewable heating and cooling energy.
Currently use of local energy resources (Ministry of Energy, 2021):
- **Coal:** Based on data from the Strategy for sustainable energy development of the republic of Bulgaria until 2030 with a horizon until 2050coal is the energy resource that has the largest share of local energy resources. The availability of this local resource is a guarantee for the stability and security of the country's energy system. This means that in the coming years, coal-fired power producers are expected to face significant challenges arising from the new legislative framework requiring the transition to a new low-carbon market model. Coal is the energy resource with the largest share of local energy resources. In 2019 local coal provides 39% of the country's gross energy production. The strategy says that given the strategic nature of coal-fired thermal power plants to ensure the country's energy security, Bulgaria will continue to rely on the efficient operation of these facilities in the future.
- **Natural gas:** So far, no significant natural gas deposits have been discovered on the territory of the Republic of Bulgaria. Currently, production in the country is limited, covering just over 1% of annual consumption. The production of natural gas in the country in 2019 amounts to 29 million m^3, and the trend is for rapid depletion of existing fields. To meet the needs of Bulgarian consumers for natural gas relies mainly on imports. In 2019, the Russian

Federation imported 2,778 million m^3 of natural gas, which represents 85.7% of the total natural gas imported into the country. High dependence on natural gas imports is one of the main risk factors for the country's energy security. In this regard, alternative solutions are being sought and action has been taken to explore and search for new natural gas fields, both on land and on the Black Sea shelf.

- **Nuclear energy:** Nuclear energy plays an important role in ensuring national, regional and European energy security, while providing affordable energy and is a key element in the transition to a low-carbon economy. In 2019, the share of nuclear energy in the structure of electricity produced by type of energy in the country is 37%. The Strategy says that the state will continue to support the development of nuclear energy in the country by providing institutional assistance for the implementation of an investment project for the construction of two new nuclear units, each with a capacity of 1,000 MW, which will be phased in after 2030.
- **Renewable sources:** Another local energy resource available to the country is energy from renewable sources (water, wind, solar, geothermal and biomass energy). The share of energy from renewable sources in primary energy production in 2018 is 21.52% (according to National Statistical Institute (NSI) data).

In 2012, Bulgaria achieved the mandatory national target of 16% share of renewable energy in the gross final energy consumption in the country for 2020. In 2018, the gross final consumption of energy from renewable sources is 20.8% (Ministry of Energy, 2021).

The Republic of Bulgaria has committed to continue the policy pursued to increase the use of renewable energy in the sectors: electricity, heat and cooling, and transport. The country has untapped potential for renewable energy production, which will be used until 2030 and beyond, which will ensure effective implementation of the national target for the share of renewable energy in gross final energy consumption by 2030 in a cost-effective manner.

The national energy efficiency targets and policies show that Bulgaria puts energy efficiency first and plans to reduce primary energy consumption by 27.89% and reduce final energy consumption by 31.67% compared to the PRIMES 2007 reference scenario.

Energy targets in the building sector

To achieve a highly energy efficient and de-carbonized building stock, a Long-term national strategy is being developed to support the renovation of the national building stock of residential and non-residential buildings by 2050. The strategy provides measures for construction of new buildings and transformation of existing ones to zero energy consumption, improving the energy performance of residential and non-residential buildings and promoting the introduction of smart technologies and renewable energy sources in the building sector.

As part of the Long-term strategy for renovation of the national building stock of residential and non-residential buildings by 2050, a roadmap has been developed that sets out the indicators for measuring the results achieved for the following periods: 2021-2030, 2031-2040 and 2041-2050, which reflect the milestones of the process. The Table 1 presents the indicators and energy targets for buildings for the three periods:

Table 1. Indicators and milestones for renovation of residential and non-residential buildings

Indicator	Unit	2021-2030	2031-2040	2041-2050
Total saved energy	GWh	2917	6502	7329
Residential buildings	GWh	2477	5694	6294
Non-residential buildings	GWh	440	808	1035
Renovated area	m^2	22 203 509	49 570 668	55 823 015
Residential buildings	m^2	19 026 656	43 735 175	48 343 297
Non-residential buildings	m^2	3 176 852	5 835 493	7 479 718
Renovated area from existing building stock	%	8	18	20
Saved CO_2 emissions	tons	1 306 435	2 891 610	3 274 453
Residential buildings	tons	1 065 184	2 448 461	2 706 441
Non-residential buildings	tons	241 251	443 149	568 012

(*Source: Integrated Energy and Climate Plan of Republic of Bulgaria 2021-2030*)

It is expected that by 2050, 60% of the housing stock and nearly 17% of the non-housing stock will be renovated. The area of renovated buildings from the entire building stock will be over 45% (Ministry of Energy, 2021).

