LONG-TERM NATIONAL STRATEGY TO SUPPORT THE RENOVATION OF THE NATIONAL BUILDING STOCK OF RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS BY 2050

Легенда:	Caption
ДЪЛГОСРОЧНА НАЦИОНАЛНА СТРАТЕГИЯ ЗА ПОДПОМАГАНЕ НА ОБНОВЯВАНЕТО НА НАЦИОНАЛНИЯ СГРАДЕН ФОНД ОТ ЖИЛИЩНИ И НЕЖИЛИЩНИ СГРАДИ	**LONG-TERM NATIONAL STRATEGY TO SUPPORT THE RENOVATION OF THE NATIONAL BUILDING STOCK OF RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS**

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ABBREVIATIONS USED

AGKK Geodesy, Cartography and Cadastre Agency

AUER Sustainable Energy Development Agency

GA Grant assistance

VAT Value Added Tax

DSS Long-term building stock renovation strategy

EBRD European Bank for Reconstruction and Development

EIB European Investment Bank

EC European Commission

EU European Union

ESCO Energy Services Company

ESM Energy-saving measures

EC European Community

ERDF European Regional Development Fund

EFSI European Fund for Strategic Investment

ZEE Energy Efficiency Act

ZID Law amending and supplementing [an act]

ZUES — Condominium Ownership Management Act

ZUT Spatial Development Act

KEVR Energy and Water Regulatory Commission

FEI Final Energy Intensity

FEC Final Energy Consumption

ME Ministry of Energy

MRRB Ministry of Regional Development and Public Works

MS Council of Ministers

MF Ministry of Finance

NDEF National Trust EcoFund

NPDEE National Energy Efficiency Action Plan

NSI National Statistics Institute

OPRG Operational Programme Regions in Growth 2014-2020

PEC Primary Energy Consumption

PPP Public-private partnership

TFA Total floor area

nZEB Nearly Zero Energy Building

SS Property Owners' Association

SSO Self-contained property owner

FEEVI Energy Efficiency and Renewable Sources Fund

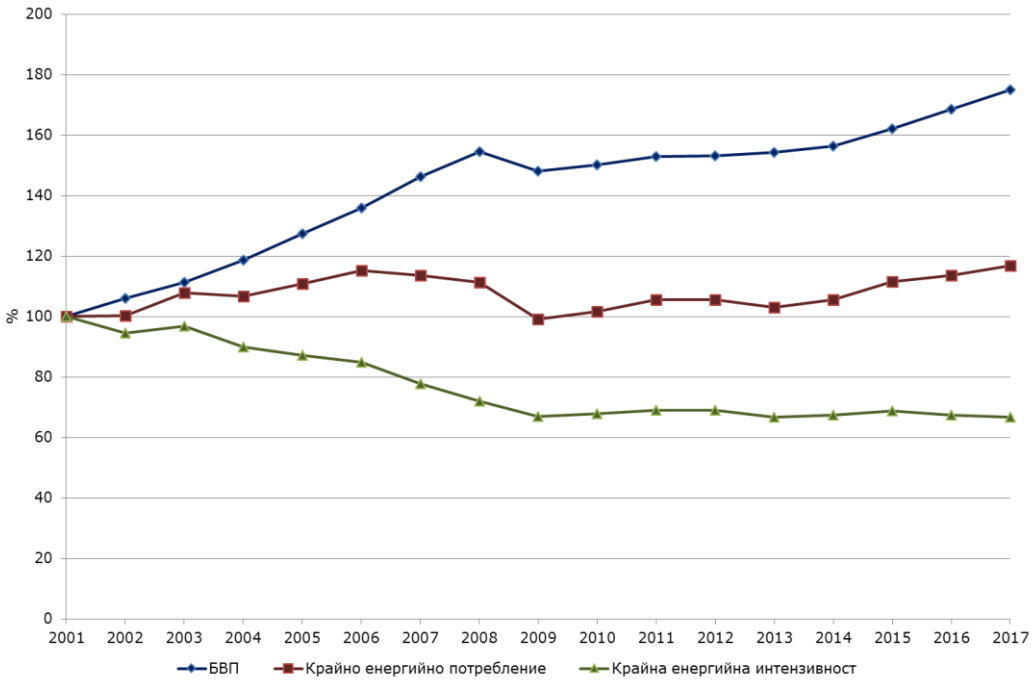
FMFIB Fund Manager of Financial Instruments in Bulgaria

Mtoe Million tonnes of oil equivalent (1 Mtoe = 11 630 000 MWh)

INTRODUCTION. ANALYSIS OF ENERGY CONSUMPTION TRENDS

A. Final energy consumption, final energy intensity

The figure below shows the indices of change in Final Energy Consumption (FEC), Gross Domestic Product (GDP) and Final Energy Intensity (FEI) in Bulgaria during the period 2001-2017. They are based on data published by the National Statistical Institute (NSI) and show a significant decrease in final energy intensity (FEI), which in 2017 stood at a 65 % of that in 2001.

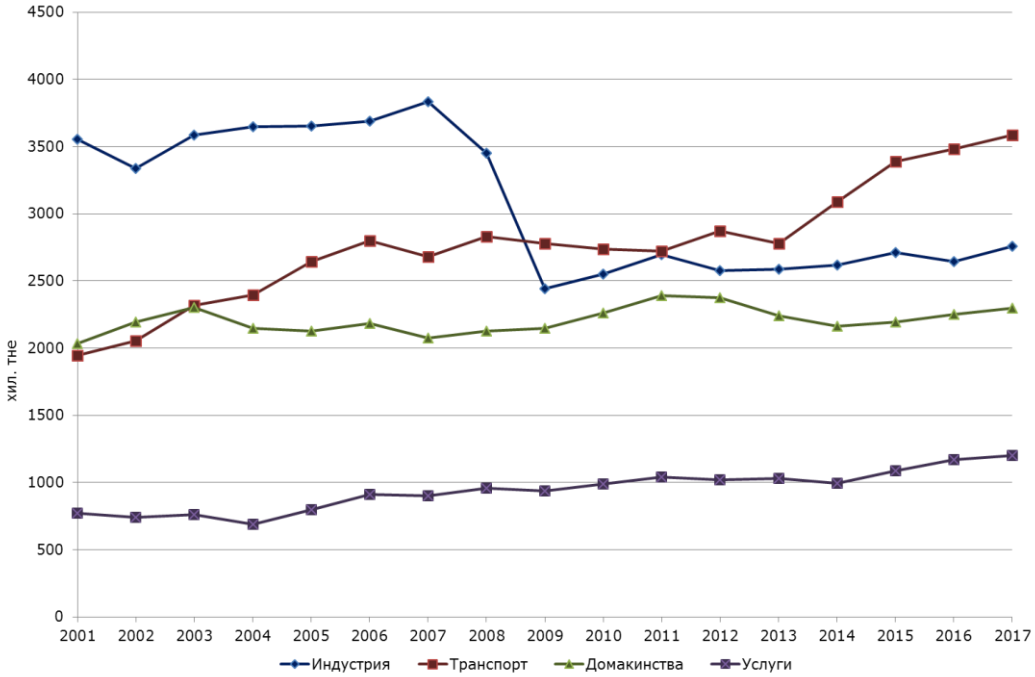


Легенда:	**Caption**:
БВП	GDP
Крайно енергийно потребление	Final Energy Consumption
Крайна енергийна интензивност	Final Energy Intensity

Figure 1: Gross domestic product, final energy consumption and final energy intensity in the period 2001-2017, index values for 2001 are set at 100 %. *Source : NEEAP Annual Implementation Report for 2018 (according to NSI data).*

Over the period 2001-2017, energy consumption decreased significantly in the industry sector (24.2 %). The largest increase in energy consumption by 67.4 % was registered in the transport sector, which displaced the industry sector as the largest energy consumer in 2009.

In the households and services sectors FEC increased by 17.4 % and 51 %, respectively. The energy consumption of residential buildings accounted for nearly all consumption in the households sector and that of public buildings for the bulk of energy consumption in the services sector. The change in FEC by leading sectors in terms of energy consumption for the period 2001-2017 is shown in Figure 2.



Легенда:	**Caption**:
Индустрия	Industry
Транспорт	Transport
Домакинства	Households
Услуги	Services
Хил. тне	Thousand toe

Figure 2: Final energy consumption by sector 2001-2017.

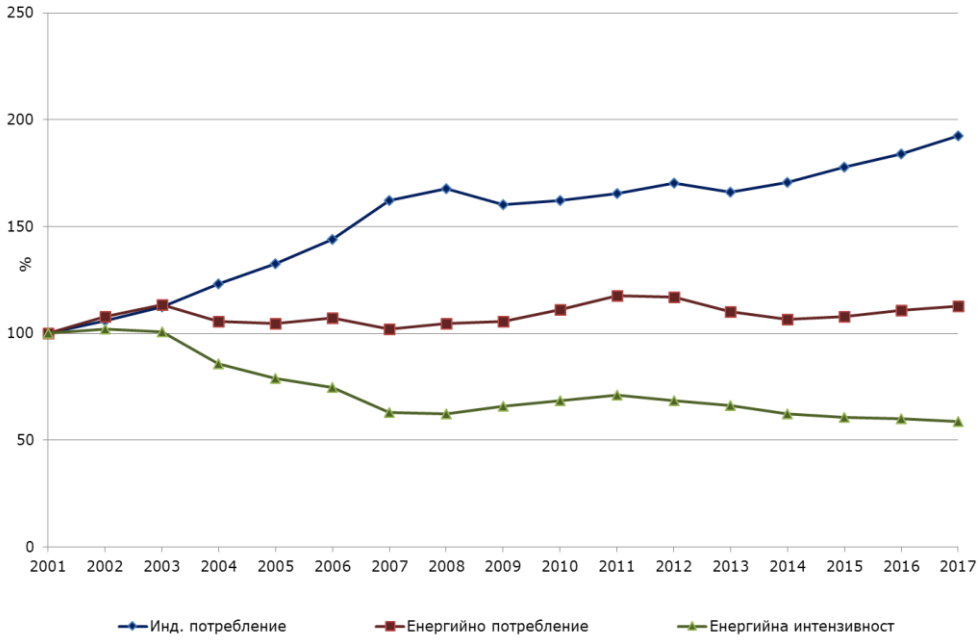
Source : Annual report on the implementation of the NPDEE for 2018 (according to NSI data).

B. Final energy consumption in the households sector

Energy intensity in the sector is measured against the growth in individual household spending. During the period 2001-2007 individual household spending increased rapidly against a flat trend of energy consumption, resulting in a corresponding rapid decrease in energy intensity.

After 2007, there was a significant decline in the growth rate of household monetary spending, coupled with relatively flat energy consumption and a marginal change in energy intensity. The decrease in energy intensity in terms of monetary consumption is an indicator of greater efficiency if household energy use, which acts as a brake on energy consumption growth.

The factors that influence changes in household energy consumption include the level of comfort in the home, the climate and floor area of housing units, the household appliances used, etc.



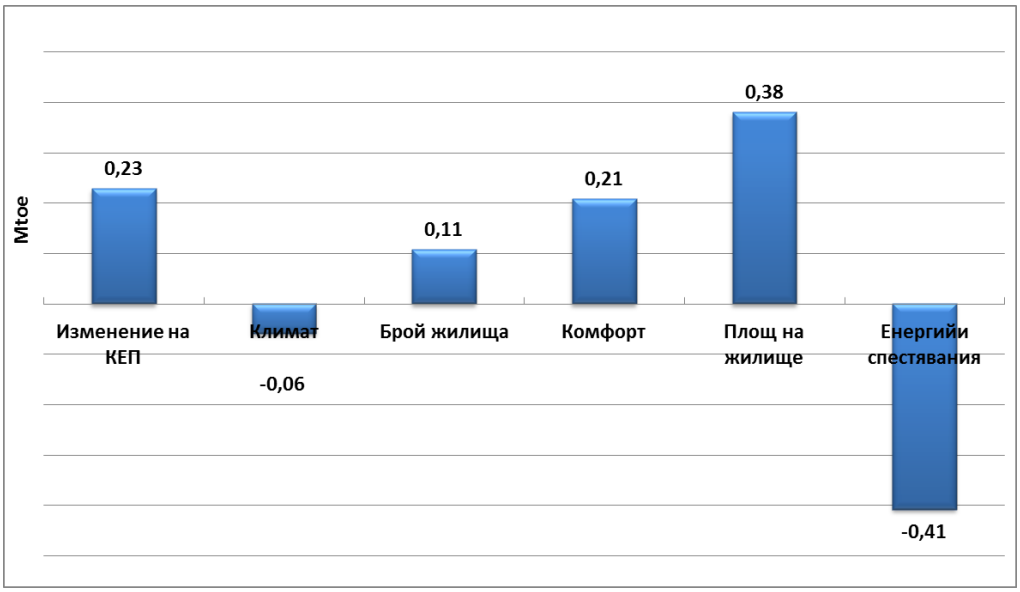
Легенда:	**Caption:**
Индивидуално потребление	Individual consumption
Енергийно потребление	Energy consumption
Енергийна интензивност	Energy intensity

***Figure 3**: Individual household spending, energy consumption and energy intensity of individual household spending in the period 2001-2017, indices for 2001 = 100 %. Source: NEEAP Annual Implementation Report for 2018 (according to NSI data).*

The analysis of the factors influencing changes in energy consumption is based on data for Bulgaria from the Decomposition tool, developed and used in the framework of project ODYSSEE-MURE. The purpose of the tool is to explain the changes that occur over a given period by 'decomposing' various effects. More specifically, the effect of the following factors on household energy consumption is shown: the increase in the number and floor area of housing units, the difference in climate conditions in the years covered by the comparison (2007 and 2017), the change in heat comfort and the energy savings achieved through improved energy efficiency.

The main factor for the increase in energy consumption in the household sector is the increase in the number and floor area of housing units and the improvement in heat comfort, which have resulted in an increase in energy consumption by a total of 0.70 Mtoe. Climate conditions, on the other hand, have led to a decrease in energy consumption by 0.06 Mtoe. The most important factor for the decrease in consumption by 0.41 Mtoe are energy savings due to improved energy efficiency.

The combined effect of these factors and the energy savings achieved resulted in FEC increasing by only **0.23 Mtoe**.

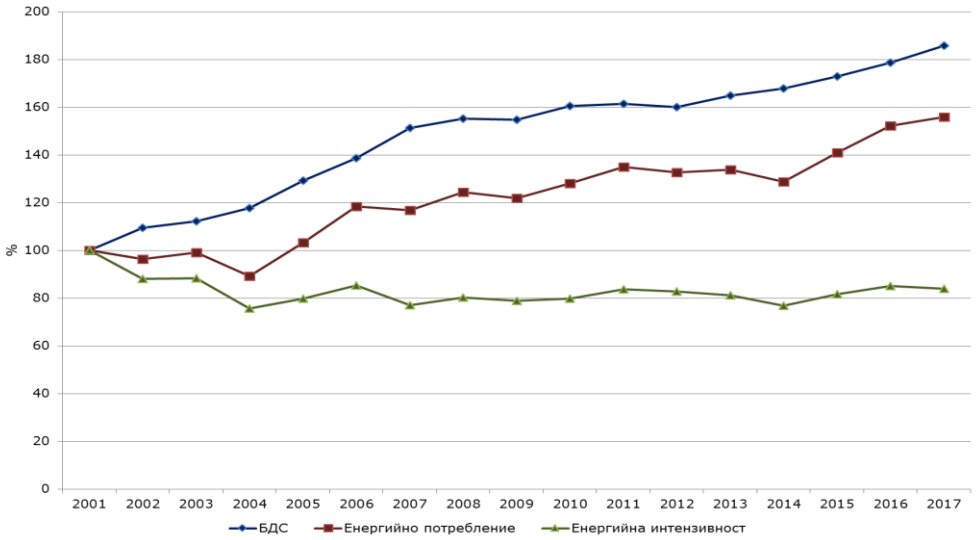


Легенда:	**Caption:**
Изменение на КЕП	Change in FEC
Климат	Climate
Брой жилища	Number of housing units
Комфорт	Comfort
Площ на жилище	Housing unit area
Енергийни спестявания	Energy savings

Figure 4: *Factors affecting household energy consumption for the period 2001-2017*
Source: ODYSEE database of [energy efficiency] indicators

C. Final energy consumption in the services sector

Gross value added (GVA) and energy consumption in the services sector show a steady long-term upward trend over the entire period 2001-2017. Energy intensity decreased until 2004, remaining relatively stable with minimal fluctuations during the rest of the period. The services sector has the lowest energy intensity. Generally, the energy intensity of the sector is 6 to 7 times lower than the energy intensity of the industry sector.



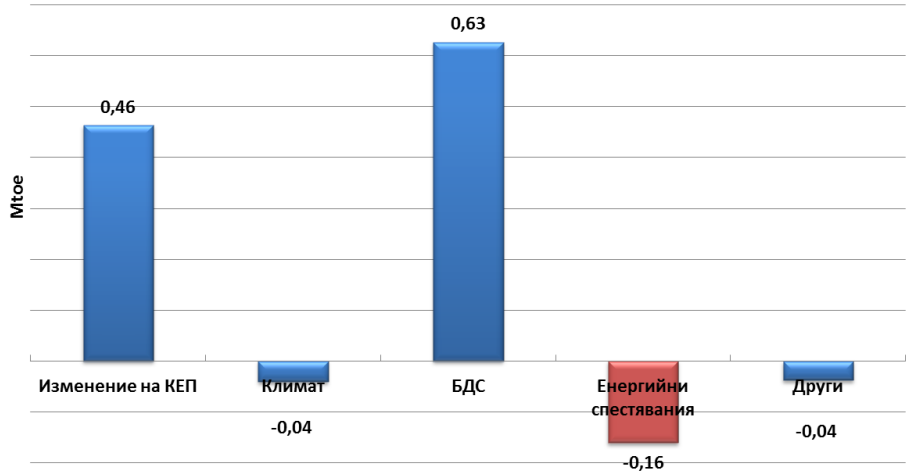
Легенда:	**Caption:**
БВП	GDP
Крайно енергийно потребление	Final Energy Consumption
Крайна енергийна интензивност	Final Energy Intensity

Figure 5: *Gross value added (GVA), energy consumption and energy intensity of the services sector in the period 2001-2017, indices for 2001 = 100 %. Source: Annual report on the implementation of the NPDEE for 2018 (according to NSI data).*

The main factors for the change in final energy consumption in the services sector in the period 2001- 2017 are as follows:

- energy consumption growth in the sector, mostly attributable to the increase in the added value of output (0.63 Mtoe);
- climate conditions and certain other factors, leading to a decrease in consumption by 0.08 Mtoe.
- energy savings due to improved energy efficiency in the sector, leading to a decrease in consumption by 0.16 Mtoe.

As a result of the combined effect of these factors, FEC increased significantly by **0.46 Mtoe**, or approximately 40 %, during the period concerned.



Легенда:	Caption:
Изменение на КЕП	Change in FEC
Климат	Climate
БДС	GVA
Енергийни спестявания	Energy savings
Други	Other

Figure 6: *Factors affecting energy consumption in the services sector during the period 2001-2017, Source: ODYSEE database of [energy efficiency] indicators*

D. Energy efficiency index (ODEX)

ODEX is an index developed and used in the ODYSSEE-MURE project to measure progress in energy efficiency by sector. The aim is to create an indicator that does not reflect, to the degree possible, the impact of structural changes in the individual sectors.

It is calculated as the ratio between actual final energy consumption in a given year and fictitious consumption during the same year, provided that the energy efficiency index remains unchanged compared to the reference year. An index value of 90 means a 10 % increase in energy efficiency.

For each sector, the index is calculated as the weighted average of energy efficiency indicators. Energy intensity, specific energy consumption, etc. can be used as energy efficiency indicators by sector.

The calculation used in ODYSSEE is based on a 'floating' baseline year, meaning that the savings achieved through the implementation of energy efficiency measures are measured against the previous year. ODEX cumulates additional energy savings from one year to another. More detailed information about the calculation of ODEX is available in the methodological report Defining ODEX indicators in the ODYSEE database, as well as on the AUER website.

Compared to energy intensity, which is traditionally used to assess this indicator for individual sectors of the economy, ODEX offers advantages in that it allows energy efficiency trends to be assessed over a one-year period for all sectors because it is not affected by structural changes and

other factors not related to energy efficiency (such as increases in the number of appliances, motor vehicles, etc.).

Легенда:	**Caption:**
ODEX домакинства	ODEX households
ODEX услуги	ODEX services

Figure 7: *Change in the ODEX index in the household and services sectors for the period 2001-2017, indices 2001 = 100 %*
Source: ODYSEE database of [energy efficiency] indicators

In the households sector, the ODEX index decreased at a very low pace and, in 2017, it stood at 98 % of its 2001 level. It should be noted that the calculation method for this index does not reflect important factors, such as the increase of thermal comfort in housing units in winter, and the increase in the use of air conditioning in the summer and household appliances in general, which has a major impact on energy consumption. The more significant improvement observed in 2017 reflects the impact of investments to upgrade the energy efficiency of residential buildings.

The services sector has a significantly smaller share in FEC, and the lowest energy intensity compared to other major sectors. Here, as in the households sector, buildings have the greatest share in energy consumption and the ODEX index does reflect changes in the level of thermal comfort in public buildings. A downward trend was registered during the period under review, reflecting the decrease in the index, which in 2017 stood at 87 % of its level in 2001. This outcome also reflects the effect of energy efficiency measures, which mainly focused on public buildings in recent years.

1. OVERVIEW OF THE NATIONAL BUILDING STOCK

There is currently no uniform approach to defining the category of buildings in Bulgaria according to their intended use. Although data [about buildings] belonging to similar categories is collected for various purposes and to enable service delivery, provision of information and conducting analyses, straightforward comparisons are not always possible. According to national law governing energy efficiency and energy performance buildings are classified into the following categories depending on their intended use:

A. Residential:

(a) single-family houses;

(b) multi-family residential buildings (apartment blocks) — low-, medium- and high-rise;

(c) mixed-use buildings;

(d) buildings for residential-type social services;

B. Non-residential public buildings:

(a) buildings for administrative service delivery;

(b) buildings of educational establishments and scientific organisations;

(c) buildings of healthcare establishments;

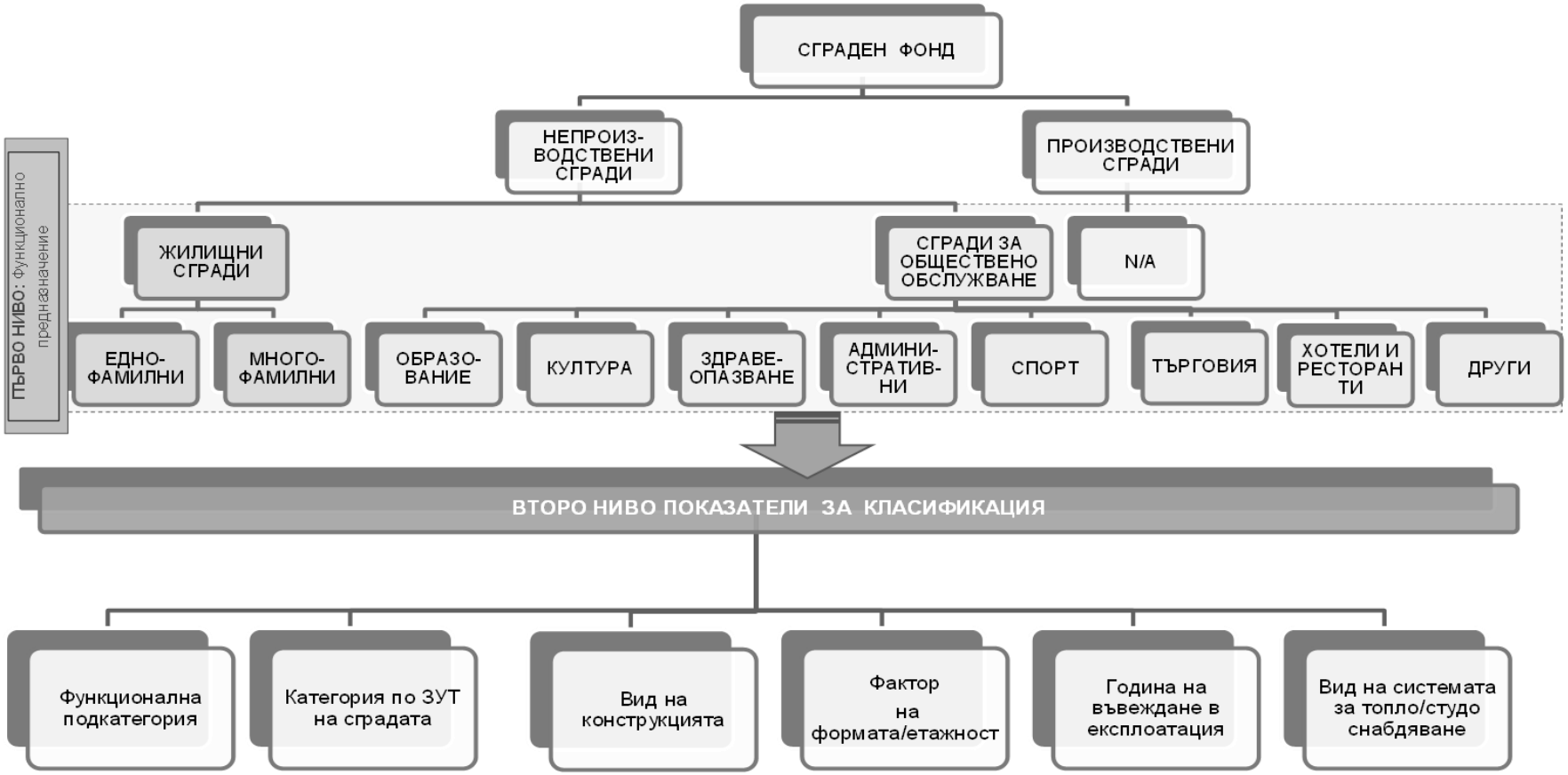
(d) hotels;

(e) commercial, mass catering and service delivery buildings;

(f) sports facilities;

(g) culture and art buildings;

(h) other public service buildings (according to the nomenclature set out in Regulation No 1 of July 2003 on the nomenclature of constructed buildings).



Легенда:	**Caption**:
ПЪРВО НИВО: функционално предназначение	**FIRST LEVEL:** functional purpose
СГРАДЕН ФОНД	BUILDING STOCK
НЕПРОИЗВОДСТВЕНИ СГРАДИ	BUILDINGS NOT INTENDED FOR INDUSTRIAL PRODUCTION
ПРОИЗВОДСТВЕНИ СГРАДИ	BUILDINGS INTENDED FOR INDUSTRIAL PRODUCTION
ЖИЛИЩНИ СГРАДИ	RESIDENTIAL BUILDINGS
СГРАДИ ЗА ОБЩЕСТВЕНО ОБСЛУЖВАНЕ	BUILDINGS INTENDED FOR PUBLIC SERVICE DELIVERY
N/A	N/A
ЕДНОФАМИЛНИ	SINGLE-FAMILY
МНОГОФАМИЛНИ	MULTI-FAMILY
ОБРАЗОВАНИЕ	EDUCATION
КУЛТУРА	CULTURE
ЗДРАВЕОПАЗВАНЕ	HEALTHCARE
АДМИНИСТРАТИВНИ	ADMINISTRATIVE
СПОРТ	SPORT

ТЪРГОВИЯ	COMMERCIAL
ХОТЕЛИ И РЕСТОРАНТИ	HOTELS AND RESTAURANTS
ДРУГИ	OTHER
ВТОРО НИВО ПОКАЗАТЕЛИ ЗА КЛАСИФИКАЦИЯ	SECOND LEVEL CLASSIFICATION INDICATORS
Функционална подкатегория	Functional sub-category
Категория ЗУТ на сградата	Building category according to the Spatial Development Act (ZUT)
Вид на конструкцията	Type of structure
Фактор на формата/етажност	Factor determined by the shape/number of storeys of a building
Година на въвеждане в експлоатация	Year placed into service
Вид система за топло/студо снабдяване	Type of heating/cooling system

Figure 8: *Building stock[1] classification*

[1] *According to Regulation No 1 on the nomenclature of constructed buildings in the Republic of Bulgaria.*

1.1 Review and classification of public service (non-residential) buildings

Information about non-residential buildings is collected by various institutions to enable the provision of administrative services and for other purposes. Data structure and distribution across the various categories is uneven. The Geodesy, Cartography and Cadastre Agency (AGKK) maintains a large dataset that covers 89.56 % of Bulgaria's territory. The table below sets out an overview of the data about non-residential building stock, which the dataset contains.

Table 1 *Overview of non-residential building stock*

Building category	TFA, m^2
Childcare establishments (kindergartens and crèches)	2 371 438
Other, incl. retirement homes, homes for orphaned and abandoned children, student dormitories, car repair centres	18 470 987
Healthcare establishments (hospitals, polyclinics, etc.)	9 685 995
Retail and wholesale outlets (supermarkets and shopping malls)	10 519 029
Education (schools, colleges and universities)	8 927 599
Public service buildings	14 878 947
Sport halls and facilities	1 793 216
Buildings of cultural and art institutions	2 296 810
Buildings in the transport sector (train stations, ports and airports)	2 803 990
Hotels and restaurants	18 898 840
Not classified	14 276 437
Total	**104 923 286**

1.1.1 Overview per type of construction system

There is a great variety of systems for the construction of non-residential buildings, with the systems varying depending on the category of building. At the present stage, available information about the different categories of buildings is insufficient and does not allow a qualitative overview or summary to be made.

1.1.2 Overview by year of construction — depending on the technical requirements for the buildings

The information about certified buildings available in the AUER's information system shows the following distribution of buildings by year of construction (year first placed into service), with the relevant periods corresponding to changes in applicable building codes.

Легенда:	**Caption:**
Разпределение по година на построяване	Distribution by year of construction
Административни	Administrative
Сгради за образование и наука	Buildings of educational establishments and scientific organisations
Детски заведения	Childcare establishments
Сгради в областта на здравеопазването	Buildings of healthcare establishments
Сгради в областта на хотелиерството	Hotels
Сгради за търговия	Commercial buildings
Сгради за спорт	Sports buildings
Сгради за култура и изкуство	Buildings of cultural and art institutions
Сгради в областта на транспорта	Buildings in the transport sector
Други сгради	Other buildings
До 1959	Until 1959
След 1959 то 1977	After 1959 until 1977
След 1977 до 1980	After 1977 until 1980
След 1980 до 1987	After 1980 until 1987
След 1987 до 1999	After 1987 until 1999
След 1999 до 2005	After 1999 until 2005
След 2005 до 2010	After 2005 until 2010
След 2010	After 2010

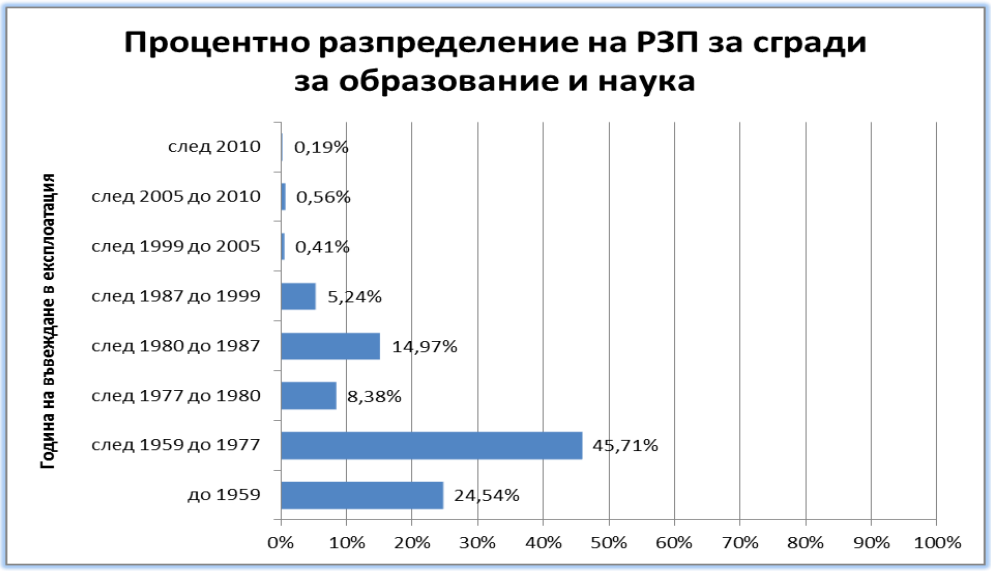
Figure 9: *A breakdown of certified buildings by year of construction*

For some of categories, the area of certified buildings provides a sufficiently representative sample and a reliable snapshot of the periods in which the buildings in the respective categories were constructed.