The analysis in the Long-term National Strategy for Support the Renovation of the National Building Fund until 2050 shows that

in order to achieve the quantitative dimensions of the indicators, the renovation policies must be focused primarily on buildings with energy classes E, F and G for all categories of buildings. For this purpose, the period of validity of the NECP is envisaged to continue the stimulation for the use of energy from renewable sources in buildings. The Energy from Renewable Sources Act sets requirements for the use of energy from renewable sources in the construction of new or reconstruction, major renovation, overhaul or reconstruction of existing buildings, when this is technically possible and economically feasible. It is envisaged that at least 15% of the total amount of heat and cooling energy needed for the building to be produced by renewable energy sources by introducing: district heating using biomass or geothermal energy; individual biomass combustion facilities with conversion efficiency of at least 85% for residential and commercial buildings and 70% for industrial buildings; solar thermal installations; heat pumps and surface geothermal systems (Ministry of Energy, Ministry of Environment and Water, 2020).

Energy targets in the industry sector

In 2018 Industry sector has a share of 28.0% and it is the second most important sector in the structure of final energy consumption by sectors in Bulgaria (Ministry of Energy, Ministry of Environment and Water, 2020). Bulgaria continues to be the most energy-intensive economy and the economy with the highest greenhouse gas emissions in the EU, far ahead of the rest countries. The high energy intensity of the economy and the slow progress towards the energy efficiency targets have a negative impact on productivity and competitiveness. There are opportunities for significant energy savings through targeted investment in the industrial sector, as well as for increasing investment in clean energy infrastructure (Council of Ministers of the Republic of Bulgaria, 2020). Investment needs in the field of energy and climate remain significant - Bulgaria is still the most energy-intensive economy in the EU, and inefficient use of energy hinders the competitiveness of Bulgarian SMEs. Bulgaria is lagging behind in its progress towards its indicative national energy efficiency target for 2020. In 2018, Bulgaria is outside the target by approximately 8% in terms of primary energy consumption and 11% in terms of final energy consumption, both gaps increasing compared to 2016 levels. Only 33.4% of SMEs have an energy efficiency policy (Analysis of the state of SMEs, conducted for the purposes of the National Strategy for SMEs 2021-2027). Bulgaria remains the economy with the highest greenhouse gas emissions in the EU. In 2016, the intensity of greenhouse gases in the Bulgarian economy was 4.3 times higher than the EU average (EC 2017). Only 6.5% of Bulgarian enterprises use green energy in their production processes (Analysis of the state of SMEs, conducted for the purposes of the National strategy for SMEs 2021-2027). There is a significant need to continue supporting SMEs in order to achieve better energy and resource efficiency (Ministry of Economy, 2021).

The measures set in the NECP for the industrial sector are aimed at:

- Higher energy efficiency in the industry sector and reduction of heat losses;
- Increasing the use of natural gas in industry through new gas infrastructure
- Use of alternative fuels;
- Creation of a technology parks - introduction of incentives to encourage the private sector to invest in research and development and innovation of widely used production methods aimed at optimal resource efficiency;
- Encouraging the exchange of good practices between enterprises regarding the efficient use of raw materials in production;
- Monitoring systems for energy use in industry
- Energy efficiency audits and implementation of recommended measures (Ministry of Energy, Ministry of Environment and Water, 2020).

Under the Competitiveness and Innovation in Enterprises Program, targeted measures for improving energy efficiency in enterprises are envisaged, incl. measures for the introduction of energy management systems and systems for monitoring and control of energy consumption, the Program for Economic Transformation in the Recovery and Sustainability Plan, Decarbonization direction, will provide additional support to promote the use of energy from renewable sources for own consumption,

as well as its subsequent storage. Insofar as in the field of energy efficiency improvement and the use of renewable sources there are significant investment needs in different economic sectors, the implementation of each of these types of interventions in their entirety will allow to use the full range of available measures. an enterprise will be able to decide which measures to apply and in what combination.

The target value for realized energy savings by 2029 from the above mentioned measures in enterprises is 377 716 MWh/year (summarized for both categories of regions, according to the Competitiveness and Innovation in Enterprises Program). From the Strategy for Sustainable Energy Development until 2050 it can be seen that the forecasted final energy consumption in the Industry sector for the period 2020-2030 in two scenarios (base and targeted) envisages an increase, which is a result of the expected economic growth. As regards the Industry sector, the forecast for the final energy consumption in the Target Scenario is lower than in the Baseline Scenario, by 0.677% in 2030 and 0.95% in 2050, respectively (Table 2).