Легенда:	**Caption**:
Процентно разпределение на РЗП за сгради за административно обслужване	Share of administrative service buildings in terms of total floor area (TFA)
Година на въвеждане в експлоатация	Year placed into service
След 2010	After 2010
След 2005 до 2010	After 2005 until 2010
След 1999 до 2005	After 1999 until 2005
След 1987 до 1999	After 1987 until 1999
След 1980 до 1987	After 1980 until 1987
След 1977 до 1980	After 1977 until 1980
След 1959 до 1977	After 1959 until 1977
До 1959	Until 1959

Figure 10: *Share of administrative service buildings in terms of total floor area (TFA)*

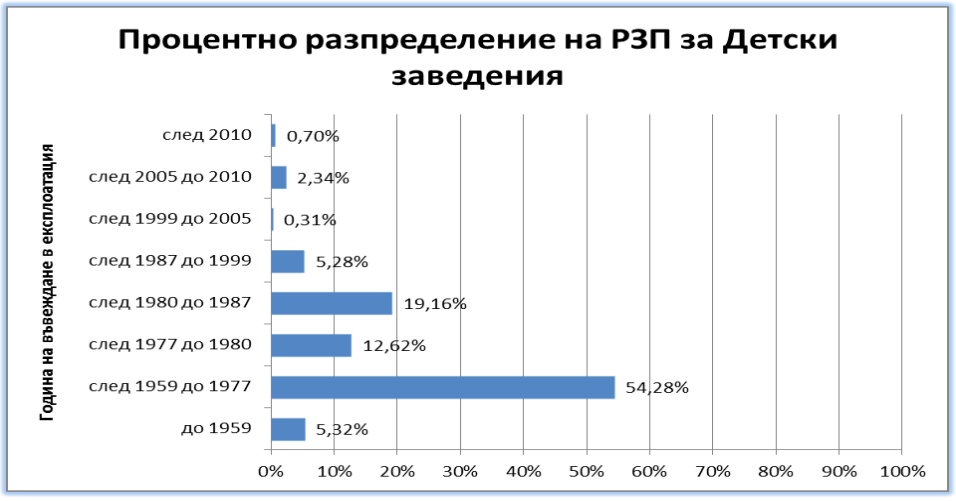
More than 20 % of administrative service buildings have been certified. The analysis shows that 52.2 % of existing administrative buildings were constructed and placed into service in the period 1959-1977, i.e. their design conforms to the oldest construction and technical standards dating back to 1959. The remaining 32 % of buildings were designed and constructed according to standards in force in the period between 1974 and 1986. Only 15 % of the administrative buildings occupied by the central government were designed and constructed after 2005 — a period during which a process of aligning national law with EU law on energy efficiency was under way.



Легенда:	**Caption:**
Процентно разпределение на РЗП за сгради за образование и наука	Share of the buildings of educational institutions and science organisations in terms of total floor area (TFA)
Година на въвеждане в експлоатация	Year placed into service
След 2010	After 2010
След 2005 до 2010	After 2005 until 2010
След 1999 до 2005	After 1999 until 2005
След 1987 до 1999	After 1987 until 1999
След 1980 до 1987	After 1980 until 1987
След 1977 до 1980	After 1977 until 1980
След 1959 до 1977	After 1959 until 1977
До 1959	Until 1959

Figure 11: *Share of the buildings of educational institutions and science organisations in terms of total floor area (TFA)*

More than 70 % of the buildings of educational institutions are certified. Most buildings in this category (93 %) were constructed before 1987, with a period of particularly intensive construction between 1959 and 1977.



Легенда:	**Caption:**
Процентно разпределение на РЗП за сгради за детски заведения	Share of buildings of childcare establishments in terms of total floor area (TFA)

Година на въвеждане в експлоатация	Year placed into service
След 2010	After 2010
След 2005 до 2010	After 2005 until 2010
След 1999 до 2005	After 1999 until 2005
След 1987 до 1999	After 1987 until 1999
След 1980 до 1987	After 1980 until 1987
След 1977 до 1980	After 1977 until 1980
След 1959 до 1977	After 1959 until 1977
До 1959	Until 1959

Figure 12: *Share of buildings of childcare establishments in terms of total floor area (TFA)*

Almost 70 % of crèches and kindergartens are certified. Likewise, there was a boom in the construction of childcare establishments between 1959 and 1977, with more than half of the buildings constructed during this period.

As regards the remaining categories of buildings, the area of certified buildings has a share of 3 % to 17 % of the TFA for the respective category, without a clear match with the data about the respective category of buildings collected by the AGKK.

1.1.3 Overview of buildings by type of ownership

The buildings owned by the central government and local authorities have a share of 29 % of non-residential buildings and privately-owned buildings have a share of 56.6 %.

Table 2: *Overview of buildings — breakdown per type of ownership*

Ownership	Central government	Municipal	Private	Joint ownership	N/A	Total
TFA, m^2	13 158 233	17 252 998	59 407 902	7 822 889	7 281 264	104 923 286
Share	12.54 %	16.44 %	56.62 %	7.46 %	6.94 %	100.00 %

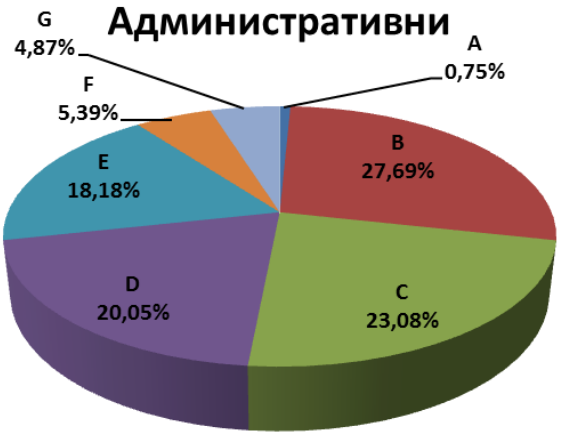
Легенда:	Caption:
Разпределение по собственост	Distribution by type of ownership
Държавна	Central government
Общинска	Municipal
Частна	Private
Съсобственост	Joint ownership
Няма данни	N/A

Figure 13: *Distribution by type of ownership*

1.1.4 Overview by energy performance and energy consumption

Information about the energy performance of buildings is mainly available from energy performance certificates and there are no other official sources of information. There are differences in the volume of buildings certified in the different categories. For this reason, the overview largely comprises categories for which large samples of certified buildings are available, notably administrative buildings, the buildings of educational establishments and scientific organisations and the buildings of childcare establishments.

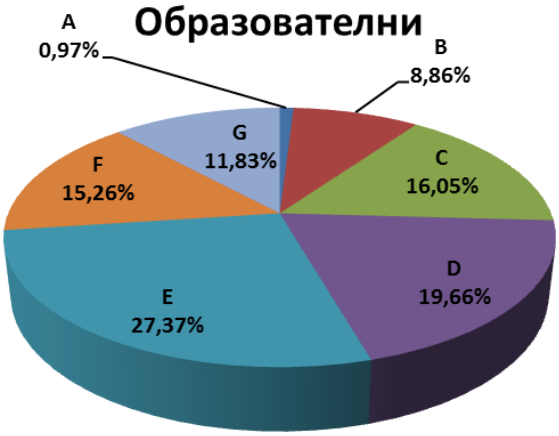
The distribution of administrative buildings in terms of their energy class is more even compared to that of buildings belonging to other categories. One of the reasons for the more even distribution by year of construction (is that 20 % of the buildings have been constructed after 1999, which is when more stringent energy efficiency requirements were introduced. A total of 48.5 % of administrative buildings are below the minimum energy consumption class (currently energy class C for all existing buildings constructed before 2010), with an additional 28.4 % belonging to energy classes E, F, or G. A relatively high share of buildings (more than 27 %) has been certified as energy class B.



Легенда:	**Caption:**
Административни	Administrative

Figure 14: *Energy consumption (efficiency) class of administrative buildings*

This category comprises schools, colleges and universities, which are below the minimum energy efficiency class (74 % of the buildings), with 54.5 % belonging to energy classes E, F or G.



Легенда:	Caption:
Образователни	Educational

Figure 15: *Energy consumption (efficiency) class of the buildings of educational institutions*

The situation in the segment of childcare establishments is similar to that in the segment of buildings of educational institutions. A total of 65.5 % of the buildings do not satisfy the minimum requirements for the energy efficiency class, and 49.5 % belong to energy classes E, F or G.

Легенда:	Caption:
Детско заведение (градини и ясли)	Childcare establishments (kindergartens and crèches)

Figure 16: *Energy consumption (efficiency) class of the buildings of childcare establishments*

Relatively few (less than 10 %) of the buildings of educational institutions and childcare establishments belong to energy class B.

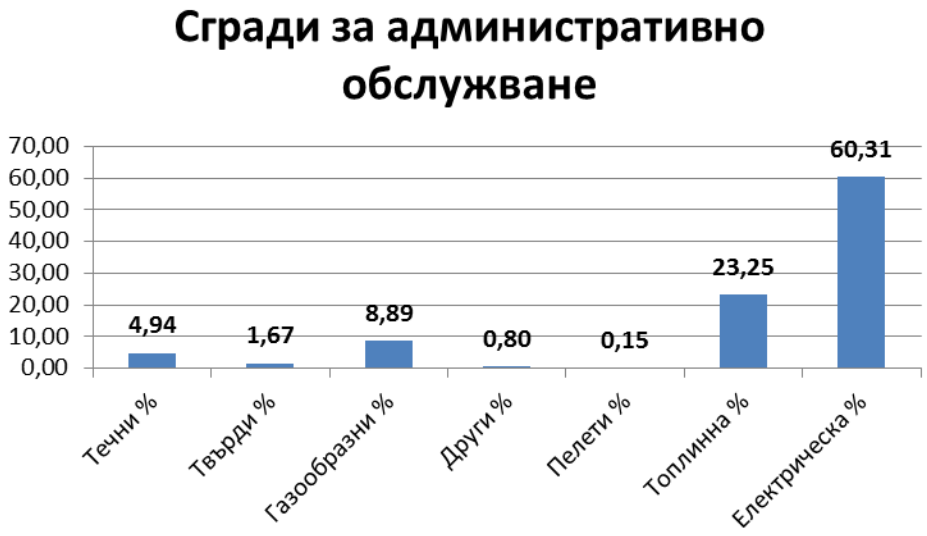
The breakdown of energy consumption in terms of FEC in the services sector according to the energy balance of the NSI for 2018 is as follows:

Легенда:	**Caption:**
Енергиен микс за 2018 г.	Energy mix for 2018
Въглища	Coal
Течни	Liquid
Пр. газ	Natural gas
ВЕИ/биомаса	RES/biomass
Топлинна	Heat
Ел. енергия	Electricity

Figure 17: *Breakdown of final consumption of fuels and energy in the services sector*

Electricity consumption has the highest share, accounting for nearly 60 % of FEC in the services sector. Natural gas, biomass and heat have a share of 38 % of consumption, with a negligible share of fossil and liquid fuels used. This is due to the fact that natural gas and central heating are not available throughout Bulgaria.

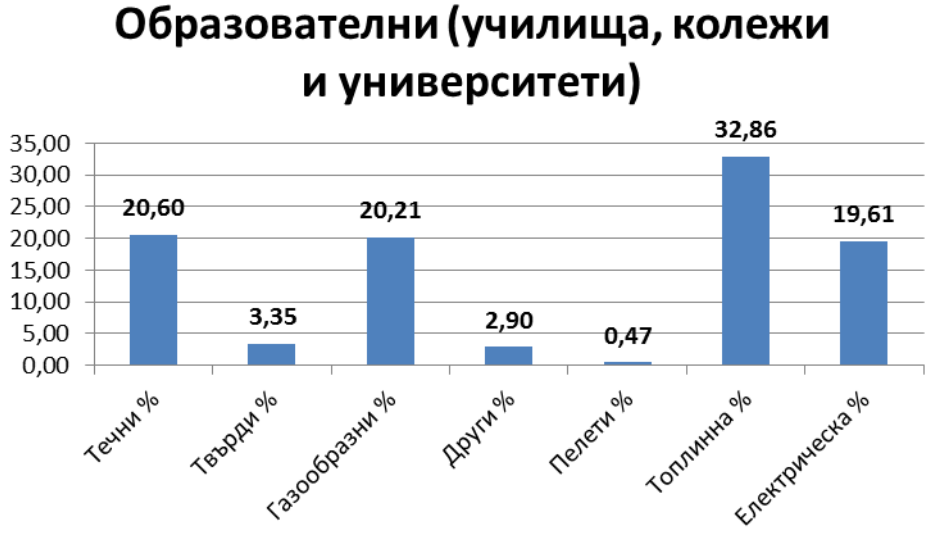
The profile of administrative buildings is almost identical to the sectoral profile. The use of biomass is very limited, with natural gas and heat having higher shares in final consumption. The buildings relying on these types of fuel are situated in larger cities and urban agglomerations, where access to gas distribution or heat distribution networks is available.



Легенда:	**Caption:**
Сгради за административно обслужване	Administrative service buildings
Течни %	Liquid %
Твърди %	Fossil %
Газообразни %	Gaseous %
Други %	Other %
Пелети %	Pellets %
Топлинна %	Heat %
Електрическа %	Electricity %

Figure 18: *Breakdown of final consumption of fuels and energy in the segment of administrative buildings*

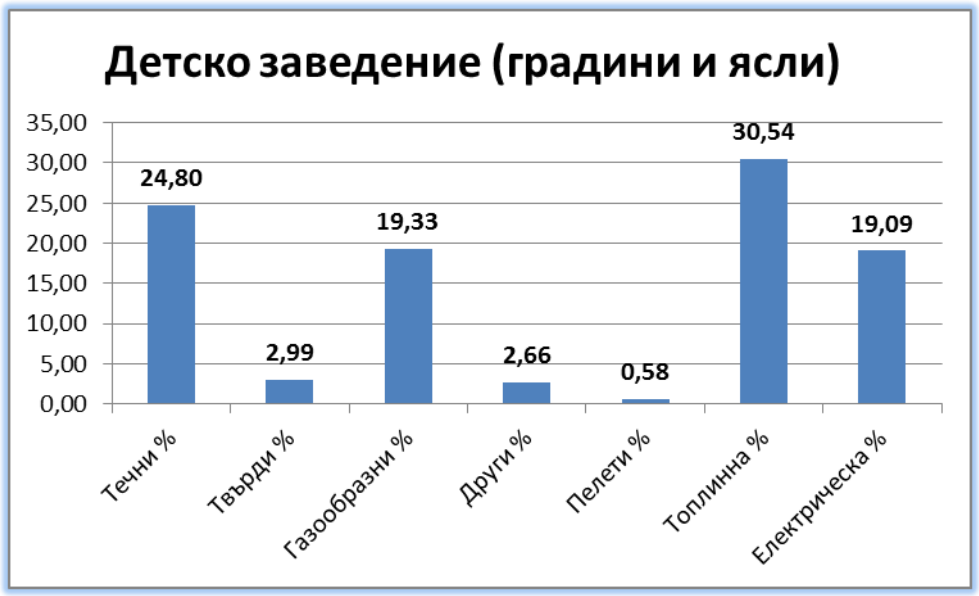
The breakdown for the buildings of educational institutions and childcare facilities differs. Electricity has a significantly lower share [in final consumption] unlike heat, which has a share of more than 30 %. Heat is very often supplied from local sources (boilers) as opposed to district heating plants. It should be noted that liquid fuels (mainly gas oil) consumption in the two categories is still very high (more than 20 %). This means that there is a significant potential for [improvement of] energy efficiency and reduction of greenhouse gas emissions.



Легенда:	**Caption:**
Образователни (училища, колежи и университети)	Education (schools, colleges and universities)
Течни %	Liquid %

Твърди %	Fossil %
Газообразни %	Gaseous %
Други %	Other %
Пелети %	Pellets %
Топлинна %	Heat %
Електрическа %	Electricity %

Figure 19: *Breakdown of final consumption of fuels and energy in the buildings of educational establishments*



Легенда:	**Caption:**
Детско заведение (градини и ясли)	Childcare establishments (kindergartens and crèches)
Течни %	Liquid %
Твърди %	Fossil %
Газообразни %	Gaseous %
Други %	Other %
Пелети %	Pellets %
Топлинна %	Heat %
Електрическа %	Electricity %

Figure 20: *Distribution of final consumption of fuels and energy in childcare establishments*

1.2 Review and classification of residential buildings in Bulgaria

The review and classification of residential buildings are based on reliable and verifiable data published by the NSI and AUER and available from strategic documents and reports on the existing housing stock.

1.2.1 Residential housing stock factsheet

According to the latest census, as at 1 February 2011 there were a total of 2 060 745 residential buildings[2] in Bulgaria. The total number of housing units[3] in these buildings was 3 887 149 and these had a total useful area[4] of 283 833 436 m^2. The total number of occupied residential buildings was 1 505 945 (76 % of all residential buildings). These comprised 3 345 819 housing units and had a useful floor area of 248 286 757 m^2.

Type of building depending on the mode of occupation	Mode of occupation					
	Total occupied and vacant buildings			Occupied buildings		
	Buildings, number	Useful floor area, m^2	Housing units, number	Buildings, number	Useful floor area, m^2	Housing units, number
Buildings occupied year-round	1 851 419	-	-	1 365 898	240 633 647	3 204 575
Seasonally occupied buildings (out-of-town houses, summer kitchens and shelters for temporary accommodation of homeless persons)	209326	-	-	140 047	7 654 110	141 244
Total	**2 060 745[5]**	**283 833 436**	**3 887 149**	**1 505 945**	**248 287 757**	**3 345 819**

Table 3: *Residential buildings in terms of occupancy type and mode*

As at 1 February 2011, the total number of occupied housing units was 2 666 733, making for a ratio of vacant housing units to the total number of housing units of 31 % (26 % in cities and 43 % in villages, reaching 100 % in completely depopulated areas). The share of vacant housing units in occupied residential buildings exceeds 20 %.

[2] 'Residential building' is a building intended for permanent occupation and consisting of one or more housing units that take up at least 60 per cent of its gross floor area (ZUT, Supplementary provisions, paragraph 5(29)).
[3] 'Housing unit' means a group of premises, covered and/or open spaces, functionally and spatially combined into a single unit, for the purpose of satisfying housing needs (ZUT, Supplementary provisions, paragraph 5(30)).
[4] The useful area of a housing unit is the area delimited by the walls enclosing the housing unit. The enclosing walls may divide the housing unit from neighbouring housing units or the common parts of the building, and may also be the external walls of the building. The useful floor area of the housing unit includes the area of balconies and loggias but does not include the basements and attics.
[5] This number includes 68 732 'summer kitchens', which are not considered separate buildings in terms of their mode of occupation.

For the purposes of the strategy, the overview and analysis of the existing housing stock is focused on the residential buildings occupied throughout the year. Otherwise, the high share of vacant housing units would produce a highly distorted statistical picture, which carries a risk of erroneous conclusions and recommendations for future policies[6].

[6]MRRB. Residential sector. Territorial analysis per thematic area.

Table 4: *[Distribution of] residential buildings occupied throughout the year according to their intended use / functional category*

Type of building	Buildings occupied throughout the year		
	Buildings, number	Useful floor area, m^2	Housing units, number
Single-family houses	1 291 549	118 300 032	1 490 460
Multi-family residential buildings/apartment buildings	66 865	117 158 877	1 640 120
Mixed-use buildings	6 465	4 052 585	53 838
Dormitories, buildings comprising communal housing units	1 019	1 103 153	20 157
Total	**1 365 898**	**240 614 647**	**3 204 575**

More than 90 % of all residential buildings occupied throughout the year in Bulgaria are single-family houses with a useful floor area of less than 50 % of the total area of the building. Multi-family residential buildings have a share of less than 5 % of the total number of residential buildings occupied throughout the year and their useful floor area is approximately equal to that of single-family houses.

1.2.2 Overview per type of ownership

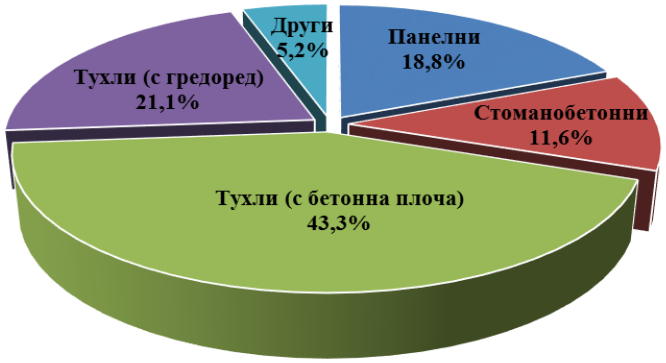
A total of 97.6 % of existing residential buildings are privately-owned, 96.5 % are owned by natural persons, and 1.1 % are owned by legal persons. Only 2.4 % of buildings are owned by the central government or local authorities. This specificity of Bulgaria largely accounts for the existing barriers (organisational, legal and behavioural) in the process of housing stock renovation and has a significant impact on the development of strategic measures and policies.

Легенда:	Caption:
Държавни или общински жилища 2.4%	Dwellings owned by the central or local government 2.4 %
Частни жилища – юридическо лице 1.1%	Private housing units — [owned by] legal persons
Частни жилища на физическо лице 96.5%	Private housing units — [owned by] private persons

Figure 21: *Distribution of housing units according to their ownership as at 1 February 2011*

1.2.3 Overview per type of construction system

The housing stock in Bulgaria (segment of occupied buildings) has been presented in five summary categories depending on the type of construction system used — panel buildings[7], reinforced concrete buildings[8], solid buildings (bricks with concrete slabs)[9], semi-solid buildings (bricks with beams)[10] and others[11].



Легенда:	Caption:
Други 5.2%	Other 5.2 %
Панелни 18.8%	Panel 18.8 %
Стоманобетонни 11.6%	Reinforced concrete 11.6 %
Тухли (с бетонна плоча) 43.3%	Bricks (with concrete slab) 43.3 %
Тухли (с гредоред) 21.1%	Bricks (with wooden beams) 21.1 %

[7] 'Panel buildings are constructed in their entirety from precast reinforced concrete panels (walls, floor slabs, roof)' (NSI).
[8] 'Reinforced concrete buildings are buildings whose supporting skeleton and floor structures are made from reinforced concrete, with their walls made of panels, bricks or other material' (NSI).
[9] 'Solid buildings are those with load-bearing walls made of bricks or stone masonry, and girders, beams and floor structure made of reinforced concrete without reinforced concrete columns' (NSI).
[10] 'Semi-solid buildings are those with load-bearing walls made of bricks or stone masonry, and girders, beams and floor structure made of wood elements' (NSI).
[11] The 'Other' category comprises buildings constructed using adobe (raw) bricks, wood and other materials (NSI).

Figure 22: *Breakdown of the useful floor area of occupied residential buildings according to the construction system used as at 1 February 2011*

Buildings in the 'other' category (i.e. those built of stone, adobe (raw) bricks and wood), which have a share of 5.2 % of the total, do not satisfy currently applicable technical standards in Bulgaria. It would therefore be neither cost-effective nor, in most cases, technically feasible to attempt to upgrade them so that they satisfy the requirements for mechanical resistance and stability, fire safety, accessibility and operational safety through the potential implementation of energy-saving measures.

The situation is similar for brick buildings with timber floors (joists) and without vertical and horizontal structural elements of reinforced concrete. Despite their relatively reliable structure (load-bearing brick walls and horizontal timber load-bearing elements), upgrading most buildings to a standard where they satisfy currently applicable regulatory requirements for energy efficiency would be technically and economically unjustified on account of the wear and tear of load-bearing elements, which have reached or will soon reach the end of their service life.

1.2.4 Overview by year of construction

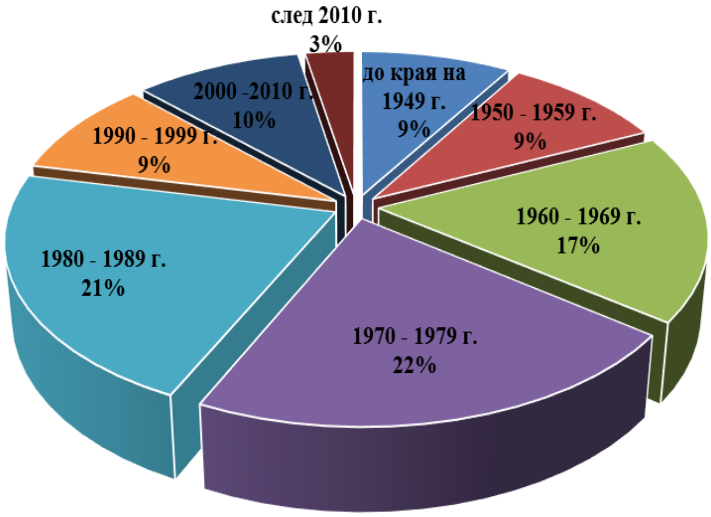
The overview of existing housing stock according to the year of construction has been compiled for the purpose of:
(1) determining the service life of the buildings and the durability of their structure;
(2) assessing the energy performance of buildings in connection with the evolution of statutory energy efficiency requirements in Bulgaria.

A total 34 % of occupied residential buildings in Bulgaria, which account for 18 % of the total useful floor area of residential buildings, were constructed before 1960, i.e. before energy efficiency requirements were first introduced into national law.

The largest share of existing housing stock in Bulgaria was constructed between 1960 and 1989 (52 % of all occupied residential buildings, comprising 60 % of the useful floor area). This is the period when most panel and reinforced concrete buildings were constructed and requirements for energy conservation in buildings were introduced for the first time in the form of statutory coefficients for heat transfer through the building envelope (external walls, floor, roof).

During the period 1990-1999, a total of 7 % of occupied residential buildings were constructed, which comprise 9 % of the total useful floor area.

Only 7 % of occupied residential buildings, which comprise 13 % of the useful floor area, were placed into service in the period after 2000, when more stringent statutory requirements for energy efficiency were introduced.

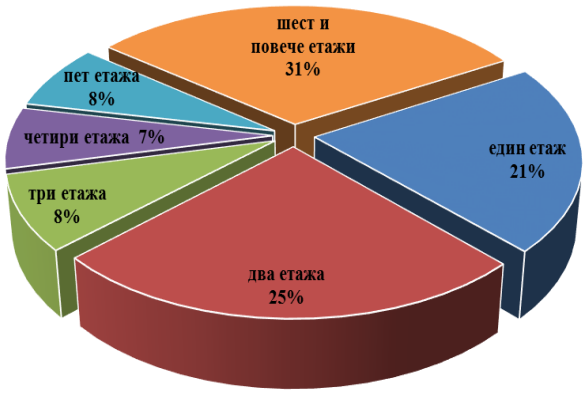


Легенда:	**Caption:**
До края на 1949 г.	until the end of 1949
1950-1959 г.	1950-1959
1960-1969 г.	1960-1969
1970-1979 г.	1970-1979
1980-1989 г.	1980-1989
1990-2999 г.	1990-2999
2000-2010 г.	2000-2010
След 2010 г.	After 2010

Figure 23: *Share of the useful floor area of occupied residential buildings according to the year of construction*

1.2.5 Overview in terms of the number of storeys of buildings

The existing housing stock in Bulgaria is dominated by low-rise[12] buildings. A total of 96 % of occupied residential buildings constructed until 2011 comprise one, two or three floors, i.e. they are classified as low-rise. These comprise 54 % of the total useful floor area of all residential buildings. Mid-rise[13] and high-rise buildings[14] have a share of only 4 % of the total, but their useful floor area has a share of 46 % of the total.



[12] Low-rise residential and mixed-use buildings up to 10 m in height (Regulation No 1 on the nomenclature of buildings under construction — Article 10(1), types of buildings under construction envisaged in letter 'a', points 1 and 2).
[13] Mid-rise residential and mixed-use buildings above 10 m in height (Regulation No 1 on the nomenclature of buildings under construction — Article 8(2), types of buildings under construction envisaged in letter 'b', points 1 and 2).
[14] High-rise residential and mixed-use buildings above 15 m in height (Regulation No 1 on the nomenclature of buildings under construction — Article 6(3), types of buildings under construction envisaged in letter 'c', points 2 and 3).

Легенда:	Caption:
Шест и повече етажа 31%	Six storeys and more 31 %
Един етаж 21%	One storey 21 %
Два етажа 25%	Two storeys 25 %
Три етажа 8%	Three storeys 8 %
Четири етажа 7%	Four storeys 7 %
Пет етажа 8%	Five storeys 8 %

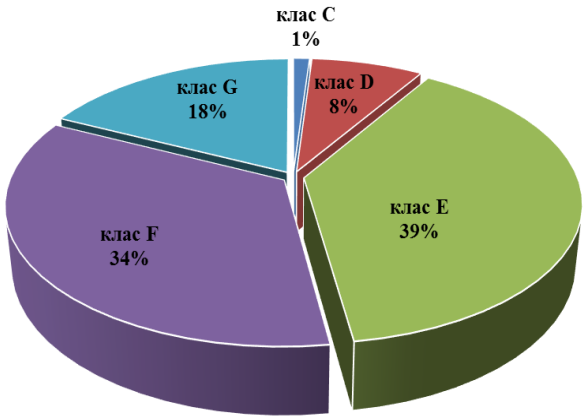
Figure 24: *Distribution of the useful floor area of occupied residential buildings according to the number of storeys as at 1 February 2011*

1.2.6 Overview of non-renovated residential buildings by energy performance and energy consumption

The energy [performance] profile of the existing housing stock has been compiled on the basis of the database of residential buildings audited and certified in the period 2015-2019, kept by the AUER.

1.2.6.1 Overview by energy performance and energy consumption

The buildings with poor energy performance characteristics, i.e. those belonging to energy classes E, F and G, have a share of 91 % of non-renovated buildings: energy class G (primary energy consumption > 435 kWh/m^2 per year) — 18 %, energy class F (primary energy consumption in the range of 364 kWh/m^2 per year up to 435 kWh/m^2 per year) – 34 %; and energy class E (primary energy consumption in the range of 291 kWh/m^2 per year up to 363 kWh/m^2 – 39 %.



Легенда:	Caption:
Клас C 1%	Class C 1 %
Клас D 8%	Class D 8 %
Клас E 39%	Class E 39 %
Клас F 34%	Class C 34 %
Клас G 18%	Class D 18 %

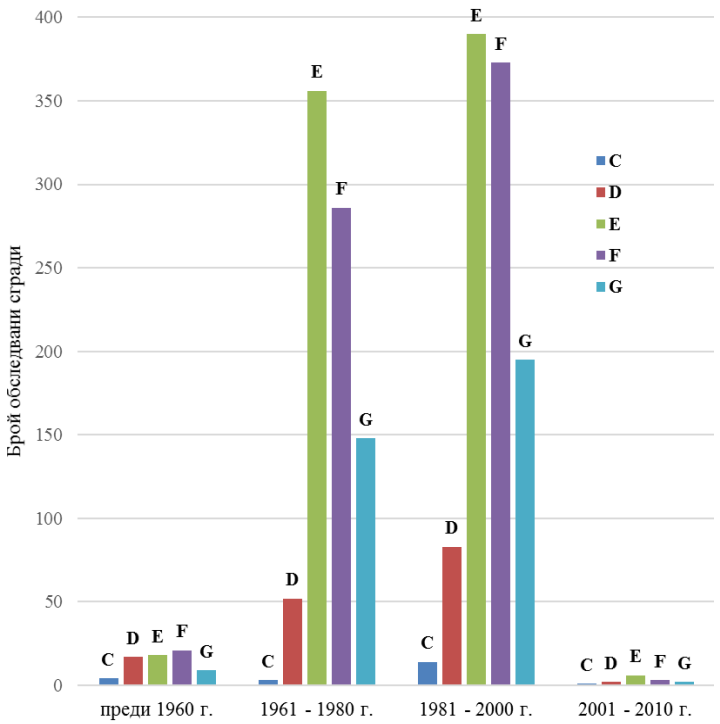
Figure 25: *Breakdown of non-renovated residential buildings placed into service before 2010 by energy efficiency (energy consumption) class*

1.2.6.2 Overview per energy efficiency (energy consumption) class and year of placing into service

An analysis of the link between the period of construction of buildings and their energy efficiency/consumption class (according to currently applicable standards) has been conducted. No direct link between energy consumption (energy efficiency class) and the year in which the buildings were placed into service has been established. The lack of a correlation is attributable to:

(1) the haphazard and partial implementation of energy saving measures on buildings (replacement of defunct external windows and doors, patchy installation of cladding systems on external walls of individual housing units, etc.);

(2) prevailing traditions in construction/architecture independent of the statutory requirements during the different periods (orientation of buildings, wall thickness, area taken up by glazing on façades, presence or absence of bay windows).



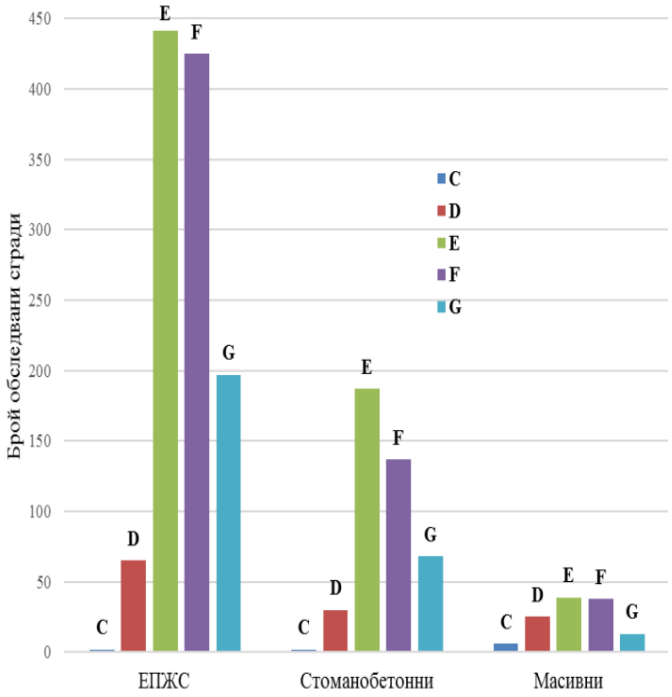
Легенда:	**Caption:**
Брой обследвани сгради	Number of audited buildings
Преди 1960 г.	Before 1960
1961-1980 г.	1961-1980
1981-2000 г.	1981-2000
2001-2010 г.	2001-2010

Figure 26: *Breakdown of non-renovated residential buildings placed into service before 2010 by energy efficiency (energy consumption) class and year of placing into service*

1.2.6.3 Overview per energy efficiency (energy consumption) class and type of construction design

An analysis of the link between the type of construction system used and the energy efficiency/consumption class of buildings (according to currently applicable standards) has been conducted. The chart below shows that there is no correlation between the pre-renovation energy consumption of buildings constructed using large, prefabricated panels (panel buildings) and reinforced concrete buildings (using beam/joistless reinforced concrete panels, monolithic in-situ cast concrete structures, sliding shuttering, lift slabs). The share of buildings constructed using the techniques concerned and belonging to the poorest energy performance classes (E, F and G) is high (more than 90 %, reaching 94 % for panel buildings and 92.4% for reinforced concrete buildings).

The share of solid buildings with low energy performance characteristics, albeit lower, is also high (74.3 %).



Легенда:	Caption:
Брой обследвани сгради	Number of audited buildings
ЕПЖС	Monolithic *in-situ* cast concrete structures
Стоманобетонни	Reinforced concrete
Масивни	Solid

Figure 27: *Breakdown of non-renovated residential buildings placed into service before 2010 by energy efficiency (energy consumption) class and type of construction system used*

1.2.6.4 Overview according to the technical system and energy source used

Heating accounts for nearly 80 % of the energy consumption in residential buildings calculated with reference to baseline consumption and 64 % of actual energy consumption.

The analysis shows that actual energy consumption for heating in buildings in their present condition, i.e. prior to renovation, is approximately twice as low as that the statutory energy consumption amount required to reach the microclimate parameters stipulated by law. This is largely attributable to unoccupied housing units, which make up more than 20 % of the housing units in occupied residential buildings, unheated common areas in buildings and the low average temperatures maintained in conditioned spaces. This specificity of the housing stock in Bulgaria is the result of the demographic situation in the country and the territorial disparities in the distribution of the population, and more specifically the depopulation of some areas.

A review of energy consumption by energy carrier shows that consumption is unbalanced, with a significant share of environmentally unfriendly/cheap sources of energy used. District heating accounts for only 18 % of total energy consumption, electricity has a share of 45 % (including heating), and solid fuels have a share of 36 %. The use of natural gas for residential heating and domestic purposes is very limited. Primary energy consumption and carbon emissions can both be reduced substantially if coal and electricity from coal-fired power plants are replaced by natural gas and low-carbon sources of energy on a broader scale.

1.2.6.5 Analysis of implemented energy saving measures (ESM) contributing to the achievement of the requisite energy efficiency (consumption) class in audited residential buildings

The analysis of the ESM implemented in audited and certified residential buildings with a view to achieving the energy performance class required by law shows that:

- the ESM implemented on 100 % of the buildings involved affixing cladding panels to the exterior of the buildings;
- the ESM implemented on 67 % of the buildings involved upgrades to the lighting system in the common areas of the building;
- the ESM implemented on 6 % of the buildings involved the upgrades to the heating and ventilation system, including building-wide systems, pumps and the relevant settings;
- the ESM implemented on 2 % of the buildings involved upgrades to the domestic hot water (DHW) systems in buildings.
- The use of renewable energy was foreseen in only 3 % of all renovated buildings.

The measures prescribed in existing certificates allow energy savings of up to 60 % to be achieved, which does not constitute a major renovation. Primary energy savings of more than 60 % have been achieved in only 6 % of the total number of renovated buildings. A further 8 % of the buildings (in which savings between 55 % and 60 % have been achieved) offer a real

potential for major renovation, provided that the ESM prescribed (including the installation of renewable energy recovery systems) are defined with greater precision.

The main finding of the review of housing stock and energy consumption is that its energy efficiency is currently low. This conclusion supports and complements other assessments carried out to date, notably the World Bank report entitled Bulgaria Housing Sector Assessment [(6)]ji drawn up in 2017 for the Ministry of Regional Development and Public Works according to which existing housing stock in Bulgaria has poor operational parameters. Several successive analyses conducted for the purpose of the national energy efficiency action plans have identified a consistent trend of households being the third most important energy consumer in Bulgaria.

1.2.7 Analysis based on social status indicators

The analysis is based on three interrelated indicators: housing improvement, poverty and social inclusion, and energy poverty.

The choice of heating sources is influenced by household income levels. The share of residential buildings heated by solid fuels is high (53.9 %) and has no alternative for low-income households in the absence of institutional and financial support. The use of solid fuels for heating is relatively low in areas with more developed central infrastructure and higher levels of economic development.

Despite being the most efficient option available, the use of central heating has declined over time due to subscribers terminating their contracts[15]. Gasified homes have a share of only 2.3 % compared to an EU average of 39 % (2016).

Following the review above, available statistical data about poverty, social inclusion and energy poverty has been analysed, the assumption being that renovation for the purpose of achieving energy efficiency is directly linked to the financial means of home owners.

While there is no complete overlap between the underlying causes of poverty and the poverty and social inclusion indicators based on statistical data, on the one hand, and those relating to fuel poverty, on the other, the link between the two is clear. The most commonly used indicators suggest that:

- In 2018, a total of 33.6 % of households experienced difficulties in heating their homes;
- In 2018, a total of 32.1 % of households were unable to meet unexpected financial expenses with own resources;

[15] the relative share of occupied housing units relying on central heating in 2011 was 15.1 % compared to 15.8 % in 2001.

- In 2018, a total of 31.9 % of households were unable to pay the costs related to the homes occupied on time.

The manifestations of poverty in territorial terms are an important part of the study. The analysis of statistical information at provincial level shows an inverse correlation between the relative share of persons living below the poverty line and the installation of energy efficient windows and insulation of occupied housing units with external cladding. At the same time, the National Energy Efficiency Plan for Multi-family Residential Buildings (NPEEMZhS), which is fully funded by the government and supported by it in administrative terms, puts all municipalities and types of multi-family residential buildings in Bulgaria on an equal footing thus leading to poorer implementation results in the economically underdeveloped northern part of Bulgaria[16]. It is evident that the factors influencing the effectiveness of the measures and programmes to overcome (energy) poverty are greater in number and stronger in terms of importance, and this should be taken into account in future policy making.

There is a growing recognition that 'effective actions to reduce fuel poverty must include measures to improve energy efficiency in the building stock at the same time as measures related to social policy', as set out in Directive 2018/2002.

In order to define effective measures to be included in the long-term strategy for energy efficiency in the residential sector, an analysis of the specificities of the social context in Bulgaria has been conducted.

Home owners or tenants who experience financial difficulties and do not have the means to renovate their homes are not concentrated in distinct buildings/areas, which would have facilitated the implementation of targeted energy efficiency policies/measures. This finding does not take into account ghettoised areas, where the implementation of development policies should precede renovation for the purpose of improving energy efficiency.

Almost 60 % of the population of Bulgaria lives in multi-family buildings. On account of the housing rules established before the transition in 1989 and the social mix that had already formed at the time, low-income owners and owners at risk of energy poverty are found in practically all areas and live in the same building with high-income owners. The financial status of owners is of great importance for the renovation of multi-family residential buildings, when co-financing is required, insofar as the participation of all property owners in the respective building is necessary.

[16] Only **25.6 % (517)** of the grant assistance contracts concluded under the NPEEMZhS envisaged the renovation of residential buildings in the Northwest, North-central and Northeast (NUTS 2) regions. The remaining **74.4 % (1 505)** of contracts were concluded in respect of residential buildings situated in the Southwest, Southern and Southeast (NUTS 2) region.

For the purpose of implementing the strategy, policies and measures will be developed that target the different needs and financial means of the owners of housing units in multi-family buildings.

A closer link should be forged between existing and future grants for heating (heating allowance) during the winter months and the support envisaged for insolvent persons to enable their participation in programmes/schemes for the introduction of energy efficiency measures in residential buildings.

1.3 Analysis of the statutory energy performance characteristics of buildings in Bulgaria

Bulgaria has transposed the requirements laid down in Directive 2010/31/EU in its national law and the same will be done for the amendments introduced by Directive (EU) 2018/844 in short order. The measures concerned have been transposed into national law together with the those envisaged in Directive 2012/27/EU, as amended by Directive (EU) 2018/2002. A separate **Renewable Sources of Energy Act (ZEVI)** transposes the provisions of EU law promoting the use of energy from renewable sources and governing public domain relations arising in relation to the production and consumption of electricity, renewable energy for heating and cooling, gas from renewable energy sources, biofuels and renewable energy in transport. In connection with the transposition of the requirements of Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, the Renewable Sources of Energy Act and the body of implementing regulations thereto will be amended.

The national legislative framework in the area of energy efficiency, including the energy efficiency of buildings, was established in 2004 and has been supported by every Bulgarian government to date.

As part of a detailed analysis of the regulatory framework for energy efficiency in buildings, a number of barriers have been identified and solutions to overcome them have been proposed. These are detailed in the table set out in section 3.1 of the strategy. The following general conclusions can be drawn:

- In strategic terms, Bulgarian energy efficiency legislation over the next three decades will evolve to ensure the achievement of a climate neutral and modern European economy.
- The comprehensive EU regulatory framework established for the purpose of achieving climate neutrality by the middle of this century will serve as the basis for building on the existing national energy efficiency framework as an element of national energy and climate regulations under the five dimensions of the Energy Union in the short and long term alike.

- Although the application of national legislation currently in force has enabled the achievement of good results as at 2020, a comparison between existing provisions and the new requirements introduced by Directive (EU) 2018/844, by which the Energy Performance of Buildings Directive (EEBD) was amended, points to a potential for further improvement of currently applicable energy efficiency legislation to ensure more effective application. This is essential for the future long-term renovation strategy of Bulgaria's building stock.
- The implementation of the government policy seeking to improve energy efficiency in Bulgaria is based on a cross-sectoral approach that pools the resources of several public sectors: energy, regional development, economy and transport. The Ministry of Energy (ME), (including the AUER) and the MRRB, within the remit of their respective functions, play a key role in the implementation of the national long-term strategy for the renovation of buildings. The new messages at EU level require swift and effective administrative action and calls for the adoption of urgent political decisions to clearly allocate responsibilities of the relevant institutions according to their competences and administrative structure.
- The prices of fuel and energy in Bulgaria are a key factor for the construction/renovation of low carbon buildings (realistically achievable decarbonisation) as a contribution to the achievement of energy consumption targets for 2030, 2040 and 2050.
- The professional qualifications of all actors in the investment process, the correct implementation of building and technical standards at each stage of the construction process, the competences needed to apply new energy-saving technologies and innovations, effective supervision during construction, follow-up monitoring and proper administrative capacity, including in the award of public procurement contracts for the renovation of buildings, are also essential for the success of building stock renovation.

2. IDENTIFYING COST-EFFECTIVE APPROACHES TO IMPROVING THE ENERGY PERFORMANCE OF BUILDINGS

(2.3.1.2. Cost-effective renovation approaches (Article 2a(1)(b) of the Directive on the energy performance of buildings, DEPB) set out in Recommendation (EU) 2019/786 of 8 May 2019 on the renovation of buildings, (OJ L 127, 16.5.2019, notified under C(2019) 3352) [(1)ii]

The intended purpose of the cost-effective approaches to improving the energy performance of buildings is to determine the policy and financial measures set out in this strategy. The study and the calculations within [their] scope provide input for the financial component of the

strategy in accordance with the requirements laid down in Article 2a of the DEPB. An essential point in the development of approaches to achieving cost-effectiveness is that they do not need to be necessarily optimal for each building/investor combination. In reality, as mentioned in the European Commission Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012, there is a multitude of cost-optimal levels for achieving the desired technical parameters depending on the individual building and the investor's own perspective, including their expectations in terms of acceptable investment conditions. The individual options for a specific building are subject to an energy performance audit and subsequent design decisions.

Cost-optimal energy performance has been calculated using the global costs methodology. The global cost component necessary for the strategic planning of the investments needed to renovate the national building stock comprising both residential buildings and non-residential buildings is the **initial investment cost**.

Cost effectiveness criteria: Energy performance also takes into account the cost-optimal levels, when the cost-benefit analysis for the projected economic life-cycle of the building is positive (§1(26) of the Supplementary provisions of the ZEE). **For the purposes of the strategy, a *'positive result'* means that the economic indicator 'net present value' of the global costs of a particular ESM package is a positive number (NPV > 0).**

Each of the ESM packages developed depending on the extent of the renovation works, i.e. light (less than 30 %), medium (between 30 % and 60 %) and major (more than 60 %), undertaken to achieve energy savings of more than 60 % on average for all categories of buildings with energy use classes E, F and G. Some of the options (packages of measures) offer opportunities for the cost-effective upgrade of existing buildings into near-zero energy buildings (nZEB) in line with the requirement laid down in Article 2a of the DEPB for cost-effective transformation of existing buildings into near-zero energy buildings.

All ESM packages comply with the European Commission recommendation to follow an integrated approach to improving the energy performance of buildings, taking into account measures for both the envelope and the technical systems of the building.

The packages include technologies for technical systems of the buildings that take into account the requirements laid down in the EU regulations adopted pursuant to Article 15 of Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of eco-design requirements for energy-related products.

2.1 Possible measures

2.1.1 Energy saving measures

The ESM combinations developed must satisfy the requirement for the measures applied to buildings to ensure fair competition between the different technologies and respect the principles and legal framework governing the free movement of goods and services in the EU market.

On the other hand, according to national law, energy efficiency measures should take into account the intended use of buildings and meet the requirements of the Regulation referred to in Article 18(2) of the Energy Efficiency Act, which means that they should lead to a verifiable, measurable or estimable increase in energy efficiency for end-users.

For the purpose of this strategy, an analysis of individual model measures for energy savings in buildings, which have been recommended by the institutions, bodies, services and agencies of the European Union, including recommendations of the European Commission to establish requirements for building installations (Article 8(1) of the DEPB), has been conducted. A list of model measures is set out in Tables 4, 5, 6 and 7.

Table5: *Building structure*

Total wall construction of new buildings or additional insulation system of existing walls
Total roof construction of new buildings or additional insulation system of existing roof
Thermal insulation of the same roof elements in existing buildings
Thermal insulation of an existing floor on the ground floor of an existing building
Increased thermal inertia with usage of exposed massive building materials at the interior space of buildings (Note: for some climate situations only).
Installing windows and doors with thermal insulation properties that are well suited to the winter period
Better sun shading (fixed or movable, operated manually or automatically and films applied to windows)
Better air tightness (maximum air tightness corresponding to the state of technology).
Building orientation and solar exposure (can constitute a measure for new buildings only).
Changing share transparent/opaque surfaces (glazed area to façade area ratio optimisation)
Openings for night ventilation (cross or stack ventilation).
Other measures in this category

Table 6: *Systems*

Sub-categories of measures covered prior to the entry into force of the amended Directive on the energy performance of buildings
Installation or improvement of heating system (based on fossil and/or renewable energy, with condensing boiler, heat pumps, etc.) at all sites
Upgrade of an existing vertical heating system through the construction of a horizontal heating system
Monitoring and metering devices for temperature control of space and water temperature
Installation or improvement of hot water supply system (based on fossil or renewable energy)
Installation or improvement of ventilation (mechanical with heat recovery, natural, balanced mechanical, extraction)
Installation or improvement of active or hybrid cooling system (e.g. ground heat exchanger, chiller)

Improvement of utilisation from daylighting
Active lighting system Energy-efficient lighting
Installation or improvement of PV systems
Change of energy carrier for a system
Change of pumps and fans
Insulation of pipes
Direct water heaters or indirect water storage heated by different carriers, can be combined with solar thermal systems
Solar heating or cooling installations and hot water supply systems of different sizes
Intensive night ventilation (Note: for non-residential buildings with massive structures and for some climate situations only)
Micro CHP with different carriers
Alternative systems such as decentralised supply systems, district heating and cooling cogeneration, etc.
Controlled used of hot water for residential purposes through a quantity control valve
Energy efficient office devices and household appliances
Other measures in this sub-category
Sub-categories of measures not covered prior to the entry into force of the amended Directive on the energy performance of buildings *Important note: These cover all aspects dealt with in Article 8(1) of the EEBD, notably 'overall energy performance', 'proper installation', and 'appropriate dimensioning, adjustment and control'.*
Building automation and control systems (BACS). The measure is implemented in combination with a smart metering system*
On-site electricity generation systems (building integrated photovoltaics, BIPV), hybrid solar collectors, photovoltaic thermal solar collectors (PV/T collectors) and micro electricity and heat cogeneration systems (micro-CHP)
Built-in lighting systems
Other measures in this sub-category

**'Smart metering system' means an electronic system that can measure energy consumption, providing more information than a conventional meter, and can transmit and receive data using a form of electronic communication (definition from Article 2(28) of the Energy Efficiency Directive, transposed into §1(9) of the Supplementary provisions of the Energy Efficiency Act).*

2.1.2 Renewable energy and waste heat recovery systems

Indicative measures for renewable energy recovery as an alternative to conventional energy sources are set out in Table 7.

Table 7 *renewable energy recovery building systems (conventional and new technologies)*

Water-to-water heat pumps
Air-to-water heat pumps
Ground-coupled heat pumps for ground heat recovery
Solar evaporator heat pumps
Solar hot water supply systems
Heating systems using geothermal energy
Solar heating and cooling systems
Combined solar energy recovery systems for cold generation with ozone-safe refrigerants
Photovoltaic systems for the electricity auto-production
Exhaust air heat recovery (heat recovery effect in buildings, incl. high efficiency systems with two-stage heat recovery)

2.1.3 Passive measures

Table 8 *Passive measures*

Category: Measures for combined application of passive elements

Open Trombe wall with and without heat insulation
Closed Trombe wall
Composite Trombe wall
Category: Measures for the external elements of buildings
Better sun shading (fixed or movable, operated manually or automatically and films applied to windows)
Building orientation and solar exposure (can constitute a measure for new buildings only).
Changing share transparent/opaque surfaces (glazed area to façade area ratio optimisation)
Ventilated façades
Green roofs

2.2 Opportunities to incorporate/renew/expand centralised energy systems

Centralised systems for heating and cooling and for domestic hot water (DHW) supply are, under certain conditions, more efficient than multiple individual solutions. The cost of energy from these systems is relatively competitive and the improvement in energy efficiency is significant. It is necessary to ensure that investment resources be accumulated or that access to such resources be provided in order to improve service delivery and regain customer confidence.

Where such systems exist, the planning of major renovation of buildings must include the upgrade of the building's heating, cooling and DHW systems and offer a possibility for conversion of an existing vertical system into a horizontal system.

According to NSI data the consumption of heat from district heating plants in 2018 stood at 3 765.76 GWh/year for the household sector and 1 553.08 GWh/year for the services sector. Slightly more than 13 % of total final energy consumption and approximately 19 % of heat consumption in the two sectors alone is met by district heating plants, with the remaining 80 % of heat consumption in the household and services sectors being met by electricity, solid fuel (coal and wood), liquid fuels and natural gas.

The share of RES in district heating is very small, but has been steadily increasing. Biomass has a more substantial share in heat generation from RES at the district heating plants of Ruse, Bansko and Ihtiman.

In 2016, a comprehensive assessment of the potential for implementation of high-efficiency heat and power co-generation and efficient district heating and cooling systems in Bulgaria was conducted in accordance with the obligations of all EU Member States under Article 14(1) of Directive 2012/27/EU.

The assessment contains the following estimates for scaling up cogeneration at district heating plants by 2025:

- Electricity generation — 3 683.4 GWh/year;

- Heat generation — 7 347 GWh/year;
- Primary energy saved per type fuel compared to separate electricity and heat generation - 3 447 GWh/year;
- Emission savings – 916.9 thousand tonnes CO_2 equivalent per year.

Where appropriate, the opportunities to expand supply networks to deliver heat to the public and services sectors, as well as residential buildings not currently connected to district heating plants, have been considered.

By 2025, new consumers with an annual heat consumption of 1 875 GWh/year are expected to be connected to centralised systems in all sectors, with 1 142 GWh of heat per year expected to be supplied from the extensions of existing or new district heating networks.

The expansion of gas distribution networks and the promotion of the use of natural gas, where technically feasible, will contribute to increasing energy efficiency. The direct use of natural gas for domestic purposes and heat generation in local or central heating systems/plants will lead to significant primary energy and carbon savings in buildings.

2.3 Packages of measures

The packages have been generated by combining the following single measures set out in Tables 9 to 12:

Table 9 : Single ESM intended for the building envelope

Measure	Heat transfer coefficient
External walls of building envelope with heat transfer coefficient	U = 0.25 W/m² K U = 0.22 W/m² K U = 0.15 W/m² K
Windows and doors on external walls with heat transfer coefficient	Uw = 1.4 W/m² K Uw = 1.1 W/m² K Uw = 0.9 W/m² K
Rood with heat transfer coefficient	Ur = 0.28 W/m² K Ur = 0.22 W/m² K Ur = 0.15 W/m² K

Table 10 : *Individual ESM for lighting systems*

Measure	Heat supply efficiency
Central heating with an upgraded substation	η = 100 %
Installation of a biomass-fired boiler and heat plant using pellets	η = 88 %
Installation of a gas-fired boiler and gas train assembly	η = 93 %

Installation of a high-efficiency gas-fired condensing boiler with gas train assembly	η = 103 %
Installation of a high-efficiency air-to-air heat pump with direct refrigerant discharge for heat generation from renewable sources	Seasonal Coefficient of Performance for three heating levels: SCOP = 4 SCOP = 5 SCOP = 5.5
Installation of a high-efficiency water-to-water heat pump refrigerant discharge for heat generation from renewable sources	Seasonal Coefficient of Performance for three heating levels: SCOP = 5.5

Table 11: Individual ESM for domestic hot water (DHW) systems

Measure	Heat supply efficiency
Central heating with upgraded subscriber station	η = 100%
Installation of a biomass-fired boiler for domestic hot water supply	η = 88 %
Installation of a gas-fired boiler and gas train assembly	η = 93 %
Installation of an active hot water solar system for residential needs	
Installation of a high-efficiency water-to-water heat pump refrigerant discharge for heat generation from renewable sources	Seasonal Coefficient of Performance for three heating levels: SCOP = 5

Table 12: *Individual ESM for lighting systems*

1	Replacement of luminaries with high-efficiency LEDs (Light Emitting Diode technology)

Automatic control and monitoring are envisaged for all technical building system measures.

The energy consumption of reference buildings over a period of one year is simulated for the conditions of climate zone 7, which is representative of the average climate conditions in Bulgaria. The simulations have been carried out in accordance with the national methodology for the calculation of the energy consumption and energy performance indicators of buildings, which transposes the requirements set out in Annex I to the DEPB into Annex No 3 to Regulation No 7/2004 on the energy efficiency of buildings (published in the State Gazette No 5 of 14 January 2005).

Each reference building package has been tested for sensitivity using the cost optimality procedure in accordance with Delegated Regulation (EU) No 244/2012 for a life-cycle of 30 years and with the following baseline economic parameters: real interest: 3 %, 4.5% and 6%; energy price escalation: 1 %/year, 2 %/year; product price escalation: 0.5 %/year. According to the study reference building packages are the most sensitive to the price of energy.

Primary energy savings have been estimated by applying each package to non-renovated buildings in a condition that corresponds to energy efficiency (energy consumption) classes D, E and F, i.e. there are three levels of assessment.

This approach shows how much primary energy is saved by applying each package to buildings belonging to three low efficiency classes on the scale that do not meet the regulatory requirements for energy efficiency in Bulgaria in terms of energy consumption. The renovation of buildings in the least energy efficient class G, under the same conditions and using the same combination of measures, will achieve higher energy savings than the renovation of buildings belonging to class F, meaning that the same set of policies as that applied to class F buildings [may be used for the purposes of class G buildings].

The priority target group comprises the buildings with the lowest energy performance, i.e. those in classes E, F and G. An assessment has also been conducted to obtain information about class D buildings, which also have potential for upgrade through the application of energy efficiency measures.

2.4 Packages of measures for buildings owned by the central government and local authorities [to achieve] more than 60 % of energy savings

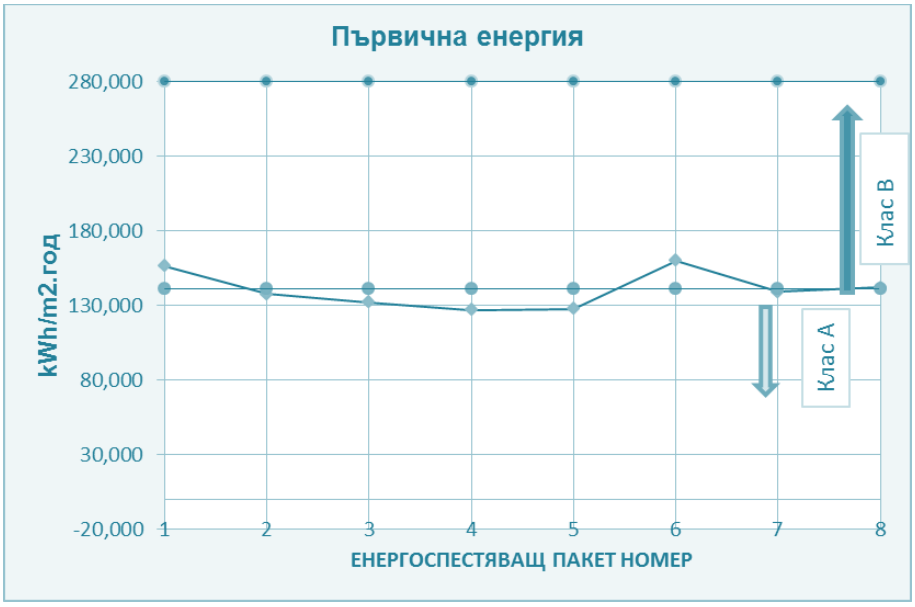
Four categories of non-residential buildings have been examined: administrative buildings, schools, childcare facilities (kindergartens and crèches) and hospitals, which are primarily owned by the central government and local authorities. For the remaining categories of buildings, notably hotels and hostels, commercial, mass catering and service buildings, sports buildings, and the buildings of cultural and art institutions, [the parameters of] reference buildings are difficult to define. This is particularly true for subcategories such as hotels, train stations, universities, etc., which are extremely diverse. For the buildings concerned, an individual approach should be defined at design level, taking into account the main objective of achieving a high energy performance class.

Summary results for the ESM packages examined are set out in Table 13. Detailed information is set out in Annex 3.