Table 2. Forecast for the final energy consumption in the Industry sector for the period 2030-2050

Year	Baseline scenario	Target scenario	Difference between baseline and target scenario
	without additional measures /	With additional measures	
	GWh	GWh	%
2020	33039	33030	0.027
2025	34094	33904	0.557
2030	34696	34461	0.677
2035	34414	34103	0.904
2040	34497	34191	0.887
2045	34416	34103	0.909
2050	34539	34210	0.953

(*Source: Sustainable Energy Development until 2050 (B)EST model, E3-Modelling*)

Energy targets in the Transport sector

Transport generates effects with a negative impact on the environment and people through emissions of harmful substances and greenhouse gases. Their limitation is an element of the sustainable development of the transport system. The main indicators for assessing the negative impact of transport on the environment and human health are energy consumption, emissions of harmful substances (ozone precursors, acidifying substances and PM10 precursors) and greenhouse gas emissions. The general trend for the transport sector in Bulgaria is towards an increase in final energy consumption. The main consumer of fuels and energy in transport is road transport, as its share in 2018 reached 94.3% of total consumption of the sector.

In 2018, compared to 2017, energy consumption in the transport sector increased by 1.4%, which is entirely due to the growth of road transport consumption by 2.9% (Ministry of Transport and Communications, 2017). Integrated Transport Strategy in the period up to 2030 - The strategy outlines the main directions for the development of the national transport system in the period up to 2030.

The document defines 3 strategic objectives, which cover nine strategic priorities, each of which contains a framework of specific objectives (tasks). On this basis, measures have been identified that are most appropriate for achieving the respective objectives.

The strategic goals of the transport policy until 2030 are:

- Increasing the efficiency and competitiveness of the transport sector;
- Improving transport connectivity and accessibility (internal and external);
- Limiting the negative effects of the development of the transport sector.

NECP sets a projected 14.2% share of energy from renewable sources in the transport sector until 2030, the achievement of which will encourage the entry of hydrogen and renewable electricity (Ministry of Energy, 2021).The energy used from renewable sources in transport in 2018 is 218.6 ktoe. The achieved share of energy from renewable sources in final energy consumption in the transport sector is 8.06%. Compared to 2017, the consumption of energy from renewable sources increased by 15.7%, and compared to 2011 it increased more than 12 times. In 2018, conventional biofuels (131.7 ktoe), new generation biofuels (11.25 ktoe) and electricity from renewable sources (8.23 ktoe) were used in the transport sector (Ministry of Energy,2020).Achieving a 14.20% share of renewable energy in the transport sector will encourage the entry of new generation biofuels, renewable liquid and gaseous transport fuels of non-biological origin, recycled carbon fuels

and renewable electricity supplied to the road and rail transport sector. Emphasis will also be placed on the possibilities for stimulating the absorption and use of new energy sources and technologies for their utilization. Consumption of these fuels and energy should contribute to achieving the policy objectives of energy diversification and decarbonisation of the transport sector. For the use of electricity from renewable sources in transport, efforts will be focused on developing electric mobility, developing and stimulating the use of public electric transport, as well as accelerating the integration of modern technologies in the railway sector (Ministry of Energy, 2021).

From the Strategy for Sustainable Energy Development until 2050 it can be seen that the forecasted final energy consumption in the Transport sector for the period 2020-2050 in twoscenarios (base and targeted) envisages an increase,which is a result of the expected economic growth. The projected final energy consumption for the period 2020-2050 in both scenarios envisages an increase, which is a result of the expected economic growth is presented in Table 3.

Table 3. Forecast for the final energy consumption in the Transport sector for the period 2030-2050

Year	Baseline scenario	Target scenario	Difference between baseline and target scenario
	without additional measures /	With additional measures	
	GWh	GWh	%
2020	42168	42162	0.014
2025	43643	43594	0.112
2030	43590	43447	0.328
2035	42031	42001	0.071
2040	40689	40619	0.172
2045	39969	39902	0.168
2050	40129	40258	-0.321

(*Source: Sustainable Energy Development until 2050 (B)EST model, E3-Modelling*)

A slight increase is observed in 2050 under the Target Scenario in the transport sector, where consumption increases by 0.3% compared to the Baseline Scenario.