Table 13

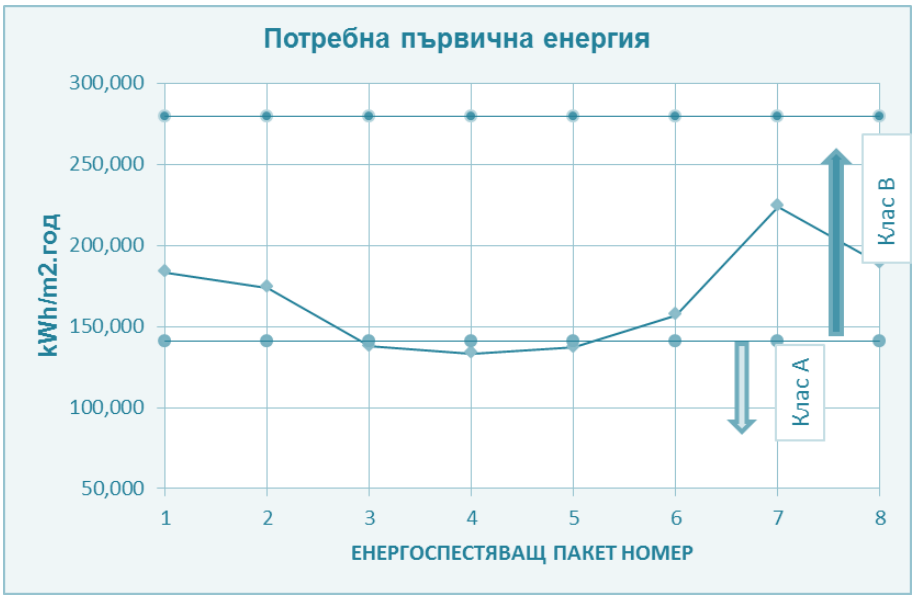
ENERGY SAVING PACKAGE FOR	Value	Primary energy kWh m^2 per year.	Primary energy saved (m^2 per year)	Relative share (%) of primary energy saved as a result of the application of the following energy performance class package:			Emissions saved CO^2, kg/m^2 per year)	Necessary investment BGN/m^2 (excl. VAT)	RS energy for package application (kWh/m^2 per year)	Share of renewable energy (excl. appliances), %
				Class D	Class E	Class F				
ADMINISTRATIVE BUILDING, Conditioned space volume 1 772 m^2	minimum	126.91	340.44	56.80	64.47	70.92	98.29	125.75	1.11	4.74
	Maximum	160.06	373.59	65.75	71.83	76.95	107.86	237.73	14.06	56.83
	average value for all packages	**140.31**	**360.19**	**62.13**	**68.85**	**74.51**	**103.99**	**186.65**	**8.66**	**36.90**
KINDERGARTEN, Conditioned space volume 3 331 m^2	minimum	60.71	138.06	24.88	46.30	58.21	39.89	138.82	10.24	17.28
	Maximum	122.44	199.79	62.75	73.37	79.28	57.73	323.10	51.34	80.63
	average value for all packages	**83.89**	**176.61**	**48.54**	**63.21**	**71.37**	**51.03**	**208.56**	**28.70**	**51.78**
SCHOOL, Conditioned space volume 3 510 m^2	minimum	29.65	100.71	46.07	57.19	65.49	29.08	143.07	0.00	0.00
	Maximum	62.29	133.35	74.33	79.62	83.57	38.50	325.43	24.60	73.41
	average value for all packages	**43.97**	**119.03**	**61.93**	**69.78**	**75.64**	**34.37**	**234.70**	**11.53**	**42.38**
HOSPITAL, Conditioned space volume 2 546 m^2	minimum	133.39	339.00	19.91	55.77	63.80	97.87	185.11	30.79	37.75
	Maximum	224.25	429.86	52.36	73.69	78.47	124.11	345.52	73.00	76.84
	average value for all packages	**166.98**	**396.27**	**40.36**	**67.07**	**3.05**	**114.41**	**241.90**	**50.77**	**65.79**

The figures below show the results that can be achieved using each individual package, with some ESM packages achieving energy class B and others achieving energy class A.



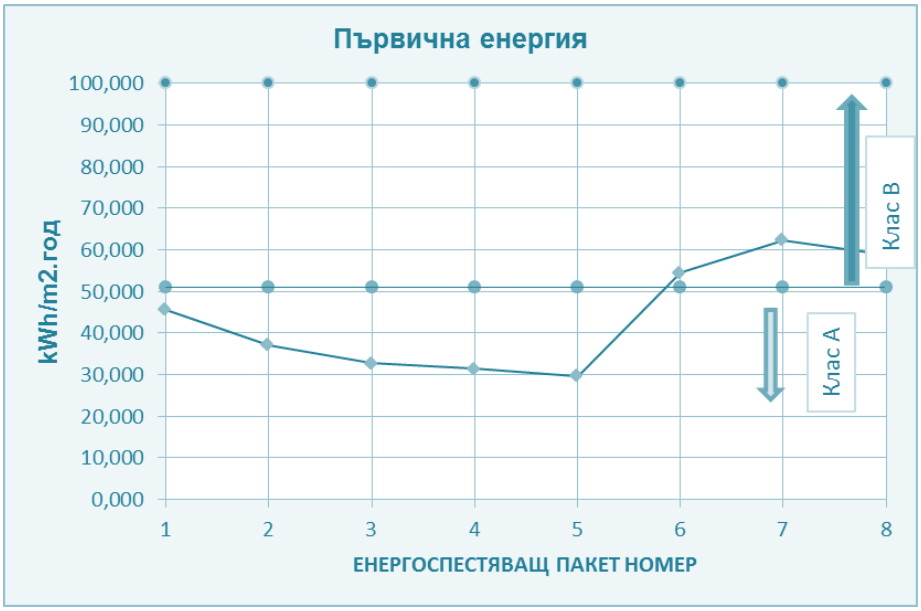
Легенда:	**Caption:**
Първична енергия	Primary energy
kWh/m2 2 год.	kWh/m² two years
ЕНЕРГОСПЕСТЯВАЩ ПАКЕН НОМЕР	ENERGY SAVING PACKAGE NUMBER
Клас A	Class A
Клас B	Class B

Figure 28: *Primary energy for ESM packages for administrative buildings as compared to Class A and Class B levels*



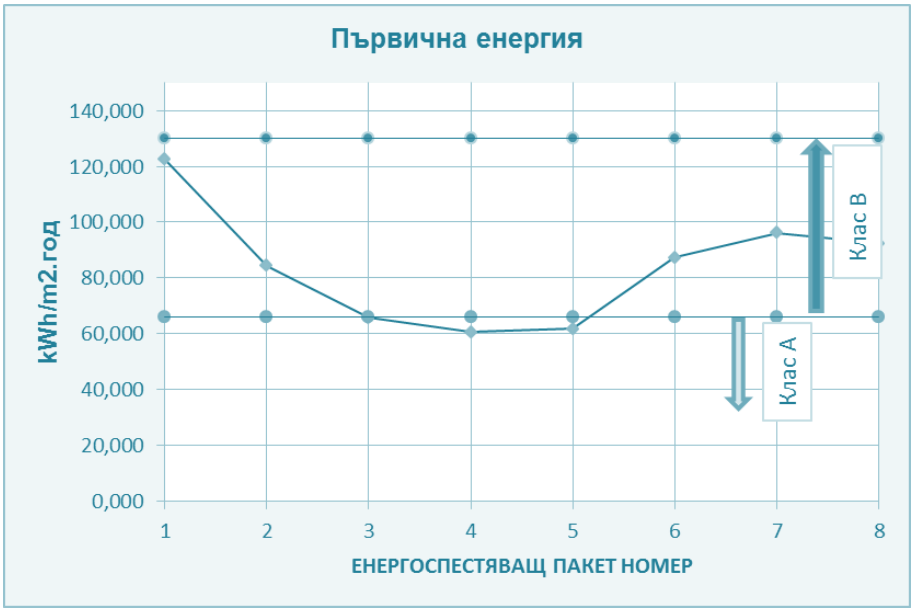
Легенда:	**Caption:**
Потребена първична енергия	Primary energy consumed
kWh/m2 2 год.	kWh/m² two years
ЕНЕРГОСПЕСТЯВАЩ ПАКЕН НОМЕР	ENERGY SAVING PACKAGE NUMBER
Клас A	Class A
Клас B	Class B

Figure 29: *Primary energy for ESM packages for the buildings of healthcare establishments as compared to Class A and Class B levels*



Легенда:	**Caption:**
Първична енергия	Primary energy
kWh/m2 2 год.	kWh/m² two years
ЕНЕРГОСПЕСТЯВАЩ ПАКЕН НОМЕР	ENERGY SAVING PACKAGE NUMBER
Клас A	Class A
Клас B	Class B

Figure 30: *Primary energy for ESM packages for school buildings as compared to Class A and Class B levels*



Легенда:	**Caption:**
Първична енергия	Primary energy
kWh/m2 2 год.	kWh/m² two years
ЕНЕРГОСПЕСТЯВАЩ ПАКЕН НОМЕР	ENERGY SAVING PACKAGE NUMBER
Клас A	Class A
Клас B	Class B

Figure 31: *Primary energy for ESM packages for kindergarten buildings as compared to Class A and Class B levels*

2.5 Residential packages (over 60 % savings)

2.5.1 Development of packages of measures for residential buildings, taking into account existing energy consumption and energy performance of residential buildings. Key considerations.

On the basis of the general findings of the review of residential buildings and energy consumption (section 1.2.4) it has been established that the energy efficiency and energy performance of the residential segment of housing stock are poor. The development of ESM packages/combinations for residential buildings is thus by necessity an iterative process that takes into account several key considerations:

- In addition to being in line with the concept set out in Delegated Regulation (EU) No 244/2012 and satisfying the conditions mentioned above, the cost-effectiveness approaches to energy efficiency in residential buildings must take into account a number of social and economic factors and the need to improve the overall technical condition of buildings. In this sense, investments in energy efficiency must ensure the sustainability of the implementation of the ESM and therefore include all the necessary works to ensure that their implementation satisfies the requisite quality standard.
- Technical measures to strengthen and ensure the structural robustness of buildings essentially require another type of survey (other than an energy audit), which is carried out in accordance with Regulation No 5/2006 on the technical passports of buildings (see also section Specific circumstances applicable to all residential buildings below). The implementation of such measures also requires an individual structural design for each building, which makes it difficult to plan this type of investment on a national scale. Therefore, the cost of structural works, construction and installation works, removal of existing barriers to accessibility for people with disabilities, as well as the cost of installing infrastructure to enable the subsequent installation of charging points for electric vehicles require further assessment to be conducted separately from the appraisal of energy efficiency investments or a clear differentiation between the two types of costs.
- According to Article 2a(1)(g) of the DEPB each strategy must include '*an evidence-based assessment of the expected energy savings and wider benefits, such as those related to health, safety and air quality*'. In line with the Commission's recommendation to ensure that this requirement is properly

understood and implemented, the ESM packages developed for residential buildings have relied on the opportunities to combine energy performance with other technical features of the proposed measures whose parameters, in addition to having an impact on energy consumption, are also relevant to achieving a healthy indoor environment and high quality of air in the occupied environment.

In view of the latter consideration and on the basis of indoor microclimate quality parameters, a preliminary assessment of the parameters stipulated in national law has been conducted in order to determine the capabilities of the simulation models to examine measures whose technical characteristics, taken together, meet or exceed the requirements laid down in applicable legislation.

2.5.2 Packages of measures and energy performance assessment for residential buildings

Taking into account considerations set out in section 2.5.1, combinations of energy-saving measures for residential buildings have been analysed. Preference has been given to measures that can generate synergies leading to better results in terms of improved energy performance, quality of the living environment and financial costs associated with package implementation.

For the purpose of the strategy, a computer simulation study of the energy consumption of reference buildings corresponding to the two largest subcategories of residential buildings in Bulgaria (single-family and multi-family residential buildings) was performed.

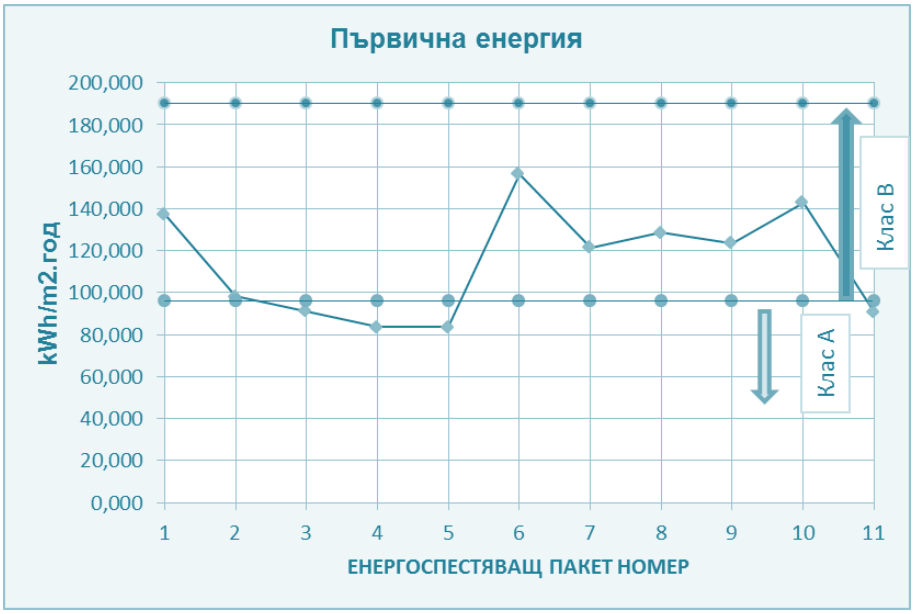
The simulation studies and computer models of the ESM packages performed for the purpose of section 4.2 were developed by the Centre for Energy Analyses, a research laboratory of the Sofia Technical University.

Eleven (11) packages of energy-saving measures were generated for single-family, solid-frame residential buildings with gross conditioned space (volume) of 195 m^2 and **10** packages of energy-saving measures for multi-family residential buildings (an eight-storey panel apartment building with conditioned space (volume) of 3 800 m^2. Summary results for all packages are shown in the following table and more detailed information in set out in Annex 3.

Table 14

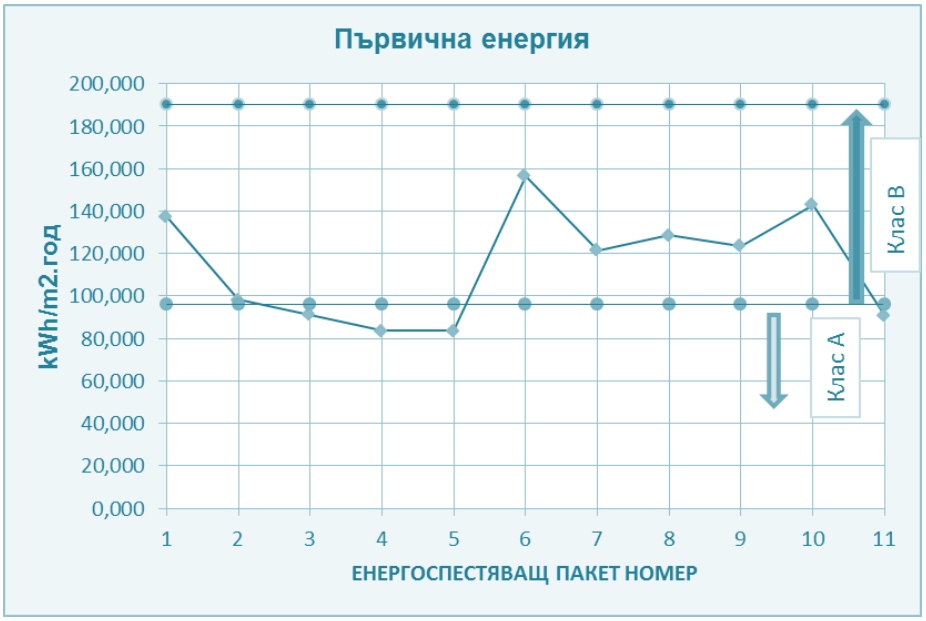
ENERGY SAVING PACKAGE FOR	Value	Primary energy kWh m^2 per year	Primary energy saved (m^2 per year)	Relative share (%) of primary energy saved as a result of the application of the following energy consumption class package:			Emissions saved CO^2 (kg/(m^2 per year)	Necessary investment in BGN/m^2 (excl. VAT)	RS energy for package application (kWh/m^2 per year)	Share of renewable energy (excl. appliances), %
				Class D	Class E	Class F				
Single-family residential buildings, Conditioned space volume 195 m^2	minimum	83.57	206.78	41.06	52.15	60.83	46.80	155.50	0.00	0.00
	Maximum	156.47	279.68	68.52	74.44	79.08	63.30	319.26	77.48	91.17
	average value for all packages	**114.31**	**248.94**	**56.94**	**65.04**	**71.39**	**56.34**	**246.23**	**38.67**	**55.92**
Multi-family residential buildings, Conditioned space volume 8 300 m^2	minimum	89.41	206.73	41.05	52.13	60.82	46.79	94.55	0.00	0.00
	Maximum	156.52	273.84	66.33	72.66	77.62	61.98	234.73	68.07	95.67
	average value for all packages	**117.47**	**245.78**	**55.76**	**64.08**	**70.60**	**55.62**	**155.40**	**32.54**	**55.62**

The figures below show the results that can be achieved using each individual package, with some ESM packages achieving energy class B and others achieving energy class A.



Легенда:	**Caption:**
Първична енергия	Primary energy
kWh/m2 2 год.	kWh/m² two years
ЕНЕРГОСПЕСТЯВАЩ ПАКЕН НОМЕР	ENERGY SAVING PACKAGE NUMBER
Клас A	Class A
Клас B	Class B

Figure 32: Primary energy for ESM packages for single-family residential buildings as compared to Class A and Class B levels



Легенда:	**Caption:**
Първична енергия	Primary energy
kWh/m2 2 год.	kWh/m^2 two years
ЕНЕРГОСПЕСТЯВАЩ ПАКЕН НОМЕР	ENERGY SAVING PACKAGE NUMBER
Клас А	Class A
Клас В	Class B

Figure 33: Primary energy for ESM packages for multi-family residential buildings compared to Class A and Class B levels

2.6 Analysis of applicable energy-saving measures for the purpose of energy efficiency programmes for residential buildings for the period 2021-2025

In view of the need to take swift action to implement this strategy and develop programmes for the renovation of the residential housing stock during the period 2021-2025, and in order to identify the barriers to improving energy efficiency in different types buildings, the packages of energy saving measures have been analysed in terms of their current applicability. The analysis has been conducted on the basis of:

- the experience gained during the implementation of energy efficiency programmes in Bulgaria;
- a thorough analysis of the energy efficiency audits performed under Operational Programme Regional Development 2007-2013, the National Plan for Energy Efficiency of Multi-family Buildings (NEEEMZhS) 2016-2020, and Operational Programme Regions in Growth 2014-2020;
- the objective condition of the housing stock in Bulgaria;
- the social situation of the population and the ownership structure of the residential buildings;
- the energy efficiency requirements for existing buildings in currently applicable legislation.

The specific technical, administrative and organisational characteristics of multi-family and single-family residential buildings are discussed below, along with the possibilities for their phased renovation.

2.6.1 Single-family residential buildings

In single-family residential buildings, heating and domestic hot water (DHW) are supplied by local plants, which generate energy for heating and cooling using different energy sources (natural gas, coal, wood, pellets, electricity, etc.). Some of these buildings, notably those placed into

service before the introduction of national energy efficiency legislation, feature conventional vertical or horizontal heating systems. In single-family houses where such systems are not available, custom heating and/or cooling solutions are applied for each room through the use of a variety of household appliances, which also consume energy.

The following offer a significant potential for the implementation of measures to upgrade building systems and recover energy from renewable sources:

- pitched roofs and the technical possibility of installing solar collectors/elements with an appropriate orientation;
- the relative ease of reaching an agreement on the installation and maintenance of renewable energy recovery systems;
- the possibility of replacing the fuel base of individual housing units/apartment buildings through the installation of biomass-fired boilers, heat pump units, etc.;
- the absence of organisational problems relating to the decisions to implement measures to upgrade building-wide systems.

The findings relating to the energy saving potential of low-rise multi-family residential buildings (up to 3 storeys) also apply to single-family houses.

In order to achieve significant energy savings, the implementation of ESM on the external envelope of this functional sub-type of buildings should be combined with improvement of the energy performance of heating/cooling and DHW systems (including changing the fuel base of the relevant systems).

2.6.2 Multi-family residential buildings

In multi-family residential buildings (medium -and high-rise), the range of ESM that can be implemented to upgrade building-wide systems and install renewable energy recovery systems is constrained by technical, administrative and organisational difficulties:

- In most multi-family residential buildings, there are no building-wide heating systems and heat and DHW are supplied to each housing unit by individual local sources of heat. Only 16 % of the occupied housing units rely on the supply of heat and DHW from a centralised source of heat.
- Grant assistance for ESM to upgrade heating, ventilation and DHW systems is only available for the common parts of buildings while the activities within individual housing units are to be fully financed by the owners.

- The decision to implement measures on the building-wide systems (including the replacement/construction of new heat generators) requires the consent of 100 % of the owners of the individual housing units.
- Multi-family residential buildings with flat roofs, i.e. most buildings in this category, do not have a sufficient area to accommodate the required number of solar panels (appropriately oriented and without shading).
- Energy recovery systems require monthly system maintenance, i.e. solar panel glass cleaning — a difficult task for multi-family residential buildings, which are governed by condominium law.

While in multi-family residential buildings connected to the networks of district heating plants ESM can be implemented on heating and DHW systems (including by upgrading subscriber stations), the implementation of ESM on the building envelope/building elements in contact with outside air in combination with energy efficient lighting solutions in common areas of the buildings that are not connected to the networks of district heating plants is, in some cases, the only feasible option to launch phased renovation with a view to improving the energy performance of the buildings concerned.

2.6.3 Applicable packages of measures

Indicative cost-effective ESM packages for different levels (light, medium)/stages of renovation for the purpose of upgrading energy performance are proposed for each of the categories of residential buildings, taking into account their specific features. Energy-saving measures are grouped according to the technical feasibility of achieving different levels of renovation for single-family houses, with the possibility to treat 'low-rise', 'medium-rise' and 'high-rise' multi-family residential buildings in the same manner:

- light or medium level of renovation to be achieved as part of the phased renovation process to upgrade buildings up to the requisite standard stipulated by law (class C for buildings in service or energy savings below 60 %);
- major renovation to be achieved by upgrading buildings to energy class B and higher, including by installing renewable energy recovery systems (where technically feasible), and energy savings of more than 60 %.

An integrated approach to improving the energy performance of buildings will be followed. This will involve the implementation of measures on both the external envelope and the technical facilities inside buildings, where possible. We propose that phased renovation in accordance

with Commission Recommendation (EC) 2019/786 of 8 May 2019 on the renovation of buildings is undertaken where the owners are unable to cover the cost of renovation or technical barriers to the implementation of certain measures exist. This will allow flexible solutions with a longer horizon to be planned that cover a wide range of buildings and owners.

Table 15: Indicative groups of ESM for single-family residential buildings

ENERGY SAVING PACKAGE	CONTENT — Individual energy saving measures			Primary energy consumption , kWh/m² per year	Primary energy saved, kWh/m² per year	Relative share (%) of primary energy saved as a result of the application of the following energy consumption class package			Emissions saved CO^2, kg/(m² per year	Necessary investment, BGN/m² (excl. VAT)	RS energy for package application (kWh/m² per year)	Share of renewable energy (excl. appliances), %
Package 1		**Parameter**	**Value**			**Class D**	**Class E**	**Class F**				
	Replacement of windows and doors	U W/m²K	1.4	**137.15**	226.10	48.34	58.60	65.67	51.17	182.60	77.48	91.17
	Thermal insulation of walls	U W/m²K	0.25									
	Thermal insulation of roof	U W/m²K	0.28									
	Installation of a biomass-fired boiler (heat plant using pellets)	n, %	88									
	Hot water system for residential buildings — Installation of a biomass-fired boiler by biomass (heat plant fired by pellets)	n, %	88									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 2	Replacement of windows and doors	U W/m²K	1.1	**98.16**	**265.09**	**63.03**	**69.98**	**75.43**	**59.99**	**287.75**	**48.92**	**72.91**
	Thermal insulation of walls	U W/m²K	0.22									
	Thermal insulation of roof	U W/m²K	0.22									
	Installation of a direct-evaporation heat pump	Coefficient of Performance (COP)	4									
	Hot water system for residential buildings — Installation of a water-to-water heat pump	Coefficient of Performance (COP)	5									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 3	Replacement of windows and doors	U W/m²K	1.1	**91.18**	**272.07**	**65.66**	**72.12**	**77.18**	**61.57**	**308.46**	**51.25**	**76.38**
	Thermal insulation of walls	U W/m²K	0.22									
	Thermal insulation of roof	U W/m²K	0.22									
	Installation of a direct-evaporation heat pump	Coefficient of Performance (COP)	5									
	Hot water system for residential buildings — Installation of a water-to-water heat pump	Coefficient of Performance (COP)	5									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 4	Replacement of windows and doors	U W/m²K	0.9	**83.57**	**279.68**	**68.52**	**74.44**	**79.08**	**63.30**	**319.26**	**44.50**	**76.98**
	Thermal insulation of walls	U W/m²K	0.15									
	Thermal insulation of roof	U W/m²K	0.15									
	Installation of direct-evaporation heat pump	Coefficient of Performance (COP)	5.5									
	Hot water system for residential buildings — Installation of a water-to-water heat pump	Coefficient of Performance (COP)	5									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 5	Replacement of windows and doors	U W/m²K	0.9	**83.57**	**279.68**	**68.52**	**74.44**	**79.08**	**63.30**	**290.58**	**44.50**	**76.98**
	Thermal insulation of walls	U W/m²K	0.15									
	Thermal insulation of roof	U W/m²K	0.15									
	Installation of a direct-evaporation heat pump	Coefficient of Performance (COP)	5.5									
	Hot water system for residential buildings — Installation of a water-to-water heat pump	Coefficient of Performance (COP)	5									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 6	Replacement of windows and doors	U W/m²K	1.4	**156.47**	**206.78**	**41.06**	**52.15**	**60.83**	**46.80**	**155.50**	**0.00**	**0.00**
	Thermal insulation of walls	U W/m²K	0.25									
	Thermal insulation of roof	U W/m²K	0.25									
	Central heating (substation)	n, %	100									
	Hot water supply system for residential buildings — Central heating (subscriber substation)	n, %	100									
	Energy-efficient lighting	n, %	70									
Package 7	Replacement of windows and doors	U W/m²K	1.4	**121.44**	**241.81**	**54.26**	**62.86**	**69.60**	**54.73**	**244.80**	**14.37**	**20.66**
	Thermal insulation of walls	U W/m²K	0.22									
	Thermal insulation of roof	U W/m²K	0.15									
	Installation of a (condensing) gas-fired boiler	n, %	103									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 8	Replacement of windows and doors	U W/m²K	1.4	**128.54**	**234.71**	**51.59**	**60.69**	**67.83**	**53.12**	**226.78**	**14.37**	**20.64**
	Thermal insulation of walls	U W/m²K	0.22									
	Thermal insulation of roof	U W/m²K	0.15									

	Central heating (subscriber substation)	n, %	100										
	Installation of an active hot water solar system	n, %	75										
	Energy-efficient lighting	n, %	70										
Package 9	Replacement of windows and doors	U W/m^{2}K	1.4	123.45	239.80	53.50	62.25	69.10	54.27	223.22	68.41	89.89	
	Thermal insulation of walls	U W/m^{2}K	0.22										
	Thermal insulation of roof	U W/m^{2}K	0.15										
	Installation of a biomass-fired boiler (heat plant using pellets)	n, %	88										
	Installation of an active hot water solar system	n, %	75										
	Energy-efficient lighting	n, %	70										
Package 10	Replacement of windows and doors	U W/m^{2}K	1.4	143.02	220.23	46.13	56.26	64.20	49.84	224.45	9.86	12.89	
	Thermal insulation of walls	U W/m^{2}K	0.22										
	Thermal insulation of roof	U W/m^{2}K	0.15										
	Installation of a gas-fired boiler	n, %	93										
	Installation of an active hot water solar system	n, %	75										
	Energy-efficient lighting	n, %	70										
Package 11	Replacement of windows and doors	U W/m^{2}K	1.1	90.88	272.37	65.77	72.21	77.25	61.64	245.12	51.68	76.64	
	Thermal insulation of walls	U W/m^{2}K	0.22										
	Thermal insulation of roof	U W/m^{2}K	0.22										
	Installation of a direct-evaporation heat pump	Coefficient of Performance (COP)	5										
	Installation of an active hot water solar system	n, %	75										
	Energy-efficient lighting	n, %	70										
SUMMARY RESULTS			minimum	83.57	206.78	41.06	52.15	60.83	46.80	155.50	0.00	0.00	
			Maximum	156.47	279.68	68.52	74.44	79.08	63.30	319.26	77.48	91.17	
			average	114.31	248.94	56.94	65.04	71.39	56.34	246.23	38.67	55.92	

Table 16: Indicative groups of ESM for multi-family residential buildings

ENERGY SAVING PACKAGE	CONTENT — Individual energy saving measures			Primary energy consumption, kWh/m^2 per year.	Primary energy saved, kWh/m^2 per year	Relative share (%) of primary energy saved as a result of the application of the following energy consumption class package			Emissions saved CO^2 kg (m^2 per year)	Necessary investment BGN/m^2 (excl. VAT)	RS energy for package application (kWh m^2 per year)	Share of renewable energy (excl. appliances), %
Package 1		**Parameter**	**Value**			**Class D**	**Class E**	**Class F**				
	Replacement of windows and doors	U W/m^{2}K	1.4	131.178	232.07	50.59	59.88	67.16	52.52	109.73	68.07	95.67
	Thermal insulation of walls	U W/m^{2}K	0.25									
	Thermal insulation of roof	U W/m^{2}K	0.28									
	Installation of a biomass-fired boiler (heat plant using pellets)	n, %	88									
	Hot water system for residential buildings — Installation of biomass-fired boiler (heat plant fired by pellets)	n, %	88									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 2	Replacement of windows and doors	U W/m^{2}K	1.1	99.61	263.64	62.48	69.54	75.07	59.67	203.75	43.61	77.36
	Thermal insulation of walls	U W/m^{2}K	0.22									
	Thermal insulation of roof	U W/m^{2}K	0.22									
	Installation of a direct-evaporation heat pump	Coefficient of Performance (COP)	4									
	Hot water system for residential buildings — Installation of a water-to-water heat pump	Coefficient of Performance (COP)	5									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 3	Replacement of windows and doors	U W/m^{2}K	1.1	94.85	268.40	64.27	70.99	76.26	60.74	224.28	45.20	80.17
	Thermal insulation of walls	U W/m^{2}K	0.22									
	Thermal insulation of roof	U W/m^{2}K	0.22									
	Installation of a direct-evaporation heat pump	Coefficient of Performance (COP)	5									
	Hot water system for residential buildings — Installation of a water-to-water heat pump	Coefficient of Performance (COP)	5									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 4	Replacement of windows and doors	U W/m^{2}K	0.9	89.41	273.84	66.33	72.66	77.62	61.98	234.73	40.19	81.11
	Thermal insulation of walls	U W/m^{2}K	0.15									
	Thermal insulation of roof	U W/m^{2}K	0.15									
	Installation of a direct-evaporation heat pump	Coefficient of Performance (COP)	5.5									
	Hot water system for residential buildings — Installation of a water-to-water heat pump	Coefficient of	5									

		Performance (COP)										
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 5	Replacement of windows and doors	U W/m^{2}K	0.9	156.52	206.73	41.05	52.13	60.82	46.79	94.55	0.00	0.00
	Thermal insulation of walls	U W/m^{2}K	0.15									
	Thermal insulation of roof	U W/m^{2}K	0.15									
	Central heating (substation)	Coefficient of Performance (COP)	5.5									
	Hot water system for residential buildings — Installation of a water-to-water heat pump	Coefficient of Performance (COP)	5									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 6	Replacement of windows and doors	U W/m^{2}K	1.4	121.24	242.01	54.33	62.92	69.65	54.77	137.50	10.61	17.77
	Thermal insulation of walls	U W/m^{2}K	0.25									
	Thermal insulation of roof	U W/m^{2}K	0.25									
	Installation of (condensing) gas-fired boiler	n, %	100									
	Installation of an active hot water solar system	n, %	100									
	Energy-efficient lighting	n, %	70									
Package 7	Replacement of windows and doors	U W/m^{2}K	1.4	132.23	231.02	50.20	59.56	66.90	52.28	120.72	10.61	17.37
	Thermal insulation of walls	U W/m^{2}K	0.22									
	Thermal insulation of roof	U W/m^{2}K	0.15									
	Central heating (substation)	n, %	103									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 8	Replacement of windows and doors	U W/m^{2}K	1.4	127.17	236.08	52.10	61.11	68.11	53.43	135.50	51.37	94.27
	Thermal insulation of walls	U W/m^{2}K	0.22									
	Thermal insulation of roof	U W/m^{2}K	0.15									
	Installation of a biomass-fired boiler (heat plant using pellets)	n, %	100									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 9	Replacement of windows and doors	U W/m^{2}K	1.4	126.68	236.57	52.29	61.26	68.29	53.54	135.55	10.61	16.42
	Thermal insulation of walls	U W/m^{2}K	0.22									
	Thermal insulation of roof	U W/m^{2}K	0.15									
	Installation of a gas-fired boiler	n, %	88									
	Installation of an active hot water solar system	n, %	75									
	Energy-efficient lighting	n, %	70									
Package 10	Replacement of windows and doors	U W/m^{2}K	1.4	95.81	267.44	63.91	70.70	76.02	60.53	157.77	45.14	76.02
	Thermal insulation of walls	U W/m^{2}K	0.22									
	Thermal insulation of roof	U W/m^{2}K	0.15									
	Installation of gas-fired boiler	n, %	93									
	Installation of a direct-evaporation heat pump	n, %	75									
	Energy-efficient lighting	n, %	70									
SUMMARY RESULTS			minimum	89.41	206.73	41.05	52.13	60.82	46.79	94.55	0.00	0.00
			Maximum	156.52	273.84	66.33	72.66	77.62	61.98	234.73	68.07	95.67
			average	117.47	245.78	55.76	64.08	70.60	55.62	155.40	32.54	55.62

Tables 15 and 16 set out energy saving measures that involve only construction works that directly contribute to energy savings. In reality, the common areas in many single- and multi-family residential buildings are in a poor state of repair due to lack of maintenance and regular repairs, which presents a potential threat to buildings in structural terms as well as in terms of the effectiveness and sustainability of future energy efficiency measures.

On the other hand, the amendments to legislation introduced over time make it necessary for renovation projects to involve measures to upgrade certain elements and systems of the buildings necessary to ensure their safety for occupation and operation, compliance with the requirements for fire resistance, etc. in order for these to meet currently applicable technical requirements (restoring/putting in place lightning protection, ensuring compliance with fire safety standards, raising the height of balcony railings, installing safety railings, etc.).

Article 2a(7) of the EPBD envisages the possibility for Member States to use the long-term renovation strategy to address fire safety and risks related to intense seismic activity affecting renovation to improve energy efficiency as well as the life cycle of buildings. The provision is linked to the implementation of Article 7 of the same Directive, which requires Member States to address these issues in buildings undergoing major renovation.

The experience Bulgaria has gained so far in the renovation of residential buildings with a view to upgrading their energy efficiency demonstrates that renovation packages have to include measures to improve both energy efficiency and the technical parameters of buildings due to their poor technical condition and in order to bring them in line with currently applicable statutory requirements. The implementation of these additional measures has resulted in greater interest in energy efficiency projects/programmes, even when co-financing is required.

It is recommended that in the future activities to improve the technical performance of buildings be included in the implementation of programmes to improve the energy efficiency of residential buildings, even if they do not directly lead to energy savings.

2.7 Possible points for intervention in the life cycle of buildings

The general technical condition of residential and public buildings and their compliance with the essential requirements for buildings in connection with Article 169(1) and (3) of the Spatial Development Act can be most fully and reliably assessed in the technical passports of the buildings issued in accordance with the requirements laid down in Regulation No 5 of 28 December 2006 on the technical passports of buildings (Regulation No 5/2006).

In short, the technical passport thus describes the technical condition of the elements and systems of a building and details the necessary major renovation and repair works that need to be carried out on its structure in order to bring it in line with the essential requirements for buildings. It also specifies the time periods for undertaking such works and the necessary maintenance measures.

The assessment of the technical condition of buildings prior to the implementation of ESM is essential as it provides:

- information about the general condition of the elements and systems of the building on which ESM are to be implemented and facilitates the accurate identification of supporting activities relating to ESM implementation;
- information about possible problems that could compromise ESM during their useful life and therefore jeopardise the energy saving effect achieved.

According to Regulation No 5/2006, a technical passport should be drawn up in respect of:

- new buildings from the building stock constructed after 2007, as well as existing buildings that have undergone reconstruction, major renovation, major repairs or conversion;
- all existing buildings comprising an element of building stock by 2022.

The passport is subject to compulsory registration with the body that issued the construction permit for the building, i.e. with the municipal administration for residential and public buildings.

The technical passport provides the owners of buildings and the municipal authorities with objective information about the necessary construction and renovation works that need to be undertaken on each building, making it possible to determine an appropriate point of intervention in the life cycle of each building so that the necessary energy efficiency measures can be implemented, taking into account other necessary works.

To date, technical passports have been issued to a very small share of existing residential buildings. There total number of residential buildings with technical passports is just over 2 200. The buildings with technical passports have participated in various renovation and energy performance improvement programmes.

The problem of residential buildings not having technical passports has several dimensions:

- Delays have occurred in the implementation of building renovation projects, no preliminary information is available about the condition of buildings and its role in estimating the expected savings and investments needed for renovation in order to improve energy efficiency.
- Awareness of the importance of technical passports is insufficient. The key consideration in obtaining a technical passport for a building is the lowest price, which often leads to questionable results in terms of accuracy and quality.
- Approaches to drawing up technical passports are highly inefficient, insofar as a separate document is issued to each building, even those that conform to identical construction standards.

One of the possible solutions to these challenges is for municipalities to systematically compile information and offer standard design solutions for the buildings constructed by the industrial method in electronic form. As a result: (1) The subsequent development of individual design projects for the renovation of each building will become less time-consuming and more efficient in terms of human and financial resources. (2) The development of package solutions that can be easily replicated for identical buildings will be facilitated.

The timing and method of intervention in the life cycle of buildings should also take into account the possibility of a building being used by (nesting, wintering) species protected under the Biodiversity Act. Such cases tend to be rare, but rare species and/or significant colonies of such species have occasionally been found in buildings. In connection with this, the development of projects for the renovation of buildings should entail, as a mandatory element, conducting a survey for the presence of synanthropic protected species (bats, swallows, swifts, etc.) to ensure that the season and construction methodology take fully into account the needs of the species found.

3. ESTIMATED ENERGY SAVINGS 2020

3.1 Energy saving effect and environmental impact. Contribution to the achievement of the EU 2020 target

The policies and measures aiming to improve the energy efficiency of building stock in Bulgaria are set out in the National Energy Efficiency Action Plan 2014-2020 (NPDEE, updated in 2017). A detailed description of the policies and measures and the methods for assessing the impact and energy savings achieved during the period 2014-2018 is set out in Annex 1.

Table 17: *Summary information about building stock renovation policies and measures*

Measure	Savings achieved during the period 2014-2018, GWh/year	Expected contribution of the implementation of the National Energy Efficiency Strategy 2020, GWh/y
1. Energy efficiency improvement programmes of central and local government bodies and mandatory energy efficiency management in public buildings[1]	**804.0**	**918.6**
Total for non-residential buildings*	**804.0**	**918.6**
Including energy savings from:		
1.1. Central government buildings[2]	*71.6*	*119.4*
1.2. Energy Efficiency and Renewable Sources Fund[3]	*28.9*	*40.32*
1.3. Operational Programme Regional Development 2007-2013/Operational Programme Regions in Growth 2014-2020[3]	*177.2*	*248.1*
1.4. The National Trust EcoFund – Climate Investment Programme[3]	*32.7*	*49.05*
1.5. Kozloduy International Fund	*98.9*	*98.9*
1.6. Renewable Energy, Energy Efficiency and Energy Security Programme[4]	-	*12.8*

Measure	Savings achieved during the period 2014-2018, GWh/year	Expected contribution of the implementation of the National Energy Efficiency Strategy 2020, GWh/y
1.7. Other measures	*394.7*	*350.03*
Total for residential buildings	**733.8**	**1 121.2**
2. National Energy Efficiency Programme for Multi-apartment Buildings 2016-2020	679.8	975.6
3. Residential Energy Efficiency Credit Line programme[3]	54	75.6
4. Project Demand-side Residential Energy Efficiency through Gas Distribution Companies in Bulgaria (DESIREE GAS)	-	70
TOTAL for all measures relating to building stock:	**1 537.8**	**2 039.75**

** In order to avoid double counting, the effect of the implementation of measures aiming to improve energy efficiency in buildings owned by the central government and local authorities is reported under measure Programmes for improvement of the energy efficiency of buildings owned by the central government and local authorities and energy efficiency management in public buildings. The implementation of measures financed by the financial mechanisms is reported by the obligated administrations in their annual energy efficiency management reports.*

The estimate of the energy savings achieved as a result of the implementation of energy efficiency policies and measures in the period 2019-2020 is based on the following assumptions:

[1] The rate of implementation of energy efficiency measures and energy savings in the period 2019-2020 is the same in the previous period 2014-2018.

[2] The assessment is based on the calculations set out in the National plan for improvement of the energy performance of heated and/or cooled spaces on the premises of public buildings used by the central government.

[3] The rate of annual energy savings is the same as that in the period 2014-2018.

[4] The assessment has been made on the basis of:

- *the following indicators set out in the Programme: 8 renovation projects involving the implementation of ESM with a maximum grant assistance per project in the amount of BGN 1.2 mln.*
- *1 500 BGN/MWh of energy saved (estimate based on actual implemented measures to improve energy efficiency in buildings)*

3.2 Broader benefits

Легенда:	**Caption:**
Разполагаем доход на домакинствата	Disposable household income
Здраве и благополучие	Health and well-being
Комфорт на живот	Comfort of living
СОЦИАЛНИ	SOCIAL
Енергийна бедност	Energy poverty
Намаляване на енергийната бедност	Alleviation of energy poverty
Енергийни спестявания	Energy savings
Влияние върху целите за ВИЕ	Impacts on RES targets
Управление на енергията и ресурсите	Energy and resource management
ОКОЛНА СРЕДА	ENVIRONMENT
Спестявания на изкопаеми горива	Fossil fuel savings
Спестявания на емисии	Emission savings
Глобални и локални замърсители	Global and local polluters
Локално замърсяване на въздуха	Local air pollution
ДОПЪЛНИТЕЛНИ ПОЛЗИ ОТ ЕНЕРГИЙНАТА ЕФЕКТИВНОСТ	ADDITIONAL BENEFITS OF ENERGY EFFICIENCY
ИКОНОМИЧЕСКИ	ECONOMIC
Микроикономически	Microeconomic
Производителност на индустрията	Industrial productivity
Стойност на активите	Asset value
Макроикономически	Macroeconomic
Ефекти върху заетостта	Employment effects
Ефект върху цените на енергията	Impact on energy prices
Публични бюджети	Public budgets
Ефект върху БВП	Impact on GDP
Енергийна сигурност и доставки на енергия	Energy security and energy supplies
Зависимост от внос	Import dependency
Въздействие върху интеграцията на ВЕИ	Impact on integration of renewables
Разнообразие на доставчици	Supplier diversity
Иновации и конкурентоспособност	Innovation and competitiveness
Въздействие върху иновациите	Innovation impacts
Оборот на стоки за ЕЕ	Turnover of energy efficiency goods
Конкурентоспособност	Competitiveness

Figure 34: *Map of additional benefits Source: Odyssee-Mure*

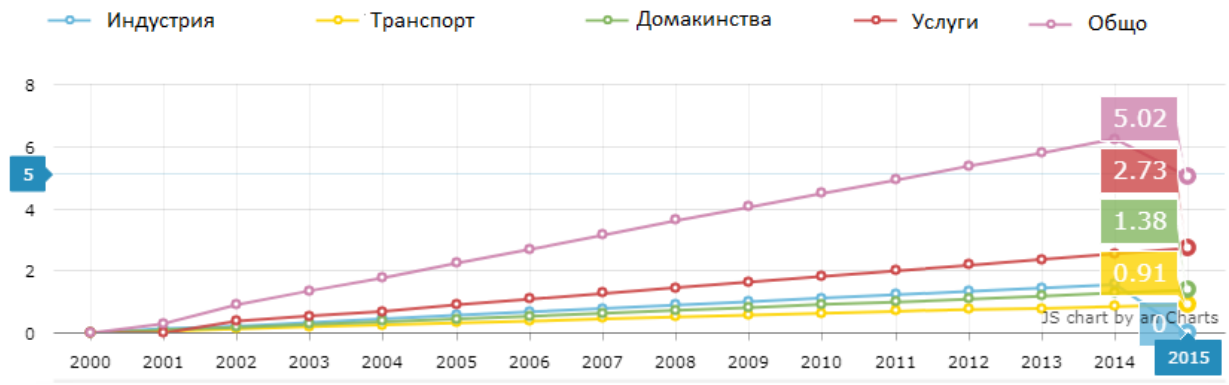
The additional benefits are most often classified into three groups: environmental, economic and social. The first group contains the most important and direct impacts of energy efficiency, such as energy savings and reductions in greenhouse gas emissions. The second group includes, among others, positive macroeconomic impacts on economic growth, innovation and competitiveness as well as import dependency. The third group of impacts covers aspects such as health benefits, poverty reduction and employment. Although the additional benefits of energy efficiency measures are indisputable, they cannot always be measured and quantified. A review and evaluation (where possible) of the more popular measures is set out below.

3.2.1 Environmental benefits

The environmental benefits of energy savings are the most obvious in addition to being well studied. The threat of climate change is one of the main drivers for energy efficiency improvement. In addition to energy savings, a number of other impacts should also be considered.

3.2.2 Reduced greenhouse gas emissions

Energy savings lead to reduction in greenhouse gas emissions. These are accounted for according to the type of energy saved and the corresponding emission factor for the type of energy concerned. Emissions savings are measured in tonnes of CO_2 equivalent. CO_2 savings are calculated by multiplying the total energy savings per sector by the average emission factor for the respective sector (tCO_2/toe). This ratio is calculated by dividing the total CO_2 emissions in a sector (including indirect CO_2 emissions from the energy sector) by the final energy consumption in the respective sector. A breakdown of CO_2 emission savings by sector compared to 2000 levels is shown in the figure below.



Легенда:	**Caption:**
Индустрия	Industry
Транспорт	Transport
Домакинства	Households
Услуги	Services

Общо	Total

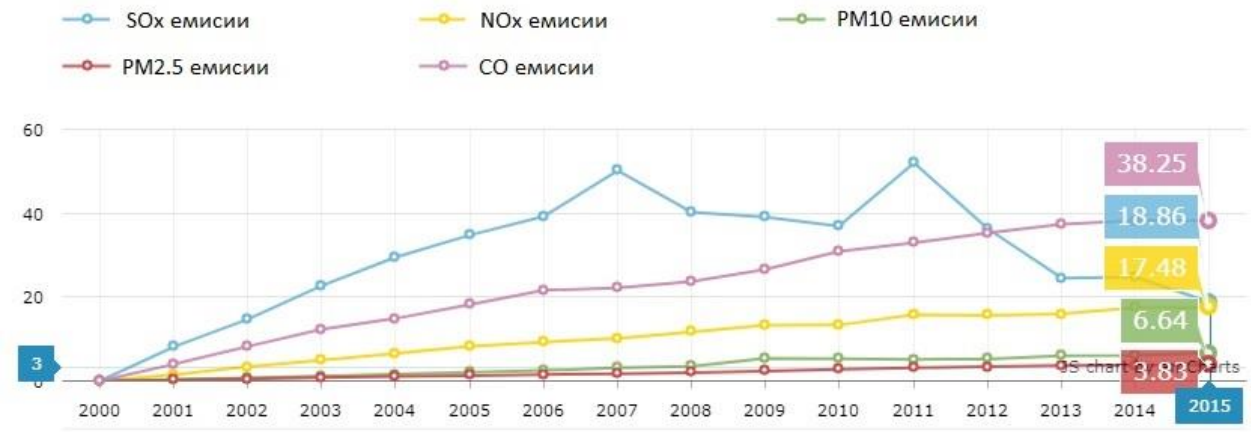
Figure 35: *CO_2 emission savings by sector in Bulgaria [Mt CO_2]. Source: Indicators for the calculation of additional project benefits Odyssee-Mure*

The energy savings milestone to be achieved by 2030 set out in point 4 of Table 18 is 2 917 GWh/year. The savings of 2 917 GWh/year are expected to result in a reduction of greenhouse gas emissions by 1 307 kt CO_2 equivalent.

3.2.3 Local air pollution

Particulate matter, which is an air pollutant, causes 3.3 million premature deaths a year worldwide.

The effect of air pollution reduction as a result of energy savings is reported according to the type of energy saved and certain emission factors specific to that type of energy. Emission reductions are assessed for the following main pollutants: nitrogen oxides (NOx), sulphur oxides (SOx), fine particulate matter ($PM_{2.5}$ and PM_{10}) and carbon monoxide (CO).



Легенда:	**Caption:**
SOx емисии	SOx emissions
NOx емисии	NOx emissions
PM10 емисии	PM_{10} emissions
PM2.5 емисии	$PM_{2.5}$ emissions
CO емисии	CO emissions

Figure 36: *Avoided annual emissions of pollutants compared to 2000. Source: Indicators for the calculation of additional project benefits Odyssee-Mure*

3.2.4 Social benefits

Improved household energy efficiency brings a range of social benefits, including impacts on household incomes, energy poverty reduction and improved health. The social effects of energy savings are therefore mainly assessed for the household sector.

3.2.4.1 Increase in household incomes

The cost of improving household energy efficiency is usually recovered through lower heating costs, which leaves a greater share of consumers' disposable income available for other purposes in the long run after the payback period of the investment. Investments in energy efficiency usually have a long payback horizon.

Regarding household appliances, the average annual financial cost savings resulting from the implementation of EU energy efficiency directives for the products concerned are estimated at EUR 332 per household across Europe.

The possibility of fostering change in consumer behaviour as a result of lower energy costs (the so-called rebound effect) should also be considered. For example, an increase in the indoor temperature of heated spaces and increased use of domestic appliances, etc.

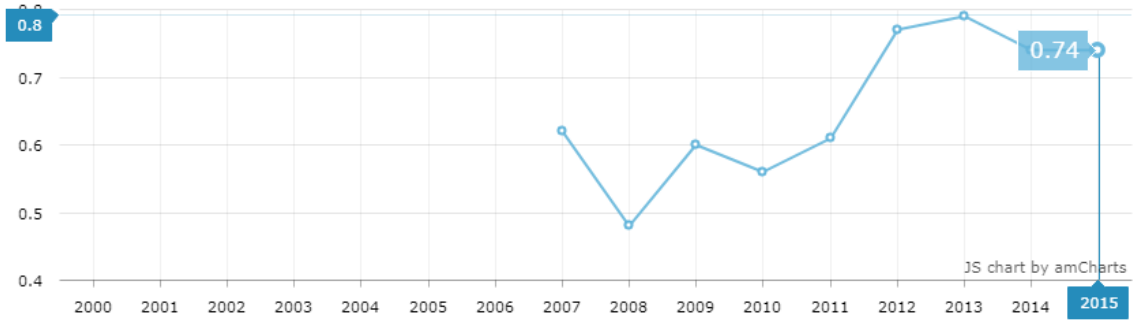


Figure 37: *Energy cost savings as a share of disposable income compared to 2000 [%]. Source: Indicators for the calculation of additional project benefits Odyssee-Mure*

The reduction in energy savings [sic] on account of changes in consumer behaviour varies between 1 % and 30 % depending on the specific conditions.

One of the effects of energy savings is higher disposable household incomes on account of lower household energy costs.

3.2.4.2 Energy poverty alleviation[17]

In 2017, the poverty line for Bulgaria was BGN 351.08 per month (EUR 179.50 per month) per person. According to the NSI data 1 665 300 persons (23.4 % of Bulgaria's population) are below the poverty line.

In this respect, the process of full liberalisation of the electricity market for household customers will commence after a mechanism for the protection of vulnerable electricity customers has been put in place. These are energy poor households due to a combination of

[17]Data from the report 'Energy poverty in the light of local elections: an analytical justification' has been used.

low income, high energy costs as a share of total household income and low energy efficiency of the home.

The mechanism for the protection of vulnerable customers will include identification criteria, and financial and non-financial measures for their protection. The support mechanism for vulnerable electricity consumers is designed to ensure that the minimum necessary quantity of electricity is available throughout the year to this category of consumers, in addition to that necessary to meet their heating needs for which a separate heating allowance is provided.

In addition to these measures, a separate set of measures will be implemented to improve the energy efficiency of the homes of energy poor consumers in order to reduce their energy costs and increase their living comfort.

According to AUER data from the energy audits performed under the largest renovation programme for residential buildings in Bulgaria (NPEEMZhS) the breakdown of buildings prior to renovation is as follows: the largest share of buildings (40.5 %) belonged to energy efficiency class E, followed by those belonging to energy efficiency classes F (35.3 %) and G (16.1 %). The upgrade of most buildings involved an upgrade to the minimum required energy class C, with a smaller share upgraded to class B (8.4 %). According to energy efficiency consultants these levels of renovation allow energy savings of approximately 40 % to be achieved. The renovation and upgrade of a multi-family residential building to energy class B, typically results in a decrease of the average monthly heating costs of a housing unit with an area of 65 m^2 from BGN 156.38 to BGN 107.64.

The improvement of energy efficiency in residential buildings makes a lasting contribution to the better quality of life of households in the renovated buildings. A survey commissioned by the Ministry of Regional Development in 2017 and carried out among the beneficiaries of the NPEEMZhS shows the following:

- Nearly 60 % of respondents said that their utility bills had decreased significantly. According to 26.6 % of respondents utility bills had decreased but only marginally compared to pre-renovation bills. 10.1 % of respondents stated that their utility bills had not decreased but that they were able to maintain a higher temperature in their homes. Only 4.5 % of respondents felt that there was no significant difference in heating bills following the renovation of the building under the NEEMZhS.
- The majority of respondents concur that the comfort of living in the homes and buildings renovated under the NPEEMZhS had improved to a very large extent (from 29.7 % to 41.4 %, respectively).

- Living comfort had improved in 95 % of the housing units as measured by the change in average indoor temperature during the winter. The respondents who stated that indoor temperatures had increased by 3 and 5 degrees, respectively, have the largest relative shares.

The results of the survey also indicate a decrease in heating costs and therefore an increase in the disposable income of households. On account of the specificities described in the analysis of the 'social situation' indicator (low income imposing self-limitations on the use of energy for heating) the beneficiaries attributed the greatest importance to the comfort of higher indoor temperatures in their homes.

3.2.4.3 Health benefits

The health benefits associated with the implementation of energy efficiency measures are indirect and relate to the reduction of harmful emissions in the air (sulphur and nitrogen oxides, fine particulate matter, etc.) and the improved heat comfort in buildings. This leads to lower morbidity and mortality rates *(See section 4.2.1.2. Local air pollution).*

The effect of lower morbidity and mortality can also be calculated in additional working days and therefore has a monetary equivalent.

The estimated positive effect on public health of saving 2 917 GWh/year in 2030 will generate an additional income of BGN 3 035 000 per year. The methodology developed under projectCalculating and Operationalising the Multiple Benefits of Energy Efficiency Improvements in Europe (COMBI) was used to arrive at this estimate. The methodology is based on data about the number of avoided premature deaths due to indoor cold as a result of unfavourable indoor conditions and the corresponding economic indicators, such as the estimated number of additional working days.

3.2.5 Economic benefits

Economic benefits are important for energy efficiency policies, which should be implemented in a cost-effective manner. The appraisal of additional economic benefits makes investments in energy efficiency more attractive and significantly reduces the time necessary to recover the cost of the investment.

3.2.5.1 Competitiveness

The development of energy efficiency technologies has a positive effect on the economy and its competitiveness. Energy efficiency is assessed for individual products or industries by

comparing the exports and imports of the respective product or industry and Bulgaria's total export and import, with a positive result indicating an increase in competitiveness.

As with innovation, this indicator is not directly linked to the energy savings achieved and is difficult to assess.

3.2.5.2 New jobs

Employment effects are determined by two main factors: Investments in energy efficiency create jobs in the industry that manufactures the products and [provides] the services concerned, and the energy savings achieved lower demand for energy products in the long term. In turn, lower demand has an effect on the value added produced — a change that affects employment in the relevant sector.

In order to track the overall economic impact of certain changes in demand across all affected sectors, an input-output analysis has been applied. This allows the effect of changes in demand on gross value added (GVA) in selected sectors to be calculated. GVA is converted into employment effects by using sector-specific productivity coefficients that link GVA to full-time equivalent figures. For example, improvements in the insulation of buildings directly induce demand changes in the construction industry.

Research shows that energy efficiency leads to net employment growth owing to a shift in spending from energy consumption to energy efficiency measures. There is a parallel increase of disposable income in the economy, which is an additional driver for job creation. Various studies have shown that net employment gains are likely to be generated by the shift in energy consumption spending toward investment in energy efficiency measures. Labour intensity in the industry sector that supplies the relevant technologies and materials is typically higher than labour intensity in the energy sector. Where energy efficiency measures are cost-effective, they increase disposable incomes and act as an additional driver for job creation in the long run.

Estimates indicate that strategy is estimated will create and sustain 17 600 new jobs over the period 2021-2030.

The estimates are based on data from the report Multiple benefits of EE renovations in buildings drawn up by Copenhagen Economics. The methodology is based on a factor derived from the ratio between newly created jobs according to currently available data for the construction sector and other services per unit of energy saved.

This effect is also associated with an additional benefit — an impact on public budgets (see section 4.2.3.8) by generating the additional tax revenue from newly created jobs as a result of the implementation of energy efficiency policies in the construction sector.

3.2.5.3 Effect on GDP

In order to assess the impact of specific energy efficiency measures on GDP, an economy-wide impact analysis can be conducted using the same inputs as those used for the purpose of analysing employment effects here.

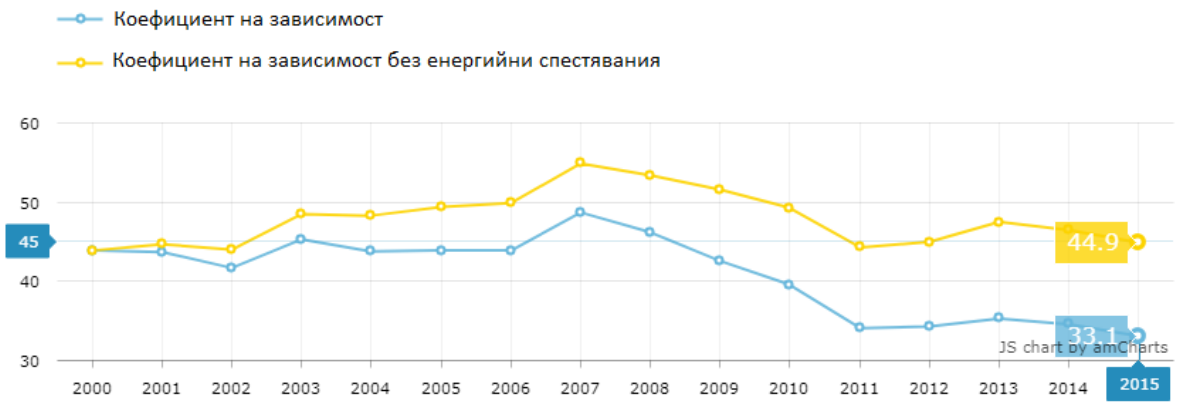
The effect of the implementation of the strategy is estimated at **an additional annual GDP growth of BGN 557 mln. by 2030.** The estimate is based on the methodology developed under project Calculating and operationalising multiple energy efficiency benefits in Europe (COMBI). A coefficient based on the COMBI-derived ratio between GDP growth and energy savings has been applied.

3.2.5.4 Asset value increase

Out of the factors that have the strongest impact on housing prices, owners have the greatest ability to influence the condition of the property and the building. Major renovation increases the value of properties in a building, making them more sustainable, improving their appearance and increasing their lifespan. Various analyses by real estate agencies show that the sales value of renovated apartments increases by 10 % to 15 %. A long-term assessment is difficult to make on account of the influence of multiple factors on the property market. It is also difficult to predict how the property market will respond to the availability of more renovated buildings in the long term.

3.2.5.5 Reduction of dependence on imports

Energy import dependence refers to the extent to which a country relies on imports to meet its energy needs. A negative dependency ratio indicates [that the country is] a net exporter of energy. Energy efficiency also has the direct effect of reducing a country's dependence on energy imports.



Легенда:	Caption:

Коефициент на зависимост	Dependency ratio
Коефициент на зависимост без енергийни спестявания	Dependency ratio without energy savings

Figure 38: *Degree of dependence for Bulgaria [%]. Source: Indicators for the calculation of additional project benefits Odyssee-Mure*

The 2030 target of 2 917 GWh of energy savings per year mentioned in point 4 would constitute a 6.9 % reduction in the total consumption of the household and services sectors in the same year. The estimate is based on the energy consumption projections for the relevant sectors in 2030 under the additional policies and measures scenario used in Bulgaria's Integrated Energy and Climate Plan for the period 2021-2030 to determine the energy efficiency targets to be achieved.

3.2.5.6 Impact on public budgets

Energy efficiency in public buildings leads to a decrease in public spending on energy bills, including a reduction in public spending on tackling energy poverty. The cost-effectiveness of energy efficiency measures is crucial factor for their positive impact on public budgets. An additional indirect benefit is the lower strain on public budgets on account of a decrease in the number of persons in need of hospital treatment as a result of improved air quality and better indoor climate.

Taking this combination of impacts into account, studies show that the monetised net annual benefit to society from full utilisation of the energy efficiency potential of existing building stock in Europe alone is in the range of EUR 30 bln. to EUR 40 bln.

However, it should be noted that a comprehensive assessment would require a broader range of impacts to be considered. For example, energy efficiency programmes act as an additional driver for employment, meaning that their positive impact on public finance may be even greater as it reduces the burden of unemployment benefits. Furthermore, government programmes to support energy efficiency vary in terms of administrative costs, which include policy design and the monitoring of their implementation, and the results achieved.

4. ROAD MAP 2030, 2040, 2050

The **roadmap** to this strategy document sets out **indicators** that will be used to measure the results achieved during the following periods: 2021-2030, 2031-2040 and 2041-2050, which correspond to the milestones set for the process of renovation of building stock in Bulgaria.

Setting milestones for the renovation of Bulgaria's residential and non-residential building stock is in line with the scenario with additional policies and measures used in the Integrated Energy and Climate Plan for the period 2021-2030 and with the targets for achieving energy

savings of 27.89 % in primary energy consumption (PEC)[18] and 31.69 % in final energy consumption (FEC)[19] .

Milestones are not defined in linear terms. The national aspects of the implementation of energy efficiency policies to date, such as the use of substantial grant components in incentive schemes, and limited experience with structuring and promoting financial instruments, have also been taken into account. The slow renovation of buildings and the low awareness of consumers and owners of the impact of energy efficiency and its wider benefits have so far failed to facilitate mass market uptake of new technologies, materials and building practices.