Energy targets in the Agriculture sector

The measures in the Third National Action Plan for Climate Change 2013-2020 are aimed at reducing emissions from the main sources in the Agriculture sector. The measures are in line with the state of the sector and the main priorities of the Common agricultural policy (CAP) for the period 2014-2020. One of the main challenge CAP is facing, is to find a solution to the deteriorating production conditions in agriculture due to climate change and the need for farmers to reduce their share of greenhouse gases, to play an active role in mitigating climate change and in providing energy from renewable sources. Based on the analysis of the main sources of emissions in agriculture, the following two main objectives are identified: (1) Reduction and / or optimization of emissions from the agricultural sector; (2) Raising awareness and knowledge of both farmers and the administration regarding actions and their impact on climate change.

The measures related to agriculture sector, provided in the Third National Action Plan on Climate Change, which are scheduled to last until 2030 and the National Program for Air Pollution Control 2020-2030, include:

- Stimulating the use of appropriate crop rotations, especially with nitrogen-fixing crops;
- Management of degraded agricultural lands through: biological reclamation with grassland species typical of the region and application of erosion control measures and tillage methods;
- Introduction of technologies for irrigation and saving of water and energy, promotion of extensive agriculture;
- Measures to reduce methane emissions from biological fermentation in animal husbandry;
- Improving the management and use of manure;
- Introduction of low-carbon manure treatment practices, e.g. composting, conversion of manure into biogas under anaerobic conditions;
- Improving farmers' awareness and knowledge of the possible use of crop residues and the threats posed by stubble burning;
- Implementation of the Code of Good Agricultural Practice for the control of ammonia emissions from agricultural sources.

As regards the greenhouse gas emissions in the agricultural sector, a significant increase in expected GHG emissions in the agricultural sector by about 20% will be a result of the expected growth of the sector according to the forecast provided by the Ministry of Agriculture, Food and Forestry.

NECP does not provide further clarification on how the goal of increasing negatives is achieved emissions from sequestration by 2050 in the sector "Rural, forest and other land use" (AFOLU), and also how land use patterns are changing by 2050. The government cites six measures in NECP that could potentially contribute to negative emissions in the sector, namely 1) the use of "unfrosted areas intended for afforestation" in forest areas; 2) afforestation of abandoned agricultural lands, bare and deforested areas, eroded and endangered areas outside forest areas; 3) increasing the area for urban and suburban parks and green areas; 4) restoration and sustainable management of wetlands, protection and conservation of wetlands in forest areas, peat lands and swamps; 5) restoration and maintenance of protective forest belts and new anti-erosion afforestation; and 6) increasing the density of the listed natural and artificial plantations.

However, no further details are provided on the scope of these measures, as well as the deadlines for their implementation, in order to quantify their impact on negative emissions. Still, specific financing measures under the Sustainable Agriculture component are set out in the National Recovery and Development Plan (Council of Ministers of the Republic of Bulgaria, 2020). The component aims to increase the sustainable governance and competitiveness of the agricultural sector through measures to improve the economic sustainability of agricultural holdings and the industry as a whole in the context of climate change and the preservation of environmental characteristics (CSD, 2021).

CONCLUSIONS

Bulgaria has defined a state's vision for the development of the energy sector by 2030, with a horizon of 2050, in line with the current European framework of energy policy and global trends in the development of new energy technologies. The main goals of the country to stimulate low-carbon economic, development of competitive and secure energy and reduce dependence on imports of fuels and energy are prescribed in the National Energy and Climate Plan and other strategic documents. Specific goals have been set for the different economic sectors. Based on different scenarios and analysis, some indicators and milestones have been projected until 2050 for the presented sectors. For the building sector indicators have been set for total saved energy, renovated area and saved CO_2 emissions for three periods: 2021-2030; 2031-2040 and 2041-2050. As regards the Industry and Transport sectors, a forecast for the final energy consumption, based on two scenarios: with and without measures, has been presented for seven 5-years periods. The measures and financial expectations are described in the NECP and the National Recovery and Resilience Plan of the Republic of Bulgaria. There are no presented numbers for expected final energy consumption until 2050 in the Agriculture sector, although specific measures are set and planned in the National Recovery and Resilience Plan of the Republic of Bulgaria.

There are still no in-depth analyzes of the expected impact in terms of energy, environmental, social and financial aspects from the implementation of the specific actions and measures planned in the presented sectors. There is a need of energy modeling and evaluation of specific scenarios for energy transition at national and local level.

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