By 2030 renovation actions can be realistically expected to gain traction in parallel to a gradual increase in demand for energy efficient services. Realistic and conservative target setting is also linked to the need to gain experience and accumulate resources to enable the use of financial instruments and gradually overcome the expectations of citizens and the owners of public service buildings for high levels of grant assistance for renovation.

The packages of measures for renovation that upgrade the energy efficiency of buildings to a standard that complies with the national definition of near zero energy buildings (nZEB) are clearly indicated in the analysis of the different packages. The lack of information about the implementation of such renovation projects in Bulgaria does not allow realistic projections to be made or indicators for the implementation of such projects in the short term to be set.

The scope of the residential buildings to be renovated has been determined on the basis of the data about occupied residential buildings (in terms of number and floor area) set out in section 'Overview and classification of residential buildings'. This estimate does not include the residential buildings renovated under various pilot projects and programmes during the period 2007-2020. Having taken into account the objective structural typology of existing housing stock in terms of reliability and suitability for normal utilisation, single and multi-family residential buildings with a total floor area of 184 mln. m^2 were identified as the target group for renovation.

In order to correctly determine the non-residential buildings remaining to be renovated, the area of the buildings in this segment renovated until 2020 was estimated and excluded from the target group. The total floor area of existing non-residential buildings yet to be renovated has thus been estimated at 98 mln. m^2.

Table 18: *Indicators and milestones for residential and non-residential housing stock renovation*

Indicator	Measure	2021-2030	2031-2040	2041-2050
Total energy savings	**GWh/year**	**2 917**	**6 502**	**7 329**

[18] Decrease in primary energy consumption compared to the PRIMES 2007 baseline scenario.
[19] Decrease in final energy consumption compared to the PRIMES 2007 baseline scenario.

Residential buildings	GWh/year	2 477	5 694	6 294
Buildings other than dwellings	GWh/year	440	808	1 035
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
Buildings other than dwellings	m^2	3 176 852	5 835 493	7 479 718
Renovated area of existing housing stock	%	8 %	18 %	20 %
CO_2 emissions savings	**tonne**	**1 306 435**	**2 891 610**	**3 274 453**
Residential buildings	tonne	1 065 184	2 448 461	2 706 441
Buildings other than dwellings	tonne	241 251	443 149	568 012

In this scenario, 60% of the residential housing stock and nearly 17 % of non-residential housing stock will be renovated by 2050. The floor area of renovated buildings will be more than 45 % of the total floor area of the entire housing stock in Bulgaria. As mentioned in section 1.1.3, the reason for this distribution is that non-residential buildings owned by the central government and local authorities account for only 29 % of all non-residential buildings. Many categories of non-residential buildings are used for economic activities, i.e. operate as hotels, shopping centres, business centres and restaurants. The opportunities to improve their energy efficiency are linked to the improvement of their competitiveness — a process driven by market mechanisms that is difficult to predict.

The analysis of the information available from actual certified buildings shows that in order to achieve the quantitative dimensions of the indicators, renovation policies should focus on buildings with energy classes E, F and G for all categories of buildings. This does not preclude granting incentives for energy efficiency improvement actions to be implemented on all categories of buildings, including individual ESM, such as replacement of solid fuel sources of heat with other high-efficiency sources or switching to other fuels.

5. POLICIES AND MEASURES PROMOTING SUBSTANTIAL COST-EFFECTIVE IMPROVEMENTS IN THE ENERGY PERFORMANCE OF BUILDINGS

The Long-term National Strategy is a dedicated systematic instrument that sets out the **vision** [of the Bulgarian government] for the renovation of housing stock in Bulgaria by 2050, the **strategic objectives** for achieving that vision, the **priorities** of each strategic objective, the **measures and policies envisaged** under the priorities identified and the **indicators** for measuring the results achieved for the period **2021-2030**.

VISION

Renovation and decarbonisation of housing stock in Bulgaria by 2050 to ensure high quality of life in a healthy, safe, energy efficient, modernised and high-tech living

environment on the basis of a set of interrelated factors, such as active consumer involvement in the efficient use of energy, energy generation management and consumption in the building and professional management of housing stock.

STRATEGIC OBJECTIVES

The strategic objectives are aligned with the EU energy efficiency targets and are based on strategic EU documents, EU and national energy efficiency legislation.

Strategic objective 1:

Adopting a modern, up-to-date and cost-effective regulatory framework in keeping with the principle 'Energy Efficiency First' at the heart of the process of harmonisation of Bulgarian legislation with EU law and ensuring the security of investments in the energy efficiency of buildings, with a phased reduction of the cost of administrative regulation for society in combination with enhanced monitoring of compliance with the requirements laid down by law.

Priority 1.1

Ensuring full harmonisation of nation and EU law. A periodic review to be carried out at least once every five years of the cost-optimal levels of the minimum requirements for the energy performance of buildings and their constituent elements and the technical standards for energy efficiency and the systems for energy generation and consumption in buildings.

Flag	Baseline value	Target value for the period 2021-2030
Enacting amendments to the ZUT and the ZEE in order to ensure compliance with the evolving provisions of EU law	0	2
Reducing the overall number of implementing regulations to the ZEE and updating applicable regulations on a regular basis	9	8
Calculation of cost-optimal levels of minimum energy performance requirements for buildings in accordance with the procedure laid down in Commission Delegated Regulation (EU) No 244/2012	Report from 2015 — 1	3
Review of the national definition of nZEB	0	1

Priority 1.2

Improving the conditions for the use of construction products that ensure compliance with the basic requirements for construction by harmonising them with evolving EU legislation on the sustainable use of natural resources and aligning them with the principles of circular economy, energy efficiency, climate change and green infrastructure.

Indicator	Baseline value	Target value for the period 2021-2030
Development of criteria and methodologies for the assessment of repurposed products from waste construction materials with a view to their use in construction by amending Regulation No RD-02-20-1/2015	Existing Regulation No RD-02-20-1/2015	Amended Regulation No RD-02-20-1/2015

Priority 1.3

Preparing buildings for smart management, promoting high levels of energy efficiency and achieving compliance with the requirements near zero energy buildings (nZEB). Introducing the following accompanying instruments: implementation of energy management systems and use of information and communication technologies to ensure better connectivity of buildings to external systems and better responsiveness to the needs of their occupants.

Indicator	Baseline value	2030 target
Introducing and carrying out a review on a regular basis of a voluntary scheme to determine the readiness of buildings for smart management	0	1
Development and periodic review of a Methodology for calculating the readiness of buildings for smart management, taking into account national specificities	0	1

Priority 1.4

Improving currently applicable condominium legislation governing the ownership, maintenance and professional management of buildings

Indicator	**Baseline value**	**2030 target**
Improving the legislative framework applicable to buildings governed by condominium law	ZUES	Amendments to the ZUES
Multi-family residential buildings using a 'specialised intermediary' providing expert assistance to the condominium throughout the renovation process	0 %	5 % of multi-family residential buildings

Priority 1.5.

Developing a scheme for following up and reporting on the results of building renovation support programmes using systematic monitoring of technical parameters and energy saving effects in order to enhance the monitoring of implementation, identify renovation deficiencies and streamline impact management processes at programme and operational level.

Indicator	**Baseline value**	**2030 target**

Development of a single digital information gathering system (database) for the different categories of building stock at municipal level	0 municipalities	265 municipalities
A system for the digitisation of technical passports and creating a municipal database with the necessary system interfaces	0 municipalities;	265 municipalities;

Strategic objective 2:

Ensuring that sustainable financial instruments are available to enable the implementation of the Long-term strategy for the renovation of buildings in Bulgaria

Priority 2.1

Ensuring that financial instruments are available that are suitable for different target groups and types of buildings. Using public funding to leverage additional private-sector investment and/or to address specific market failures. Making optimal use of available financial resources from EU funds, international financial institutions, specialist funds and programmes and private sources of finance, and ensuring that a combination of different public and private financial mechanisms can be used.

Indicator	Baseline value	2030 target
Establishing a National Decarbonisation Fund to provide financial instruments, grants and technical assistance to participating intermediaries and final beneficiaries, respectively	0	1
Structuring and launching new financial instruments to support the implementation of the objectives set out in the Long-Term Strategy for the Renovation of Buildings in Bulgaria	0	at least 1

Priority 2.2

Developing the energy efficiency obligations scheme, providing opportunities for participation in funds and mechanisms with a view to meeting obligations and developing the market of energy efficiency services

Indicator	Baseline value	2030 target
Introducing requirements for ESCOs	0	Requirements introduced
An instrument to mobilise private investment through the energy efficiency obligations scheme	none	Instrument developed — 1

Strategic objective 3

Support for building administrative and professional capacity at the level of central government, local authorities and actors in the investment process

Priority 3.1

Developing administrative and technical capacity through systematic provision of technical assistance to central government bodies and local authorities for the implementation of programmes for the renovation of residential and non-residential buildings

Indicator	Baseline value	2030 target
Specialist training events for local authorities	3	12
Energy efficiency programmes developed and/or updated by local authorities	80 %	90 %
Implementation of energy management systems for public buildings	0 buildings	20 buildings

Priority 3.2

Support for strengthening the professional capacity of the actors in the investment process by continually updating the system of vocational education and training, lifelong learning and promoting the continuing professional training of designers, consultants, installers, construction workers and managerial staff

Indicator	Baseline value	2030 target

Training to improve the qualifications of professional condominium managers and property management and maintenance companies	Adopted training programme — 0	Adopted training programme — 1
Creating a register of qualified workers and specialists in construction	Register — 0	Register — 1

Priority 3.3

Implementing a nation-wide communication campaign to raise awareness of the benefits of energy efficiency and change public attitudes with a view to supporting the overall process of building renovation and maintenance, including the benefits involved in private financing and additional benefits in a broader sense.

Indicator	Baseline value	2030 target
Conducting national and local awareness campaigns to educate the public about the potential financial, health, economic, social and environmental benefits in order to promote, and attract interest in, clean heating alternatives and support regulatory reforms	0	20
Introducing one-stop-shop advisory service delivery (incl. the provision of tailored advice to building owners and investors) in relation to the process of overall renovation	0	1

Priority 3.4

Providing support for research and applied activities that promote innovation and new technologies for energy saving and renewable energy in buildings

Indicator	Baseline value	2030 target
Support for pilot projects for the application of new or improved technologies and techniques for renovation with a view to upgrading buildings to energy Class A or the nZEB standard	0 buildings	50 buildings

5.1 Analysis and assessment of existing barriers to energy efficiency and measures to address them

The improvement of energy efficiency requires a systematic and comprehensive approach as well as coordinated efforts to ensure its application. An analysis and assessment of existing barriers and their periodic review are also necessary. The challenge is to design a policy framework that facilitates the removal of barriers while ensuring that sufficient information,

incentives and capacity are available as an incentive for owners and investors to take the necessary steps.

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
Strategic objective 1: Adopting a modern, up-to-date and cost-effective regulatory framework in keeping with the principle 'Energy Efficiency First' at the heart of the process of harmonisation of Bulgarian legislation with EU law and ensuring the security of investments in the energy efficiency of buildings, with a phased reduction of the cost of administrative regulation for society and digitalisation of the construction sector in Bulgaria, coupled with enhanced monitoring to ensure compliance with the requirements laid down by law.					
Priority 1.1 A periodic review carried out at least once every five years of the cost-optimal levels of the minimum requirements for the energy performance of buildings and their constituent elements and the technical standards for energy efficiency and the systems for energy generation and consumption in buildings Ensuring full harmonisation of national law with EU law					
Putting in place the 'Energy Efficiency First' principle	Legislative and regulatory [barriers] (LR)	Review and harmonisation of the technical standards for energy efficiency of buildings in accordance with the procedure laid down in Commission Delegated Regulation (EU) No 244/2012. Examining the possibility to introduce more stringent minimum requirements for [the renovation] of all buildings up to energy class B Introducing requirements that are more stringent than the minimum requirements for major renovation of buildings under projects financed by public funds	N/A	2020 2021-2027 2022	MRRB All institutions from which grant assistance and financial instruments are available MRRB, ME

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		Introducing special provisions to ensure optimal performance of the technical systems of buildings			
Dynamic development and complex structure of energy efficiency legislation	LR	Periodic review and alignment of energy efficiency standards and related building codes Streamlining and reducing the number of implementing regulations to the ZEE Reducing the administrative burden on the owners of buildings by creating an obligation for information about certification and auditing to be provided by the municipalities and energy consultants on an *ex officio* basis Review of the national definition of nZEB and introducing options or exceptions for specific cases, such as highly urbanised areas and lack of technical possibilities, supply of heating by district heating plants using high-efficiency energy	N/A	At five-year intervals 2022 2022 2021	ME, MRRB ME, MRRB MRRB, AUER MRRB, ME

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		sources, share of renewable energy in the energy mix supplied, etc.			
Lack of coordination with other strategic and programme documents at national and local level	LR	Ensuring coordinated alignment with the Integrated National Energy and Climate Plan (INECP) and other key strategic documents at national level, including the future National Housing Strategy Methodological guidance to regional and local authorities to ensure the implementation of the measures envisaged in the Strategy within the framework of the corresponding plans and programmes		2021-2050	Central government bodies and local authorities and/or bodies responsible for the development and/or implementation of strategies and programmes.
Priority 1.2 Improving the conditions for the use of construction products that ensure compliance with the basic requirements for construction by harmonising them with evolving EU legislation on the sustainable use of natural resources and in line with the principles of circular economy, energy efficiency, climate change, green infrastructure					
Lack of regulatory conditions for the repurposing and subsequent re-use of products from construction waste	LR	Developing criteria and methodologies for the assessment of repurposed products from waste construction materials with a view to their use in construction by amending Regulation No RD-02-20-1/2015	Planning budget funds/EU-funded programmes	2021-2030	MRRB

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
Development of EU law and standardisation of construction materials	Technical barrier (TB)	Introducing relevant national standards and EU standards such as the Bulgarian State Standard (BSS)	National budget funds/EU-funded programmes	2021 – 2050 on an ongoing basis	MRRB, Bulgarian Standardisation Institute (BSI)
Priority 1.3 Preparing buildings for smart management, promoting high levels of energy efficiency and achieving compliance with the requirements for near zero energy buildings Introducing the following accompanying instruments: implementation of energy management systems and use of information and communication technologies to ensure better connectivity of buildings to external systems and better responsiveness to the needs of their of the occupants					
Lack of a study and criteria at national level to assess the readiness of buildings for smart management	LR	Introduction of an optional EU-wide scheme for assessment of the readiness of buildings for smart management and adaptation of the methodology for calculation of the readiness of buildings for smart management developed by the European Commission, taking national specificities into account	Building stock renovation programmes	2021-2030	MRRB, ME, AUER
Lack of incentives for achieving the nZEB standard Insufficient administrative capacity	LR	Special provisions, timeframes and incentives for the upgrade of existing buildings into highly energy efficient buildings (energy class B and higher) and, where possible, achieving compliance with the requirement for near zero energy buildings (nZEB)	Housing stock renovation programmes	2021-2030	MRRB, ME, AUER

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
Using polluting solid fuels	LR	Promotion of the use of clean energy sources for heating or energy sources with lower emissions than solid fuels	All funds and instruments	2021-2050	All institutions from which grant assistance and financial instruments are available
Lack of measures to promote heating from cost-effective and environmentally friendly sources — district heating, natural gas and energy from renewable sources	LR	Identifying the barriers to the use of district heating, natural gas and renewable energy Imposing requirements to eliminate the use of polluting fuels as part of the renovation programmes under which grant assistance is available and creating incentives for connecting buildings to district heating systems in the course of implementation of renovation measures Taking action, together with relevant industry organisations, to create a positive environment for the introduction and use of renewable energy sources in residential buildings Promoting the replacement of domestic heating appliances using solid fuels (wood and coal) with	N/A N/A N/A All funds and instruments	ongoing 2021-2027 2021-2030	NGOs, sectoral organisations All institutions from which grant assistance is available Sectoral organisations, MRRB, ME

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		environmentally friendly and energy efficient alternatives Examining the possibilities to introduce low-emission zones in cities	N/A	2021-2027	All institutions from which grant assistance and financial instruments are available local authorities, NGOs
For buildings that are not connected to centralised energy supply systems, the implementation of measures to replace the heating/DHW systems or connect the buildings to a centralised system are not technically or economically viable, which is an obstacle to achieving high levels of energy efficiency.	TB	Developing package solutions for the achievement of high levels of energy savings without switching to another fuel base/source of heating Promotion of the use of better-quality materials and new technologies in the renovation of buildings to upgrade their energy efficiency Promotion of the use of RES for auto-production, where technically feasible and economically viable Promotion of the switch to gas, where technically feasible	Loans at preferential terms from revolving funds / revolving financial instruments Specialist credit lines Other structured financial instruments, National Decarbonisation Fund	2021-2027 2021-2027 2021-2027	MRRB, FMFIB

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		Promotion of the replacement of household appliances with ones that are more energy efficient		2021-2030 2021-2030	
Priority 1.4: Improving currently applicable condominium legislation governing the ownership, maintenance and professional management of buildings					
Structure of ownership in residential buildings: different social, financial, age and psychological profiles of occupants, leading to a poorly functioning mechanism for the management of buildings governed by condominium law — inadequate regulation of the rights and obligations of the owners of independent housing units in the ZUES, lack of reliable mechanisms for effective monitoring to ensure compliance with the law and need to	LR	Improvement of the legal framework governing relations under condominium law, including the introduction of more stringent requirements for the maintenance and renovation of buildings by the owners, including the owners of vacant apartments, and strengthening of the powers of local authorities to monitor compliance with the ZUES Introduction of condominium registers in municipalities Enactment of amendments to legislation to increase the penalties for owners in buildings governed by condominium law and enhance	N/A	2022	MRRB

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
strengthen the role of local authorities in this respect.		monitoring by the administrative authorities. Enhancing the capacity of municipalities for effective enforcement of the Condominium Management Act and effective monitoring of compliance. Establishing a regulatory framework to encourage the take-up of professional management and maintenance of housing stock.			
Practices of poor and inefficient management of multi-family buildings have become entrenched over time, hence the lack of capacity to organise and manage the renovation process and motivation to do this free of charge. Furthermore, renovation for the purpose of upgrading the energy efficiency of buildings requires	LR	Establishing and promoting the use of specialised intermediaries capable of providing expert assistance to condominiums throughout the renovation process (from the stage of drawing up applications for the renovation project to the stages of implementation, monitoring and reporting).	N/A	2021-2030	Professional and sectoral organisations, owners' associations, MRRB

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
technical, legal, economic and other management competencies.					
The lack of regular maintenance of residential buildings increases the cost of renovation to improve the energy efficiency of buildings because it creates a need for accompanying measures to be implemented in advance in order to ensure the subsequent effectiveness of ESM, which increases investment costs, lowers profitability and limits the possibilities for participation in programmes under which	TB	At the stage of financial planning of future programmes, the overall condition of the buildings to be renovated in order to improve their energy efficiency should be taken into account and financial resources should be made available for necessary accompanying measures.	All funds and financial instruments	2021-2027	All institutions from which grant assistance is available and financial instruments

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
financing is only available for energy efficiency measures					
Priority 1.5 Developing a scheme for following up and reporting on the results of building renovation support programmes using systematic monitoring of technical parameters and energy saving effects in order to enhance the monitoring of implementation, identify energy-saving deficiencies and streamline impact management processes at programme and operational level.					
Lack of predictability and poor long-term planning of renovation programs, which make it difficult for businesses and property owners to plan their actions	LR	Development of short- and medium-term plans to enable budgeting that ensures that sufficient funds are available (from the national budget and other sources) for support mechanisms.	N/A	2021-2030	All institutions from which grant assistance is available and financial instruments
Lack of reliable information about the results of renovation programmes	Information and capacity related (ICR)	Implementation of mandatory schemes for monitoring of actual energy savings, taking into account climate conditions and the indoor microclimate [appropriate] for different types, buildings, households and income groups (where applicable) as an element of all support programmes for the renovation of buildings	N/A	2021-2030	Central government bodies and local authorities from which grant assistance is available and financial instruments
Barriers to conducting analyses and reporting on	Information and	Creating a system for gathering information about building	EU and international financial instruments,	2021-2030	Central government bodies and local

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
renovation plans and programmes at national and local level	capacity related (ICR)	renovation measures implemented in residential and non-residential buildings Annual monitoring of the implementation of strategies and programmes, publication and presentation in public of monitoring reports with mandatory inclusion of optimisation measures	budgets of central government agencies and local authorities		authorities from which grant assistance and financial instruments are available
Lack of a database of publicly owned and residential buildings, which creates difficulties in the planning of major renovation actions and aggregating projects in order to scale up investment	TB	Development of a single digital information gathering system (database) for the different categories of buildings that comprise existing housing stock at municipal level. Ensuring connectivity between municipal databases and the databases of various institutions collecting housing stock data. Greater efficiency of the national information system on the state of play of energy efficiency in Bulgaria through the provision of aggregated anonymised data Creating a single system for collecting information for the	Operational programmes, EU funds, municipal budgets	2021-2027	MRRB, municipalities, AUER

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		purpose of implementing social policies targeting energy poor groups in the population.			
Most buildings lack technical passports, which delays project implementation. Furthermore, no information is available in advance about the condition of buildings, although it is a factor for estimation of expected energy savings and the investment necessary to renovate and upgrade the energy efficiency of the building.	TB	Digitisation of technical passports and creating a municipal database with the necessary system interfaces Systematic compilation of information and digitisation of standard design solutions for the buildings constructed by the industrial method by the municipalities Technical passport modification to incorporate a section on the planning of renovation to upgrade energy efficiency Clear requirements and penalties for local authorities that fail to ensure the proper monitoring of the issuance of technical passports to existing buildings	Operational programmes, EU funds, municipal budgets	2021- 2027 2021-2027 2023 2023	MRRB, municipalities, AUER Municipalities MRRB MRRB
Technical passports issued to a very small number of	TB	Developing package solutions that are easy to apply to similar types of	N/A	2021-2030	MRRB

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
buildings, highly inefficient process of drawing up technical passports on account of lost design and executive documentation relating to the construction of buildings		buildings Creating a database of technical solutions to serve as a guide for future projects/investments Sound familiarity with different renovation solutions will promote their multiplication. Ensuring strict compliance with the requirement for the mandatory issuance of technical passports to all buildings from the beginning of 2022. Putting an effective monitoring system in place and imposing penalties for non-compliance, including a ban on selling and renting properties in buildings without a technical passport and energy efficiency certificate. Increasing the commitment of the owners of buildings through incentives for the issuance of technical building passports and penalties for non-compliance.			

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		Encouraging local authorities to compile systematic information and digitise standard design solutions for buildings constructed using the industrial method.			
Lack of accessible, quality advice on the measures and steps in the major renovation of buildings and the additional benefits associated with these measures and steps	Information and capacity related (ICR)	Support for demonstration projects at local level as an example of the benefits and effects of major renovation projects, including dissemination of best practices from Bulgaria and other EU countries	N/A	2021-2030	MRRB
Strategic objective 2: Ensuring that sustainable financial instruments are available to enable the implementation of the Long-term National Strategy					
Priority 2.1 Ensuring that grant assistance is available and creating financial instruments that are suitable for different target groups and types of buildings and an optimal combination of available public resources and a gradual and sustainable increase in private investment Making optimal use of the funding available from the national budget and available financing from EU funds, international financial institutions, specialist funds, programmes and private sources, and ensuring a possibility to combine various public and private financial mechanisms					
High intensity of grant assistance (100 %), which creates unrealistic expectations and acts as a barrier to the development and	LR	Differentiation of the level of technical and financial assistance depending on the energy efficiency class achieved, taking into account the requirement for nZEB Adoption and promotion of a roadmap for gradual reduction of	Specialist credit lines / Concessional loans from revolving funds/financial instruments with revolving capital	2021	All institutions from which grant assistance and financial instruments are available

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
implementation of market mechanisms		the grant component in the multi-family housing segment in line with the social policies put in place, with accompanying measures to provide low-interest and/or interest-free loans to home owners while maintaining a 100 % grant component for targeted social policies, including by local authorities			
Non-market energy prices make investments in the major renovation of buildings less attractive from a financial standpoint.	LR	Full electricity market liberalisation while ensuring that the interests of consumers are protected Establishing a favourable regulatory environment for the integration of auto production using renewable sources of energy in buildings under different ownership and management regimes	N/A	2025	ME
Poor coordination of policies on building stock renovation	LR	Ensuring that a possibility is available to combine measures under different programmes, including clean air and social assistance programmes, in order to support the renovation of buildings.	All funds and financial instruments	2021-2027	All institutions from which grant assistance and financial instruments are available

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		Coordination should take place at local level.			
Perception of risk by financing institutions: Energy efficiency projects do not typically meet the generally accepted risk assessment criteria for project financing. Commercial banks choose to finance investment projects that they consider safe. i.e. those that generate a moderate return on investment, and regard investments in energy saving measures in the segment of residential buildings as high-risk and uncertain.	FB	Establishing a specialist national fund that provides loans and bank guarantees to the participating financial institutions Developing mechanisms for risk sharing between public institutions and commercial banks Use of assistance from IFIs to structure the mechanisms Implementation and multiplication of pilot projects, including under the Horizon 2020 Programme and the Horizon Europe programme with a view to lowering risk perception on the part of financial institution.	Municipal/national guarantee schemes Guarantee schemes, National Decarbonisation Fund	2023 2023 2021-2030 2021-2030	FMFIB FMFIB Project actors
The average size of energy efficiency projects is often small compared to that of typical commercial bank	FB	The standardisation of processes and documents will support organisation and create cost	Super ESCO Green Bonds Green mortgages		

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
loans, making such projects less attractive to bankers. Moreover, energy efficiency projects usually involve a higher share of 'soft' costs compared to traditional loans.		reduction opportunities for financing institutions. Creation of platforms for the aggregation of similar projects at municipal or regional level.		2021-2030	NSORB, municipalities, MRRB, ME, FMFIB
The low creditworthiness of the owners' association (due to lack of assets that can be used as collateral) is a barrier to the market funding of the renovation of multi-family buildings.	Financial barriers (FB)	Development of financial instruments for risk-sharing that create incentives for banks to enter this market, including the provision of collective loans	Contracts with guaranteed results/ESCO Specialist credit lines Guarantee funds, National Decarbonisation Fund Combinations of financial instruments and grant assistance	2021-2030	FEEVI, FMFIB
The need for co-financing and the lack of a well-developed social safety net means that insolvent property owners constitute a real barrier to the implementation of a	FB	Creating conditions to ensure the participation of low-income owners in renovation programmes through a separate mechanism for the provision of target grants	Partial/full grant assistance Combinations of financial instruments and grant assistance	2021-2030	All institutions from which grant assistance and financial instruments are available

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
renovation model with a co-financing component			Other structured financial instruments, National Decarbonisation Fund		
Lack of sufficient financial resources to allow home owners to undertake energy efficiency upgrades on their own due to low income levels as compared to the level of initial investment required for major renovation The 'poor owner' phenomenon means that the process of renovation cannot be deployed on a large scale without the availability of grant assistance.	FB	Development of different renovation programmes, taking into account the specificities of the different types of residential buildings / introduction of individual measures with different aid intensity, depending on the objectives of the specific programme and level of social tolerance Differentiated financial contribution, tailored to the different needs and capacity of owners in multi-family buildings, to ensure the inclusion of all home owners in combination with an optimal use of financial resources Further differentiation of the grant assistance component on a regional basis (for low-, middle- and high-income regions) and enhanced participation of municipalities,	Loans granted under preferential terms from revolving facilities Specialist credit lines On-bill financing	2021-2030	All institutions from which grant assistance and financial instruments are available

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		including through the co-financing of measures. Ensuring the availability of attractive sources of market financing, such as long-term and low-interest loans for owners Ensuring the participation of low-income (insolvent) owners in renovation programmes through a separate mechanism from which (additional) targeted grants are available Providing a legal possibility to establish municipal funds to support housing policy and renovation			
A high share of vacant housing units in a building and hence a small number of owners make investments inefficient from an energy efficiency and/or financial perspective, regardless of the source of financing.	TB	Financial instruments funding the implementation of individual measures will be developed.	Loans upon preferential terms from revolving funds / revolving financial instruments Specialist credit lines	2021-2030	FMFIB, FEEVI, municipalities

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
It is practically impossible to carry out major renovation of such buildings because no interventions to the building envelope can be undertaken.					
Priority 2.2: Developing the energy efficiency obligations scheme, providing opportunities for participation in funds and mechanisms to meet obligations, and developing the market of energy efficiency services					
Limited access to financing: insufficient number of mechanisms used to finance measures for the major renovation of buildings	FB	Linking financial measures for energy efficiency improvements in the renovation of buildings to the target or actual energy savings achieved Developing energy efficiency services under energy efficiency performance contracts (EEPC) Developing model energy efficiency performance contracts for the public sector Introducing requirements for companies that identify as ESCOs Creating an ESCO register and	Contracts with guaranteed results/ESCO Financing through utility bills Specialist credit lines Municipal/national guarantee schemes Revolving funds / revolving financial instruments; Green mortgages	2021-2030 2021-2030	All institutions from which grant assistance and financial instruments are available, FEEVI ESCOs

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		updating the code of ethics and indicative contracts Mobilising private investment, including through the energy efficiency obligations scheme Developing financial instruments that facilitate access to loans, including collective loans, for all residential buildings	N/A	2023 2021-2030 2021-2030	MRRB, AUER All institutions from which grant assistance and financial instruments are available FMFIB
Strategic objective 3: Support for building administrative and professional capacity at the level of central government institutions and local authorities and the actors in the investment process					
Priority 3.1: Developing administrative and technical capacity through systematic provision of technical assistance to the central government bodies and local authorities for the implementation of programmes supporting housing stock renovation					
Lack of technical capacity at the level of local authorities for the implementation of	TB	Mandatory technical assistance component to be integrated into		2021-2027	All institutions from which grant assistance and

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
programmes for the renovation of buildings and investor supervision		support programmes for the renovation of buildings.			financial instruments are available
		Specialist training, methodological guidance and provision of information materials to local authorities	Operational programmes, EU funds, financial instruments	2021-2030	NGOs, MRRB, NSORB
		Implementation of energy management systems in public and private buildings	Operational programmes, EU funds, financial instruments, private investment	2021-2030	Owners of buildings
		ICT implementation to improve the connectivity of buildings to external systems and make them more responsive to the needs of their occupants	Operational programmes, EU funds, financial instruments, private investment	2021-2030	Owners of buildings
		Encouraging the participation of local authorities in international initiatives such as the Covenant of Mayors, the European Energy Awards etc., international projects within the framework of the Horizon Europe programme and the LIFE programme, the development of pilot and demonstration projects	N/A	2021-2030	NSORB, MRRB, NGOs

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		and creating incentives for research and development at local level			
Priority 3.2: Support for strengthening the professional capacity of actors in the investment process by continually updating the system of vocational education and training, lifelong learning and promoting continuing professional training of designers, consultants, installers, construction workers and managerial staff					
Insufficiently qualified and experienced actors in the supply chain, i.e. those involved in the design, implementation and financing of energy efficiency projects without having received appropriate training and having sound knowledge of housing renovation	Information and capacity related (ICR)	Promotion and encouragement of upskilling through training programmes across a range of key occupations and specialist professional areas Creating a link between secondary school and university curricula and current trends and practices in energy efficiency and supporting the development of facilities in cooperation with manufacturers and suppliers of appropriate building materials and products Integrating special requirements for the training and qualification of installers and consultants in applicable legislation Expanding the scope and stepping up the training of energy efficiency consultants with a view to allowing them to obtain qualifications to	Operational programmes, EU funds, financial instruments N/A	2021-2030 2021-2030	MRRB, MON, National Agency for Vocational Education and Training (NAPOO), sectoral and training organisations

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		perform energy efficiency audits, certify buildings and be entered in the register referred to in Article 44 of the ZEE Encouraging the establishment of continuing professional training and expanding the scope of training programmes on energy efficiency and renewable energy for planners (architects and engineers) and construction professionals and workers, with the relevant industry organisations playing a leading role Creating registers of qualified construction professionals and workers and putting in place an effective system for recognition of professional qualifications acquired on the job Providing specialist training, methodological guidance and making information materials on building stock renovation, including the achievement of the requirements for nZEB, available to designers, supervisors, energy	N/A	2021-2030	Higher education institutions that meet the requirements stipulated in the ZEE Sectoral and professional organisations and training centres

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		auditors and building supervision bodies Introducing training for professional building managers and property management and maintenance companies as a measure to improve their capacity and have them serve active drivers and accelerators of the renovation process of multi-family residential buildings	N/A Operational programmes, EU funds	2021-2030 2021-2027	Sectoral and professional organisations and training centres MRRB
Shortage of construction workers and specialists	Information and capacity related (ICR)	Modernising and providing incentives for the system of vocational education and training; creating registers of qualified workers and specialists, career guidance support	N/A	2021-2030	Sectoral and professional organisations and training centres
Lack of training on energy efficiency projects for local administrations,	Information and capacity	Conducting capacity building training campaigns at local level for municipal specialists, energy	Operational programmes, EU funds, financial instruments	2021-2030	Municipal administrations, NGOs,

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
energy consultants, designers and construction professionals (including construction, author and investor supervision)	related (ICR)	consultants, planners and construction professionals Strengthening the capacity of municipal authorities in connection with their obligations relating to municipal energy planning and energy management in buildings that are property of municipalities Increasing the capacity of owners of State-owned buildings to implement energy efficiency and energy management projects in buildings			educational institutions, AUER
Priority 3.3: Implementing a nation-wide communication campaign to raise awareness of the benefits of energy efficiency and change public attitudes in support of the overall process of building renovation and maintenance including the benefits of private financing and additional benefits in a broader sense					
Lack of awareness among the broader public of the advantages of major renovation	Information and capacity related (ICR)	Communication programme to explain the benefits of major renovation at national and local level, including by conducting: national and awareness campaigns to educate the public about the potential financial, health, economic, social and environmental benefits in order to promote and attract interest in clean heating	Operational programmes, EU funds	2021-2030	MRRB, ME, AUER

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		alternatives and support regulatory reforms Conducting local awareness campaigns to address the specific local context and increase trust in the implemented programmes			
Underdeveloped culture of renovating buildings: Practice shows that, to the extent possible, users tend to choose the least efficient solutions on account of the lower upfront cost of the investment. The benefits of implementing measures are underestimated whereas the time, cost and effort involved are overestimated.	Information and capacity related (ICR)	Service delivery in line with the one-stop-shop principle, including the provision of tailored advice to building owners and investors on all stages of the process of renovation to ensure that comprehensive information is available, provide assurance that the measures proposed, including the monitoring and supervision mechanisms, do indeed guarantee results and benefits.	Operational programmes, EU funds, financial instruments	2021-2027	MRRB, municipalities, AUER
Priority 3.4: Providing support for research and applied activities that promote innovation and new technologies for energy saving and renewable energy in buildings					

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
Inadequate support for research and development, the design and implementation of demonstration projects showcasing new or improved renovation technologies and the multiplication of best practices	IRD	Support for research and the design and implementation of demonstration projects showcasing new or improved renovation technologies and the multiplication of best practices Support for the implementation of pilot projects for upgrading buildings to energy class A or nZEB standard	Operational programmes, EU funds, financial instruments Partial subsidy from the National Decarbonisation Fund	2021-2030	MON, MRRB, FMFIB
Lack of social and economic studies of the effects of housing renovation, including its broader benefits	IRD	Support for data collection and analysis, sociological and market research and the development of methodologies for assessment of the immediate and wider benefits of energy efficiency — economic, social and environmental, including those related to the improvement of health status and disposable income of households, clean ambient air and indoor air quality, the positive effects on work capacity and the quality of the education, higher employment and local economic	Operational programmes, EU funds	2021-2030	All institutions from which grant assistance and financial instruments are available

Description of obstacles/challenges	*Type of obstacle*	*Policies and measures to address them*	*Applicable financial instrument*	*Deadline*	*Responsible institution/stakeholders*
		growth and higher energy security and stability.			
High price of innovative technologies	IRD	Targeted incentives for the development and implementation of innovative approaches, technologies, materials and products for the structure and envelopes of buildings	Structured financial instrument, National Decarbonisation Fund	2021-2030	MRRB

Type of obstacle: Abbreviations used in column 2

Legislative and regulatory (LR)
Financial barrier (FB)
Information and capacity related (ICR)
Technical barrier (TB)
Innovation, research and development (IRD)

5.2 Additional focus on the measures for the implementation of the National Long-term Strategy

5.2.1 Policies and measures promoting cost-effective major renovation, including phased major renovation, and supporting economically effective measures and renovation

The achievement of a high level of energy efficiency and decarbonisation of existing housing stock will require: (1) lowering energy demand by improving the energy performance of building envelopes and microclimate systems; (2) generating a greater share the necessary energy from sources with low CO_2 emissions (renewable energy sources).

The technical potential to achieve high energy efficiency in existing housing stock will entail:

- upgrading the insulation properties of building envelopes to ensure that they meet or exceed the energy efficiency requirements stipulated by law;
- limiting the impact of thermal bridges;
- upgrading the air tightness of the building envelope;
- installing the following highly efficient microclimate systems in residential buildings:
  - lighting system;
  - heating system, hot/cool air generator;
  - ventilation system[20] ;
  - installing a domestic hot water system;
  - installing electricity auto-production systems using renewable energy (solar and geothermal energy, biomass)

The most economically advantageous long-term solution is to renovate buildings to an energy class higher than the minimum required by law for buildings that have been placed into service in combination with the implementation of measures for the recovery of energy from renewable sources. Insufficient resources are a major obstacle to promoting the cost-effective renovation of buildings.

Where technically feasible, a **phased approach** to the major renovation of residential buildings at affordable initial investment levels should be pursued.

Phased renovation will commence with the implementation of energy saving measures to upgrade the external envelope of buildings — heat insulation of walls, roof and floor, and replacement of windows.

The remaining energy efficiency measures can be undertaken in the following stages:

[20] An efficient ventilation system is required in order to increase the airtightness of the building envelope.

- implementation of appropriate and cost-effective ESM packages to improve the energy efficiency of microclimate systems;

- utilisation of energy from renewable sources.

5.2.2 Policies and measures targeting the worst performing segments of the national building stock, split-incentive dilemmas and market failures, and an outline of relevant national actions that contribute to the alleviation of energy poverty

The recommendation set out in EU directives is that renovation should focus on the building stock segment with the worst energy performance. At the same time, some of the key findings of the review and analysis set out above show that building stock in Bulgaria is energy inefficient overall, with poor energy performance across all segments and that consumers that face financial difficulties and cannot afford to renovate their homes are not concentrated in distinct buildings or areas.

Singling out a 'narrow' segment with the worst characteristics in terms of energy performance would therefore be ineffective and counterproductive.

In view of the identified set of barriers to renovation and the detailed study of the energy saving potential of multi-family and single-family residential buildings, an approach has been recommended which will ensure that the policy implemented during the period 2021-2030 focuses on energy efficiency measures implemented across all groups of residential buildings, with gradual phasing in, starting with the buildings with the highest level of readiness for renovation:

- In the segment of multi-family residential buildings, energy class G buildings have the greatest potential for achieving energy savings. At the same time, the buildings in this category account for a relatively small share of those renovated to date using grant assistance from public funds that covers 100 % of renovation and administrative costs. This is due to a complex set of barriers (both surmountable and insurmountable), which explains the slow deployment of the process on a large scale.
- The post-renovation energy saving potential of buildings that currently have a higher energy class is lower. The socio-economic conditions in these buildings, however, are **more conducive to launching renovation on a larger scale**.
- The potential of single-family buildings (and to a large extent low- and medium-rise multi-family buildings) is generally underdeveloped insofar as this segment offers major opportunities from a technical and organisational point of view. The main challenge in this segment is the posed by inadequate number and scale of appropriate measures and mechanisms currently available and, hence,

the lack of substantial experience gained to date. At the same time, **42 %** of the area to be renovated by 2030 should be in this segment.

A wide range of programmes and financial instruments are in the pipeline with differentiated levels of aid intensity, depending on the extent of renovation, respectively the energy savings expected to be achieved.

Approach to addressing issues relating to energy poverty and its reduction

Measures to improve the energy efficiency of building stock are particularly important insofar as they not only alleviate the situation of socially vulnerable groups in the short term (as social benefits do) but also make a lasting contribution to lifting people out of poverty through their impact on the underlying causes of poverty.

However, a distinction should be made between the two types of benefits inasmuch as they are used in different contexts and seek to achieve different objectives: the heating allowance aims to meet basic heating needs whereas targeted energy renovation grants enable the participation of low-income owners that are not likely to qualify for heating benefits. It is also important to distinguish between the two target groups as well as the approaches and criteria for qualifying for assistance in that renovation grants are needed in buildings that have taken the first steps to establishing a management regime under condominium law. In territorial terms, an overlap between the two groups in need is unlikely to emerge.

From a social standpoint, the situation is as follows**:**

- **Vulnerable owners or tenants are not concentrated in distinct buildings/areas[21],** which would have facilitated the implementation of targeted energy efficiency policies/measures.

- Dispersion of low-income and energy-vulnerable owners in multi-family buildings alongside more affluent owners.
- Relatively small share of persons (households) receiving heating benefits. According to data published by the Social Assistance Agency a total of 303 195 persons and households submitted applications for heating assistance for the heating season 2019/2020. Of these, heating allowances were approved in 252 615 cases by the issuance of dedicated orders (approximately 3.6 % of the population) and 50 580 applications were refused. At the same time, official NSI and Eurostat data based on subjective indicators[22] related to the material deprivation

[21]Ghettoised areas, where the implementation of development policies is of greater priority than renovation for the purpose of improving energy efficiency, constitute an exception.

[22] The indicators concerned measure the subjective assessment and personal attitudes of individuals and households in terms of their capacity to satisfy their individual needs. It should be emphasized that the statistical data distinguishes between individuals (households) that cannot afford particular goods or services and those that do not have the goods or services

experienced by households in Bulgaria shows that the relative share of households unable to meet unexpected financial costs with their own resources (such as the cost of participating in energy efficiency schemes for residential buildings that require co-financing by owners) is 32.1 %.

- The experience gained during the course of implementing projects, such as the demonstration project for the renovation of multi-family buildings (DOMZhS) and the project for energy renewal of Bulgarian homes (EOBD) confirms the fact that persons who cannot afford the co-financing component of renovation projects with their own funds and/or by obtaining a loan are rarely eligible for the dedicated heating allowance.
- The low amount of the dedicated heating allowance (BGN 465.90 for the entire 2019/2020 heating season) means that it is negligible compared to the investment needed to introduce energy efficiency measures in order to upgrade a residential building to energy class C (BGN 9 375.00 incl. VAT based on an estimate for a housing unit with a floor area of 75 m^2 in a multi-family residential building that has been placed into service, or BGN 125 per m^2 incl. VAT).

Housing policy is essentially a local policy, and it is advisable that renovation grants are integrated into municipal policy for support of persons who do not have the financial means to participate in programs for the renovation of buildings with a view to upgrading their energy efficiency. Needs can thus be considered in the context of local specificities more easily and local authorities have greater flexibility to launch residential building stock renovation on a large scale in a timely manner. On the other hand, the limited available support from public funds will be targeted at persons/households living in buildings that have put in place a management system under condominium law in order to participate in energy efficiency programmes that require co-financing by the owners.

5.2.3 Policies and measures targeting all public buildings

The ESCO mechanism has the potential to contribute to the implementation of energy efficiency projects in all public buildings. Building trust in the mechanism will require the introduction of minimum criteria for energy service companies (ESCOs).

The creation of an online platform or aggregator for clustering and grouping projects can also boost uptake on the part of ESCOs. The platform will provide technical support, information on possible sources of funding, monitoring of implemented projects, feedback to contracting authorities and a list of 'verified contractors' compiled on the basis of certain criteria such as the results achieved, absence of defects to be rectified during the warranty period, loan repayment terms (if any), etc.

concerned for another reason, for example because they do not want or need them.

The introduction of the platform will improve available information and the functioning and accessibility of data on certified buildings, acting as a useful resource on energy savings estimates, investments, payback periods, etc. The platform can be linked to other local and municipal platforms.

5.2.4 Initiatives to promote smart technologies and well-connected buildings and communities as well as skills acquisition and education in the construction and energy efficiency sectors

Bulgaria's participation in the expert working group on the Energy Performance of Buildings Directive under the Concerted Action project (CA EPBD) will enable the dissemination of information on new technological solutions and their applicability in buildings and communities among stakeholders. The possibility to introduce an optional Union-wide scheme to define an indicator for the readiness of buildings for smart management on the basis of an EU methodology for its calculation, taking into account national specificities, will be considered.

The one-stop-shop concept for the provision of both energy efficiency and renewable energy services will be elaborated in greater detail, and administrative and technical capacity will be ensured at municipal level to facilitate access to relevant services.

Legislation will be amended to enable the functioning of 'energy communities/energy cooperatives', including renewable energy communities.

Support for the efforts of technical education institutions for the development of modules to enhance professional competence in energy efficiency

Support for sectoral organisations and training centres for the design and implementation of training courses for construction sector professionals and practical and dual training for the improvement of skills and qualifications.

6. NECESSARY INVESTMENTS UNTIL 2050

The assessments conducted at EU and national level show that significant investments are needed to renovate building stock and upgrade its energy efficiency. This requires the development of policies, financial instruments and programmes geared towards mobilising private capital and increasing demand for energy efficient services, coupled with efforts to raise awareness of the associated benefits.

The calculation of the necessary investment to renovate and upgrade the energy efficiency of building stock is based on an analysis of projects implemented under the NPMZhS and FEEVI, data from the implementation of energy efficiency measures recommended in the context of energy efficiency audits, and the model study of ESM packages leading to higher energy savings. The investments necessary to upgrade different categories of buildings and implement different ESM packages in buildings belonging to the same category vary widely.

In order to calculate the level of funds necessary for the next ten-year period, an average has been calculated on the basis of data about a multitude of different packages. In addition, the ten-year period was divided into two sub-periods: 2021-2025 and 2026-2030.

Table 19 Necessary investments

	2021-2025	2026-2030	2031-2040	2041-2050
Investment	**BGN/year**	**BGN/year**	**BGN/year**	**BGN/year**
Residential buildings	257 180 671	535 480 142	911 015 558	1 007 003 984
Buildings other than dwellings	59 899456	80 831802	129 253125	165 671859
Total per year	**317 081 000**	**616 312 000**	**1 040 269 000**	**1 172 676 000**
Total for the period	**1 585 405 000**	**3 081 560 000**	**10 402 690 000**	**11 726 760 000**

The necessary investments indicated in the table above cover only the cost of energy efficiency measures. Many of the measures, especially those implemented to upgrade the building envelope, are accompanied by ancillary activities necessary to ensure the quality and lifetime of core energy efficiency measures. According to estimates based on the largest housing renovation programme implemented to date these costs can account for as much 30 % of the total investment in energy efficiency measures. This means that the costs concerned also need to be taken into account in the structure of financial instruments.

Furthermore, many buildings have structural problems for a variety of reasons. In order to provide guarantees that they can remain in service throughout their lifetime, construction works may be required, which can inflate renovation costs considerably. These costs are beyond the purview of this strategy as they vary for each building and cannot be estimated in advance. However, the existence of such buildings should be taken into account for the purpose of giving priority to certain building stock segments for the purpose of renovation.

The necessary investments to renovate and upgrade the energy efficiency of building stock in the period 2021-2050 will be funded by EU funds and programmes, including national co-financing, where required. Funding is also expected to be available under the Just Transition Fund, Invest EU, international financial institutions (FI), private investors and the budgets of the central government and local authorities.

6.1 Existing sources of funding

6.1.1 2014-2020 Regions in Growth Operational Programme

- **Call for proposals BG16RFOP001-1.001-039 for grant assistance for the implementation of Integrated Urban Regeneration and Development Plans**

The purpose of the grant assistance procedure is to support the implementation of Integrated Urban Regeneration and Development Plans with a view to addressing, in a sustainable and lasting manner, the high concentration of economic, environmental and social problems in

39 towns and cities of the first, second and third tiers of Bulgaria's National Spatial Development Concept for the period 2013-2025.

- **Call for proposals BG16RFOP001-2.001 for grant assistance for upgrading energy efficiency in peripheral regions**

Priority axis 2 Support for energy efficiency in focal points in peripheral regions is designed to support the implementation of energy efficiency measures in public and residential buildings in small towns (municipal centres) in peripheral regions, which provide services to the surrounding peripheral regions. It corresponds to thematic objective 4 'Support for the transition to a low-carbon economy in all sectors'. The activities implemented under the priority axis will contribute to the achievement of the national indicative energy savings target for 2020 under the National Energy Efficiency Action Plan (NEEAP) for the period 2014-2020.

The priority axis has two specific objectives: 'Increasing energy efficiency in the housing sector in the key tier 4 centres of the national polycentric system' and 'Increasing energy efficiency of public buildings in the key tier 4 centres of the national polycentric system'.

The named beneficiaries of the call for the provision of grant assistance are 28 small town municipalities designated as tier-four focal points in the national polycentric system under the National Spatial Development Concept for the period 2013-2025.

6.1.2 Financial instruments financed by Operational Programme Innovation and Competitiveness 2014-2020 and Operational Programme Regions in Growth 2014-2020 and managed by the Fund Manager of Financial Instruments in Bulgaria (FMFIB)

- **Financial instrument 'Loss-capped Portfolio Guarantee', financed by Operational Programme Innovation and Competitiveness 2014-2020 and co-financed by the European Structural and Investment Funds (ESIF).**

The financial instrument will support small and medium-sized enterprises, as well as large companies from almost all sectors of the economy, in the implementation of projects for energy efficiency upgrades identified as important by an energy efficiency audit. The first 161 micro-, small and medium-sized enterprises under the scheme will be eligible for grant assistance for the performance of energy efficiency audits. The financial instrument has a total budget of BGN 78 mln. and the total amount of the loans granted under the financial instrument may reach and exceed BGN 400 mln. The FMFIB offers up to 80 % risk coverage under each loan, enabling the lender to offer financing to the final recipient at preferential interest rates and under less stringent requirements for the collateral to be provided.

- **Financial instrument 'Urban Development Fund', financed by Operational Programme Regions in Growth 2014-2020 and co-financed by the ESIF.**

The financial instrument is implemented under Priority axis 1 Sustainable and Integrated Urban Development and Priority axis 6 Regional Tourism and offers loans with an embedded guarantee for the co-financing component provided by the financial intermediary. With a total budget of BGN 353 mln., it is expected to provide final beneficiaries with access to nearly BGN 600 mln., including private funds raised, in the form of loans to be granted at preferential interest rates and under less stringent requirements for the collateral to be provided, with the added benefits of a longer repayment period and a grace period.

Under Priority axis 1, the financial instrument covers eligible investment projects in 39 towns and cities, with funding focusing on the improvement of the energy efficiency of single-family homes and student residences in the respective agglomerations among others, subject to confirmed compliance with the Integrated Urban Regeneration and Development Plans of the respective town/city. Investments should achieve compliance with the minimum energy efficiency standard for existing buildings that corresponds to energy consumption class C. Major renovation projects can also be financed, where a reduction in energy consumption by more than 60 % is envisaged. Residential buildings are also eligible for major renovation grants under the instrument, provided that they were designed before 1999. The expected contribution of the financial instrument at operational programme level is an annual reduction in greenhouse emissions by 12 812 tCO_2 eq. and a total of 2 284 households upgraded to a higher energy class.

In addition, the financial instrument can be used to fund the implementation of other projects under Priority axes 1 and 6 in areas such as sports, cultural, transport and tourism infrastructure, as well as industrial zones, where the projects envisage the implementation of environmental actions and activities contributing to the improvement of energy efficiency.

6.1.3 Household Energy Efficiency Credit Line (REECL)

On 1 September 2016, the European Bank for Reconstruction and Development launched the third programming period of the Home Energy Efficiency Credit Line (REECL), which was first launched in Bulgaria in 2005. The aim is to ensure the continuity of the positive effect of the credit line achieved to date and address the need for further measures for the improvement of energy efficiency in the housing sector in Bulgaria.

The credit line is a financial mechanism with a budget of EUR 20 mln. to be disbursed on energy efficiency projects in the residential sector via established Bulgarian commercial banks. The beneficiaries can be natural persons, associations of apartment owners and private service providers catering to the needs of energy efficiency projects in the residential sector.

In order to create incentives for the implementation of energy-saving measures in homes, additional grant assistance in the amount of 10 % is provided for eligible projects to be implemented in buildings comprising one or two housing units and 20 % for projects in multi-

family buildings comprising more than three housing units. The funds are disbursed upon completion of installation works and their verification by an independent consultant. A grant in the amount of EUR 4.4 mln. has been provided by the Kozloduy International Fund.

6.1.4 Energy Efficiency and Renewable Sources Fund

The Energy Efficiency and Renewable Sources Fund was established by the Energy Efficiency Act (2004) as a legal entity that is independent from other government institutions. The Fund operates under the provisions of the Energy Efficiency Act, the Renewable Energy Act and the donor agreements to which it is a party. The income and expenditure of the Fund are not part of the consolidated State budget. The initial capital of the FEEVI comprised exclusively grant financing. The main donors of the FEEVI are the UN Global Environment Facility through the International Bank for Reconstruction and Development (World Bank) with a USD 10 mln. grant, the Government of Austria with a EUR 1.5 mln. grant, the Bulgarian government with a BGN 3 mln. grant and private Bulgarian sponsors.

6.1.5 National Trust EcoFund (NDEF)

The National Trust EcoFund was established in October 1995 under the bilateral Debt-for-Nature Swap Agreement between the Government of the Swiss Confederation and the Government of the Republic of Bulgaria.

6.1.6 Guaranteed energy savings performance contracts

The financial mechanism is envisaged in Article 72 of the ZEE.

Guaranteed energy savings performance contracts (ESPCs) aim to implement energy efficiency measures in buildings, at enterprises and on industrial and outdoor artificial lighting systems, with the contractor recovering the cost of the investment and their remuneration from the cost savings achieved.

6.1.7 National programme for energy efficiency in multi-apartment buildings

The National Programme has been designed with a view to enabling the achievement of both short-term and long-term objectives at EU level and addressing the challenges of climate change, energy security and depletion of natural resources.

6.1.8 Other energy savings financing schemes

At EU level, the scale of investment necessary to achieve a 20 % increase in energy efficiency by 2020 is estimated at approximately EUR 100 bln. per year. In order to achieve the target, the Union has increased the amount of public funds available for energy efficiency. At the same time, additional private investment is being leveraged through appropriate financial mechanisms to provide the necessary resources.

6.2 Opportunities for new sources, instruments and mechanisms for financing

This section aims to present selected financial instruments that are based on international best practices and could support the achievement of the objectives of long-term for building stock renovation. Each of the financial mechanisms and instruments set out above has been analysed to assess its applicability to the Bulgarian market and the time needed for its implementation on the ground.

6.2.1 Funds and instruments at EU level

The EU has developed a number of mechanisms and instruments to support and assist Member States in a number of areas. Those that are particularly relevant for the long-term renovation of buildings are set out below.

- **InvestEU Programme**

The InvestEU programme will be implemented between 2021 and 2027 and will serve as the Union's main instrument for support of investments and access to finance in the EU. It will succeed the European Fund for Strategic Investments (EFSI), also known as the 'Juncker Plan', building on the experience already gained and proposing certain improvements, including an integrated management and implementation structure for all centralised financial instruments and EFSI. The programme aims to bring together under one roof the multitude of EU financial instruments currently supporting investment in the EU, thereby simplifying the financing of investment projects in Europe and making the process more efficient and flexible.

One of the elements of the programme is the InvestEU fund, which will provide guarantees covered by the EU budget by way of supporting investment and access to finance across the Union. The ambitious goal is to trigger at least EUR 650 bln. in additional investment by providing a EUR 38 bln. guarantee from the EU budget, with potential implementing partners contributing at least EUR 9.5 bln. in additional funds (75 % of which from the The European Investment Bank (EIB)). Project proposals from all EU Member States will compete for financing on the same terms.

In addition, each Member State may contribute to the InvestEU guarantee by earmarking up to 5 % of its EU funds (ERDF, CF, ESF+, EMFF) for the period 2021-2027 for investment in only in the respective Member State.

Support from the InvestEU Fund will target four policy areas, including 'Sustainable Infrastructure'. In this area, support will be available for investments in transport, energy, including energy efficiency and renewable energy, environment, climate action, circular economy, maritime and digital infrastructure.

By comparison, the EFSI — through a guarantee in the amount of EUR 16 bln. from the EU budget, complemented by EUR 5 bln. in EIB equity — has contributed to attracting

approximately EUR 194 bln. of investment as of mid-May 2017, of which 24 % in the energy sector.

Last but not least, the InvestEU programme will also include the InvestEU Advisory Hub, which will provide technical assistance to support project ideas, proposals and investment intentions at different stages of development or readiness, providing expertise and advice on funding opportunities for the public and private sectors, through programming and policy assistance, project identification assistance, project formulation and implementation assistance, eco-system development and capacity building.

- **Sustainable Europe Investment Plan**

The Investment Plan Sustainable Europe was launched on 14 January 2020 as the investment pillar of another new EU initiative — the **Green Deal**. It aims to mobilise at least EUR 1 trillion in public and private investment in 'sustainable' projects over the next decade through the EU budget and related instruments. This amount, intended to fund the green transition, will be raised through funds in the long-term budget of the EU and a quarter has been earmarked for climate-related actions. The plan will leverage additional private financing through the EU budget guarantee mechanism under the InvestEU programme. As part of the EU Green Deal, the European Commission will set up the Renovation wave open platform, intended to bring together the housing and construction sectors, architects, engineers and local authorities from across the EU. The platform aims to enable the sharing of experiences and good practices, promote dialogue between all stakeholders, develop new financing opportunities and new technological solutions, inform campaigns, promote investment in energy efficiency in buildings and pool renovation efforts in order to capitalise on economies of scale. Particular attention will be paid to the renovation of social housing in order to help households that struggle to pay their energy bills.

The European Investment Bank will be transformed into the Union Climate Bank. It has announced that by 2025 it would gradually increase the share of its financing dedicated to climate action and environmental sustainability to 50 % of its total operations. While this contribution demonstrates the Union's commitment to finance the European Green Deal, it will not be sufficient to unlock the necessary amount of investment on its own. The chart below illustrates how different countries and initiatives will work together to generate the target amount.

Легенда:	**Caption:**
Инвестиционен план за устойчива Европа (инвестиции 2021-2027 г., екстраполирани за 10 години)	Investment Plan for Sustainable Europe (investments over the period 2021-2027, extrapolated for a ten-year period)
Поне 1 трилион	At least 1 trillion
Бюджет на ЕС (503 млрд, евро за климат и околна среда)	EU budget (EUR 503 bln. for climate and the environment)
Invest EU ГАРАНЦИИ	Invest EU guarantees
ЕИБ	EIB
Национални банки-партньори и МФИ	National banks partnering with IFI
Public and private investment *Contribution of InvestEU to the achievement of climate and environmental objectives* Mobilising EUR 279 bln. in investments	Public and private investment *Contribution of InvestEU to the achievement of climate and environmental objectives* Mobilising EUR 279 bln. in investments
Just transition mechanism with a budget of EUR 100 bln. (EUR 143 bln. over 10 years)	Just transition mechanism with a budget of EUR 100 bln. (EUR 143 bln. over 10 years)
National co-financing European Structural and Investment Funds EUR 114 bln.	National co-financing European Structural and Investment Funds EUR 114 bln.
European Emissions Trading Scheme (EUR 25 bln.)	European Emissions Trading Scheme (EUR 25 bln.)
EU budget	EU budget
External financing raised in addition to the EU budget	External financing raised in addition to the EU budget
*without reduction of the annual financial framework	*without reduction of the annual financial framework
There is no overlap in the figures between the targets under the just transition mechanism, climate targets and environment targets.	There is no overlap in the figures between the targets under the just transition mechanism, climate targets and environment targets.

Figure 39: *Sustainable Europe Investment Plan*

6.2.2 The LIFE programme — EU's funding instrument for environmental and climate action

The LIFE Programme is the European Union's funding instrument for environmental and climate action, established in 1992. In the current funding period 2014-2020 the programme has a budget of EUR 3.4 bln. For the EU budget framework for the period 2021-2027, the Commission proposes to increase funding under the LIFE programme by almost 60 %. One of

the main priority areas is to stimulate investment and support activities aimed at the improvement of energy efficiency, especially in European regions lagging behind in the transition to clean energy. Both private and public actors can apply for support for the implementation of various projects, as long as the support is linked to the environmental and climate actions. The Private Finance for Energy Efficiency (PF4EE) facility, an element of the LIFE Programme, is a joint agreement between the EIB and the European Commission to complement financing for energy efficiency investments. The facility is targeted at projects that support the implementation of national energy efficiency action plans or other energy efficiency programmes of EU Member States.

6.2.3 European Energy Efficiency Fund (EEEF)

The European Energy Efficiency Fund (EEF) is another public-private partnership (PPP) financing option made available by the European Commission to ensure the implementation of the Energy Union. The Fund provides direct funding or channels resources through financial institutions by partnering with organisations at municipal, local or regional level. It provides dedicated financing (both debt and equity instruments) for energy efficiency projects, but also for renewable energy and clean urban transport projects. The beneficiaries are municipal, local and regional public authorities or organisations acting on their behalf. The EEEF was established in 2011 with a total budget of EUR 265 mln.

6.2.4 ELENA (technical assistance)

ELENA is managed by the European Investment Bank (EIB) and provides grants to support programmes with an investment volume of more than EUR 30 mln. (including energy efficiency projects) and a three-year implementation period. Since its inception in 2009, the Project Support Facility has provided more that EUR 130 mln. in EU support, resulting in EUR 5 bln. of investment. The initiative can cover up to 90 % of all technical assistance and project development costs such as feasibility studies, market studies, programme structuring, business plans, energy audits and financial planning.

6.2.5 National funds, financial mechanisms and instruments

The purpose of this section is to describe a selection of financing methods used in other countries and appraise their suitability for the Bulgarian market.

- **Green bonds**

A bond is a fixed-income instrument — essentially a loan made by an investor to a borrower — that is typically used by corporations, municipalities, States and sovereign governments to finance various projects and operations. The bond issuer must pay the investor interest and principal on the bond at a later date. Over the past 10 years, green bonds (bonds issued specifically for environmental or clean energy purposes) have become increasingly popular.

More specifically, energy efficiency and building renovation continue to gain importance, particularly at national and municipal level.

Some of the main considerations regarding green bonds are:

- The need for bonds to reach a critical size before they become attractive to investors. This usually requires the pooling of multiple projects;
- Bonds can usually serve as a source of cheap loan capital for municipalities and national governments in the long term.
- Issuers must be creditworthy.

Green bonds — analysis of the instrument	
Suitable for:	Public buildings — owned by the central and local government and, to a lesser extent, for privately-owned public buildings.
Strengths:	Green bonds enable large amounts of loan capital to be raised and invested in energy efficiency measures and spread the credit risk among multiple investors. The bond issuer (usually also the owner of the assets to be renovated) is in a better position to negotiate favourable financial terms. Financing is linked to meeting certain technical criteria and targets for energy savings and emission reductions.
Weaknesses:	Inapplicable to single or smaller project packages. Green bonds require a minimum amount of capital to be raised to justify the administrative costs associated with their issuance and sale and the monitoring and reporting on green performance. They are included in the cumulative amount of municipal debt under the Municipal Debt Act and lower the creditworthiness of the issuer.
Market potential:	Moderate. In addition to the central government, larger and more affluent municipalities in Bulgaria may also use green bonds to raise funds for energy efficiency investments. Medium and small municipalities would not attract investment interest.
Degree of market readiness:	High. There are practically no obstacles to introducing such an instrument on the market. It could be traded on the regulated market (Bulgarian Stock Exchange) or privately offered to investors.
Necessary legal/regulatory changes or support through technical assistance	In order to encourage municipalities to make more frequent use of green bonds to raise funds for building stock renovation, it would be advisable to adopt more detailed provisions governing municipal debt ceilings (similar to the provisions relating to ESCO contracts). Specific financial and technical know-how will be needed to assist municipalities in preparing prospectuses for green bond placement and setting qualitative and quantitative targets for energy savings and emission reductions. Free technical assistance could be provided under EU programmes or by international financial institutions (such as those mentioned in section 2 above).

- **Energy efficient ('green') mortgages**

An energy efficient mortgage (EEM) is similar to a regular mortgage, the main difference being that the applicant receives a higher loan amount or more lenient financial terms (e.g. lower loan interest and fees), if they implement energy efficiency measures. This approach offers incentives to incorporate energy efficiency improvements to buildings where these were not originally planned. Incentives include favourable financing terms or a higher loan amount.

Some of the important aspects of EEM are explained below.

- The underlying idea of EEM is that energy efficiency improvements should have a positive impact on a borrower's disposable income, enhance their ability to service their loan, increase the value of the property and ultimately lower the risk for banks. For example, a study conducted the USA has shown that a borrower is up to 32 % less likely to default on a green mortgage than other borrowers. Similar analyses conducted in the UK, the Netherlands and Italy confirm these findings.
- Another important aspect of EEMs is that banking market supervisors, notably the Basel Committee[23], the European Banking Federation and the European Commission, have recently started to recognise that green mortgages have a lower risk profile and can be subject to lighter capital requirements, so supervisors are now ready to re-examine banking regulations.

There is also great potential for linking the EEI to the Building Renovation Passport (BRP) for residential single-family homes[24]. The BRP, supplemented by a log of the improvements undertaken, would document the energy efficiency history of a building, serving as a log of the improvements made over time. It will also include recommendations and advice for future rational energy efficiency improvements that ensure the maximum potential for the property can be reached in a cost-effective manner. The passport would thus enable the compilation of data on energy efficiency improvements that can be used by financial, property valuation and construction sectors, providing a particularly valuable input for the purpose of mortgage pricing, and bond and debt securitisation. The BRP will also help real estate valuators to recognise the 'green value' of energy upgrades by granting them access to validated information documenting the interventions performed on the property and the energy efficiency improvements achieved.

[23] The Basel Committee recommended an indicative amount of capital that banks should hold against risk. These standards have a direct bearing on interest rates and have been incorporated into the body of EU law in the form of capital requirement directives.

[24] The European Commission is currently conducting a feasibility study on the Building Renovation Passport as required by Article 19a of the EPBD.

Energy efficient ('green') mortgages — analysis of the instrument	
Suitable for:	Residential buildings Primarily in the subcategory of single-family residential buildings. For multi-family buildings, the application of EE measures at the individual site level is inapplicable.
Strengths:	Mortgages represent one-third of the assets of the European banking sector and are the best-known form of real estate consumer financing. Energy efficient mortgages are thus a powerful economic incentive to tackle the risks posed by poorly performing buildings.
Weaknesses:	If a link to BRS fails to be established, banks will need to acquire specific property valuation know-how to understand the level of energy savings and how these translate into lower credit risk. Another important point in this regard may be the adequate reporting [of risk levels] to the national banking regulator.
Market potential:	Modest. The high share of owner-occupied properties in Bulgaria and the limited application of this instrument in multi-family residential buildings precludes the achievement of a significant market effect.
Degree of market readiness:	High. There are practically no obstacles to introducing such an instrument on the market. However, in order to make it more attractive to banks and borrowers banking regulations need to be amended.
Necessary amendments to applicable legislation/regulations	For banks to be able to offer their customers less stringent financial terms under energy efficient mortgages, banking regulations should be amended to lower capital requirements for this type of asset class. Financial institutions will thus have an incentive to offer green mortgages while demand from buyers will concurrently increase due to the lower cost of credit.

- **Special credit lines and**

International Financial Institutions (IFIs) such as the EBRD, EIB, etc. can enable local banks to finance energy efficiency loans through dedicated credit lines[25]. Each credit line is specifically designed to provide loans to residential or commercial borrowers in order to enable them to pursue investment opportunities in energy efficiency and/or renewable energy. Local banks [will] use the credit line to extend commercial loans for energy efficiency and/or renewable energy at their own risk to borrowers wishing to pursue eligible investment opportunities. This type of specialist credit lines often comprises a partial grant component, which reduces the investment and financial costs for the end customer. To qualify for financing, applicant

[25] Credit lines are a type of revolving loan.

projects must meet certain technical criteria and achieve certain minimum levels of energy savings (typically at least 20 % reduction in energy consumption after project completion).

Specialist credit lines — analysis of the instrument	
Suitable for:	All types of buildings — residential, commercial, public. The instrument is suitable for both privately-owned and municipal buildings.
Strengths:	Enables local banks to offer financing for energy efficiency upgrades. Can be combined with other instruments — grants, guarantees and technical assistance. Ability to achieve a strong market impact and reach multiple building owners through the extensive branch networks of local banks.
Weaknesses:	Commercial lending rates may not be attractive to potential borrowers. Commercial banks prefer to finance only customers with proven high creditworthiness, meaning that the owners of apartments in the same building may not have equal access to financing under this facility.
Market potential:	High. Particularly when combined with a subsidy (grant component), this type of credit is an effective instrument for financing energy efficiency measures. Partnerships with several large commercial banks provide access to owners of buildings throughout the country.
Degree of market readiness:	High. Such credit lines are very popular in Bulgaria and have been repeatedly used with great success. The Home Energy Efficiency Credit Line (REECL), which combines a repayable loan and a grant component, is a case in point. Similar instruments have also been structured for the public sector over the years in cooperation between IFIs such as the EIB and EBRD and local commercial banks.
Amendments to applicable legislation/regulations are necessary.	There is no need for amendments to applicable legislation or regulations. Assistance is needed from public authorities to structure the grant component (e.g. through the Kozloduy International Fund, operational programmes financed by EU funds, etc.).

- **National/Municipal Guarantee Fund and specialist credit risk sharing schemes**

By using different sources of revenue, the central government and local authorities can set up guarantee funds to support loan schemes of private lending institutions in order to facilitate access for citizens with poor capacity to take on debt. Such specialist institutions are well known in Bulgaria and include the National Guarantee Fund and the Municipal Guarantee Fund of the Metropolitan Municipality of Sofia, among others. For the purposes of this

instrument, the institutions providing the guarantees (at national or local level) are liable in case of non-payment by the end users, meaning that the presumed solvency of the relevant government/municipal institution may act as an incentive for banks to provide loans on better terms to a wider range of owners of buildings or residential/non-residential units situated on their premises. Such a guarantee scheme is currently available in Bulgaria from the Fund of Funds (FoF), which offers a risk-sharing mechanism for energy efficiency loans to several Bulgarian banks.

Guarantee funds and credit risk sharing mechanisms — analysis of the instrument	
Suitable for:	All types of buildings — residential, commercial, public. The instrument is suitable for both privately-owned and municipal buildings.
Strengths:	Enables local banks to more actively finance energy efficiency projects in buildings. Has a strong multiplier effect as a limited amount of public funds attracts significant private funding.
Weaknesses:	Requires specific administration of guarantee funds. Fortunately, several institutions in Bulgaria have extensive experience in such risk sharing schemes.
Market potential:	Moderate to high. A lack of sufficient collateral is often cited as a major obstacle to financing energy efficiency. This type of instrument overcomes this weakness and enables the financing of a large number of projects through cooperation with commercial banks.
Degree of market readiness:	High. The National Guarantee Fund, the Capital Guarantee Fund, the Energy Efficiency and Renewable Energy Fund and the Bulgarian Fund of Funds have experience with the implementation of similar instruments.
Necessary amendments to applicable legislation/regulations	There is no need for amendments to applicable legislation or regulations. Technical assistance is necessary to define the technical requirements for eligible projects and structure the relevant loan products.

- **On-bill financing mechanism**

Description

On-bill financing is a mechanism where a utility company provides capital to finance the cost of energy efficiency or renewable energy investments in a building. The investments are then paid back by the building owner through their monthly utility bill. There are several forms of financing through utility bills (or local taxes) that are well established in the USA and are currently being piloted across the EU.

Funding is provided to local utility companies, which in turn will use the capital to lend funds to end users. The end user will then use the monthly cost savings from their lower energy bills to pay off the loan in monthly instalments through their electricity/heating bill.

Credit risk

An important aspect of on-bill financing is the allocation of credit risk among project participants, including the following:

- The creditworthiness of potential customers is usually based on their recent history of payment of utility bills, which allows them to avoid the much stricter loan approval conditions of banks.
- In the event of a default on the loan, the utility company is generally entitled to discontinue the supply of the respective service. This is a potential solution to the problem of lack of adequate collateral in the case of commercial loans.

Building typology

As a starting point, we propose that utility companies should consider on-bill financing for energy investments in residential buildings, including single-family and multi-family buildings.

On-bill financing — analysis of the instrument	
Suitable for:	Residential buildings
Strengths:	On-bill financing enables individuals to avoid upfront investment costs, which are one of the most common barriers to energy renovations. Simplified procedure for the submission and approval of application for funding. Loans are repaid from the lower utility costs (electricity, heat, water, gas, etc.).
Weaknesses:	reliance on the active participation of energy companies. Allocation of funding to individual measures instead of a comprehensive and integrated energy renovation project. Existing legal obstacles in Bulgaria — utility companies cannot include loan repayment instalments in their invoices and make their payment a condition for continued service delivery.
Market potential:	Moderate. Instruments of this type tend to target individual independent energy efficiency measures, such as installation of more efficient air conditioning systems, DHW systems, etc.
Degree of market readiness:	Low. The current legal framework in Bulgaria does not allow for the implementation of this instrument.
Necessary amendments to applicable legislation/regulations	Legislative changes are necessary to allow utility companies to include the repayment of the energy efficiency loans in the customers' bills and to tie non-payment of the loan to the discontinuation of service delivery.

- **Energy savings performance contracts (ESPC) / ESCO / Super ESCO**

Energy service companies (ESCOs) implement and often finance energy saving measures and/or renewable energy projects by offering energy savings performance contracts (ESPCs). A variety of organisations can qualify as energy service companies, including utility companies, equipment installers, energy suppliers, construction or engineering companies, etc. Some of the main characteristics of ESPCs are set out below.

- ESPCs are based on the payback of investments made from the energy savings achieved. For some types of energy efficiency measures, the payback periods may be too long.
- In the case of ESPCs, an optimal allocation of technical, operational and financial risk is achieved between the parties best equipped to manage these risks.
- Reliance on a multidisciplinary team of experts is a key element of success.

- Typically, ESPCs are intended for projects with limited investment potential. The small scale of the investment and the accompanying technical risks make large investors reluctant to finance ESPCs.

The development of a robust market for ESCO services can boost energy efficiency as ESCOs have the technical know-how to implement energy saving projects and grow the market.

In terms of market revenue, the EU ESCO market is worth approximately USD 3 bln. and has seen moderate growth in the last 15 years. In Bulgaria, the sector is relatively well developed in terms of available technical know-how and professional experience gained over the years. Unfortunately, investment volumes are relatively small, making the ESCO market unattractive for financial institutions. There are also certain legal and regulatory obstacles that hinder a wider deployment of market organised around ESPC in Bulgaria. The main obstacles to the development of the ESCO market are as follows:

- There is currently no legal possibility to conduct an energy efficiency audit for the purpose of projects to be implemented by the ESCO company that will assume the technical and financial risk associated with project implementation.
- Lack of possibility for owner contributions. According to the rather narrow definition set out in the Energy Efficiency Act, the implementation of ESPCs can only be funded by the ESCO or a third-party financier. However, the third parties concerned do not include the owners of buildings, which limits the application of one of the two most common ESPC models (the so-called guaranteed savings contract)
- Objective obstacles exist to the repayment in the first year of the investment made by an ESCO company in the implementation of public sector projects on account of the requirement for a twelve-month period to elapse during which the savings achieved are to be established and verified.
- Difficulties in the assignment of claims of ESCO companies due to the narrow definition used in the ZEE and the settled case-law of national courts, which do not to recognise future claims under ESPCs as valid and assignable. ESCOs are thus deprived of a source of fresh funds that can be used to expand their activities.
- There is no possibility for off-balance treatment of ESPCs, meaning that they are essentially treated as any other type of credit agreement and the element of guaranteed savings is not recognised as a source of loan repayment.
- The existing financial mechanisms for the purchase and securitisation of receivables under ESPCs are insufficient, which limits the possibilities to raise working capital in the sector.

Super ESCO: One of the ways for the government to stimulate the ESPC market is to create the so-called Super ESCO. This is typically a partly or wholly State-owned and funded institution that acts as a transaction aggregator and a source of financing. The ability of a Super ESCO to aggregate a large number of projects and contract ESCOs to implement these addresses two major drawbacks of the industry — a significant volume of contracts becoming available on the market at the same time (attracting investors), on the one hand, and funding becoming available to local ESCOs, enabling the implementation of a greater number of contracts with appropriate arrangements for strict monitoring of ESM implementation and the achievement of the requisite energy savings, on the other.

Specialist funds for the purchase of claims under ESPCs: The development of a more viable market for ESCO services in Bulgaria requires a secondary market for long-term claims under energy savings performance contracts. This will enable ESCOs to sell their long-term receivables under ESPCs and raise the working capital they need for the implementation of subsequent projects. The Energy Efficiency and Renewables Fund currently acts as a financial mechanism offering this service through debt assignment but its limited financial and administrative capacity precludes it from acting as a catalyst for significant growth in the ESCO market. The recapitalisation of the FEEVI with EU funds and/or debt instruments would increase the level of investment in the sector.

The creation of favourable conditions by enabling private funds to purchase claims under ESPCs is another necessary factor for the development of the ESCO market in Bulgaria. Such private funds operate successfully in other countries in Central and Eastern European countries (such as LaBEEF in Latvia), attracting large amounts of private capital to the segments of both residential and public owned buildings of the renovation market. The legal and regulatory changes necessary in order to attract private investment funds are described in the table below.

Energy savings performance contracts — analysis of the instrument	
Suitable for:	All types of buildings — residential, commercial, public. The instrument is suitable for both privately-owned and municipal buildings.
Strengths:	Optimal allocation of technical, operational and financial risk between the parties best equipped to manage the relevant risk. Payment depends on the savings achieved, providing an additional guarantee for quality. Owners do not invest money upfront but pay back the investment from the energy savings achieved, which makes the instrument highly attractive.
Weaknesses:	Relatively small size of the contract, making the option unattractive to financial investors (aggregation is necessary).

	A number of legal and financial obstacles exist in Bulgaria as described above. Excessively long payback period for contracts aiming to upgrade buildings to the standard of near-zero energy buildings. A combination with grants/subsidies is needed to optimise the financial viability of this type of instruments.
Market potential:	Moderate. The current ESPC market is focused almost exclusively on the segment of publicly owned buildings.
Degree of market readiness:	High. The instrument remains a popular option for the implementation of renovation projects.
Necessary amendments to applicable legislation/regulations	In order to create better market conditions, a number of legislative and regulatory changes should be made, such as: allowing ESCO companies to perform energy audits of buildings; allowing the owners of buildings to finance the implementation of the ESPCs with their own funds against guarantees provided by ESCO companies; removal of obstacles to the assignment of future claims under the ESPCs; establishing a regulatory framework for the operation of ESCOs (a framework of technical and professional requirements and creating an obligation for an industry organisation to keep a register and certify professional energy service companies); creation a new or expanding existing mechanisms for ESPC/ESCO financing through the possibility for debt buybacks.

- **extending soft loans via revolving funds and revolving financial instruments (incl. the Energy Efficiency and Renewable Sources Fund)**

Local authorities or the central government can set up revolving funds to provide soft loans for building renovation to end users. Soft loans (typically having low- or zero-interest rates, lower requirements for collateral, longer loan repayment terms, etc.) are one of the most common forms of financial assistance available for energy efficiency projects, and are a well-established and popular form of financing. They are similar to the loans granted under specialist credit lines. The difference is that, under the soft loans instrument, loans repayments are 'recycled' to finance other energy efficiency projects. The funds set up for this purpose can provide concessional loans for the implementation of various eligible energy efficiency projects, such as technological improvements to heating/cooling/lighting systems, renovation of building stock, installation of renewable energy systems for electricity auto-production, etc.

A similar financial mechanism — the Energy Efficiency and Renewable Sources Fund (FEEVI) — has been operating successfully in Bulgaria for more than 15 years. The Fund has financed

more than 200 energy efficiency projects in both privately and publicly owned buildings and has established itself as a sustainable dedicated financial instrument structured on the basis of a revolving mechanism and providing financing to ESCOs and end users. Although it operates with a small working capital, it has financed a large number of projects. Increasing the capital of the FEEVI will undoubtedly boost the market for specialist financial products for building renovation and energy efficiency.

Lessons learned and recommendations:

- These types of funds can complement the financial market and provide solutions for feasible projects or SMEs that commercial banks consider too risky or too small.
- The social return of a project should be valued as much as its financial return
- Central government bodies and/or local authorities could seek possibilities to co-finance the FEEVI from the ERDF, the EBRD, EIB and other international financial institutions

The disbursement of funds should, if possible, take place at regional level which can significantly increase the effectiveness of management and communication.

Revolving energy efficiency funds — analysis of the instrument	
Suitable for:	All types of buildings — residential, commercial, public. The instrument is suitable for both privately-owned and municipal buildings.
Strengths:	Soft loans enable the owners of buildings to borrow funds for the implementation of energy efficient renovation projects at lower interest rates. Repayments can be used to extend new loans.
Weaknesses:	A loan, even at a low interest rate, may not be sufficiently attractive on its own unless combined with grant assistance. Revolving funds of this type usually have a limited effect on the market. The administrative and management costs associated with a revolving fund can be relatively high compared to generated revenue.
Market potential:	Low to moderate.
Degree of market readiness:	High Bulgaria has one of the best examples of an energy efficiency revolving fund — the FEEVI.
Necessary amendments to applicable legislation/regulations	There is no need for amendments to applicable legislation or regulations. Assistance from public authorities is necessary to supplement the capitalisation of existing or the initial capitalisation of new revolving funds.

6.3 Establishing new financial mechanisms in Bulgaria with a view to enabling the implementation of the long-term strategy

6.3.1 National Decarbonisation Fund

Description

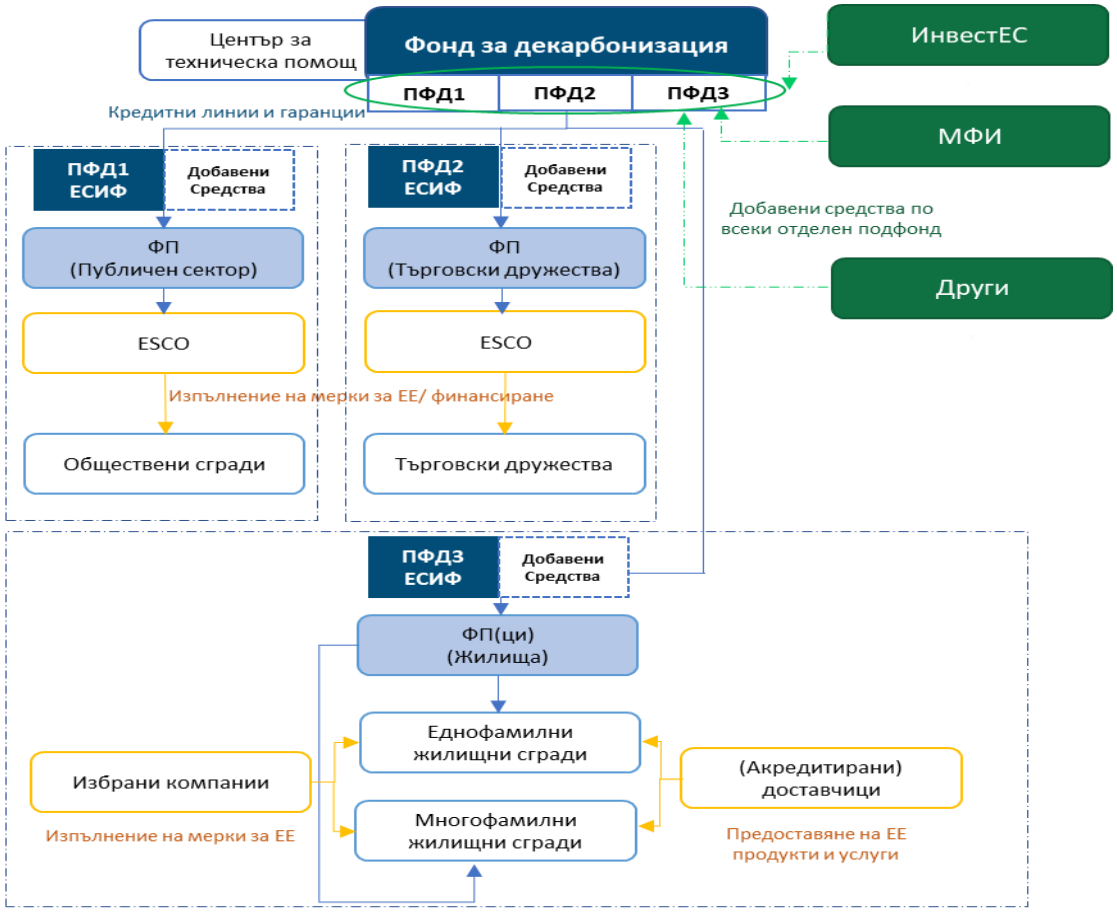
As the main financial scheme supporting Bulgaria's long-term renovation strategy, a single national Decarbonisation Fund (the Fund) will be established and financed by EU cohesion policy instruments and other sources. With a clearly identifiable and consolidated structure, the Fund will engage a wide range of stakeholders and successfully address the need for funding for a large group of beneficiaries to maximise the achievement of the objectives to be determined. The Fund will operate at national level and will be managed by an independent (fund) manager. It will comprise three sub-funds, depending on the final beneficiaries: (i) Public sector subfund (Subfund 1), (ii) Commercial undertakings subfund (Subfund 2) and (iii) Residential buildings subfund (Subfund 3) (jointly 'Subfunds'). This structure ensures the necessary flexibility in terms of future (legal and regulatory) requirements for certain recipients or a more detailed national segmentation to be decided in the future.

The necessary financial resources will be channelled to the Fund from the EU funds, and at the sub-fund level financing may be complemented by funding from various sources including: (i) the adopted budgets of central government institutions and local authorities, and other potential mechanisms adopted by the government; (ii) EU funds and programs, including the Just Transition Fund and InvestEU; and (iii) financing from international financial institutions to enhance leverage. It will be possible for the additional resources at the sub-fund level to be channelled to activities and costs that are not eligible under the rules for the disbursement of EU funds.

The Fund will offer grant assistance and financial instruments, including credit lines and guarantees and/or a combination thereof. Last but not least, it will provide a single point for technical assistance to applicants through a one-stop shop or a similar mechanism.

The participation of local banks/financial institutions in the financing scheme will be key to the success of the Fund as their participation in the capacity of financial intermediaries will not only contribute to leveraging co-financing but is also expected to greatly simplify the process of project financing. International financial institutions will also have an opportunity to actively participate as financial intermediaries. Last but not least, the intermediary could also be a utility company, participating via an on-bill mechanism. In this case, end users effectively borrow and pay back the loan through their electricity/heating bills.

In terms of targeted measures, the Fund will promote investment in renovation and energy efficiency packages through a more holistic approach leading to greater energy savings. At the same time, in order to achieve better results, the individual measures set out in the Long-term National Strategy that would be implemented on specific parts of buildings or their HVAC/energy systems will also be promoted. Adequate funding (i.e. solutions that are affordable and appropriate for the target groups) will be supported through a more ambitious set of policies. These are expected to prompt stronger interest in the owners and managers of buildings through a combination of incentives and obligations. A combination of strong policy and available financial resources is therefore essential.



Легенда:	**Caption:**
Център за техническа помощ	Technical Assistance Centre
Фонд за декарбонизация	Decarbonisation Fund
ПФД1	Subfund 1
ПФД2	Subfund 2
ПФД33	Subfund 3
Инвест ЕС	Invest EU
МФИ	IFI
Добавени средства по всеки отделен подфонд	Added funds under each subfund
Други	Other
Кредитни линии и гаранции	Credit lines and guarantees
ПДФ1 ЕСИФ	Subfund 1 ESIF
Добавени средства	Added funds
ПДФ1 ЕСИФ	Subfund 1 ESIF
Добавени средства	Added funds
ФП (Публичен сектор)	Financial intermediaries (public sector)
ФП (Търговски дружества	Financial intermediaries (Commercial undertakings)
Изпълнение на мерки за ЕЕ/Финансиране	Implementation of EE measures/Funding
Обществени сгради	Public buildings
Търговски дружества	Commercial undertakings
ЕСКО	ESCO
[Д]обавени средства	Additional funds
ФПци (жилища)	Financial intermediaries (housing units)
Избрани компании	Selected companies
Изпълнение на мерки за ЕЕ	Implementation of EE measures
Еднофамилни жилищни сгради	Single-family residential buildings
Многофамилни жилищни сгради	Multi-family residential buildings
Акредитирани доставчици	Accredited providers
Предоставяне на ЕЕ продукти и услуги	Provision of EE products and services

Ownership and management

The Fund will be financed by EU funds and managed by a national operator with experience in the management of financial instruments related to energy efficiency and infrastructure. Management will be delegated to a Fund Manager. For each of the Subfunds, the Fund Manager is expected to attract different investors capable of providing equity or debt financing. Significant support is expected to be provided by international financial institutions in exchange for them obtaining a shareholding interest in the subfunds (in addition to their investment in debt instruments). It should be clearly recognised that the management of each subfund will involve the Bulgarian government as a stakeholder and that it will have the same influence as the other shareholders in the relevant subfund.
Regarding the governance structure, the affairs of each Subfund will be managed by an independent board of directors elected by the shareholders. The Board will oversee the operation of Subfund and determine its overall approach whereas operational management will be outsourced to an independent investment manager.

a subfund managed in line with the above principles will benefit from the following:

- independent professional management to boost investment performance;
- attracting capital from international financial institutions;
- reliance on the know-how and experience of international financial institutions with similar financing mechanisms.

Sub-fund capitalisation

The Fund can be capitalised from the following sources (the list is non-exhaustive):

- EU funds and programmes, including the Just Transition Fund and InvestEU;
- national co-financing provided through the approved budgets of government institutions and local authorities;
- additional proceeds from the fulfilment of obligations under the Energy Act;
- green bonds or other debt instruments (issued by the Fund);
- International financial institutions;
- private equity;
- other.

Preparation and technical assistance

In addition to the governance structure explained above, the Fund should support the establishment of an independent technical assistance mechanism that provides assistance for, *inter alia*, market studies, advisory services to stakeholders, projects implementation, the provision of comprehensive information and monitoring of the results achieved by the Fund.

In addition to earmarking funds for a robust technical assistance programme, it will be possible for the instrument to be combined with technical assistance under the ELENA mechanism,

which provides grant assistance for project development services used to design eligible investment programmes, including energy efficiency and renewable energy. The budget of these programmes typically exceeds EUR 30 mln. and ELENA grants can cover up to 90 % of the total eligible costs.

Fund capital utilisation

Subfunds1 and 2 will rely on a mechanism involving ESCO intermediaries. The separation into two subfunds is justified by the different objectives and regulations governing public sector enterprises and commercial undertakings. The mechanism will ensure the necessary flexibility and provide opportunities to leverage available financing. The financial instruments to be made available to the financial intermediaries may include credit lines and guarantees and/or combinations thereof and will seek to channel financing to ESCO intermediaries for the implementation of the renovation and energy efficiency measures.

One of the main arguments for the adoption of the proposed approach for Subfund 1 is the need to overcome existing legal and regulatory constraints. To this end, the following additional options may be considered:

- Where financing cannot be repaid in full from the savings achieved, support can be provided in the form of a guarantee, grant assistance or a soft loan.
- The government may choose to establish a national ESCO.
- The Fund may contribute capital to ESCOs.

For Subfund 3, two mechanisms and two financial instruments are proposed to ensure the implementation of the separate strategies for:
(a) major renovation, and
(b) partial renovation.
The Facility will finance both major and additional, partial renovation of all residential buildings that have not undergone major renovation or have implemented adequate partial energy efficiency measures without assistance (e.g. in energy class C and D buildings).
Both financial instruments will again be structured in the form of credit lines and guarantees and/or a combination thereof as an incentive for the private sector to finance energy efficiency projects. Joint support through financial instruments and grants with different intensity ceilings for different final beneficiaries will be available, with the applicable criteria and mechanism to be defined in the process of structuring the respective financial instrument.

Last but not least, the Fund will adapt existing financial instruments or structure additional instruments, as necessary. Bulgaria's National Decarbonisation Fund will address the barriers to increasing energy efficiency as these emerge by providing effective financial support to the target groups of final beneficiaries for the entire implementation period of the Long-Term National Strategy thereby contributing to the achievement of its objectives.

7. MONITORING AND UPDATES

The national strategy has a long-term horizon and the necessary flexibility to respond to the advances in technological development and the requirements for energy efficiency measures.

The dynamically evolving EU policy on energy efficiency requires decisions to be made on the further development of the renovation of the national housing stock.

In connection with this, the Ministry of Energy, together with the Ministry of Regional Development and Public Works and the Agency for Sustainable Energy Development, will monitor and evaluate the progress achieved in the implementation of the Long-Term National Strategy and publish biennial reports, which will form part of the progress reports under the Integrated National Climate and Energy Plan, including analyses of the implementation of the set objectives and priorities and, where necessary, make proposals on adapting and updating the Long-Term National Strategy.

[i] Bulgaria Housing Sector Assessment, Final Report, June 2017

My proposal is as follows: .....Ivaylo Aleksiev,Executive Director of AUER and Chair of the Working Group established by Order No R-140 of 29.10.2019 issued by Tomislav Donchev, Deputy Prime Minister of Bulgaria

Agreed by: .....Zhecho Stankov, Deputy Minister

.....Nikolay Nalbantov, head of the Directorate for Energy Strategies and Policies for Sustainable Development of the Energy Sector

.....Aleksandrina Dimitrova, Head of Department Energy Efficiency and Renewable Sources of Energy

.....Valentina Ilieva, State Expert, Department Energy Efficiency and Renewable Sources of Energy