

National Energy Efficiency Action Plan

1 EXECUTIVE SUMMARY

Macedonia has signed the Treaty for establishing the Energy Community and as a result has undertaken a number of commitments, which refer to the harmonization of national legislation in the field of energy and environment with EU legislation. One of the commitment to EnC, as well as obligations of the Law on Energy Efficiency is to prepare a National Energy Efficiency Action Plan (NEEAP) which should report on the measures that have been implemented in the previous three years, but also to propose measures to reduce consumption in the period from the next three years. This is exactly the purpose of this document to review what has been realized in the period 2016-2018 and to propose measures for the period 2019-2022. Having in mind that the data collection process for the preparation of the Action plan started in 2019 and the development of the document continued in 2020, as well as the situation with Covid-19, this Action plan covers the period from 2016-2019, and measures for 2020, 2021 and 2022 are proposed. This Action plan is actually the fourth in a row.

The indicative target for 2018 is to reduce the final energy consumption in North Macedonia for at least 9% until 2018 relative to reference consumption¹, or the cumulative final energy savings to be 147.2 ktoe. Energy savings of the implemented energy efficiency measures must be calculated and verified. Energy savings in the Fourth NEEAP are calculated using two methodologies, Top-down and Bottom-up. The methodologies used follow the Rulebook for energy audit, as well as the methodology developed within the MultEE project.

The calculation of energy savings using the top-down methodology is done for four sectors, namely Households, Industry, Transport and Commercial and Service sector. According to the Rulebook on energy controls for each sector there are special indicators that help monitor energy savings. Depending on which indicators are used by sectors, different energy savings are obtained. If the "P" indicators are used for households and industry, and the "M" indicators are used for commercial and transport, it is obtained that the total energy savings in 2018 reached 255 ktoe, which is an increase of 51% compared to the savings achieved in 2015. Most of the savings are from the industry sector (37%), followed by the Households sector (34%) and the Commercial sector (29%). There are almost no savings in the Transport sector. If you look at the sub-sectors, the biggest savings are in the Iron and Steel sector (27%), in the household space heating sector (25%) and in the industry sector in non-electricity consumption (18%).

What is of particular importance is that the goal for 2018, which is given in the Third NEAP, is achieved, ie the savings are greater than the set goal by 70%. It is even more significant that in 2018 the energy savings that were planned for 2020 in the Third NEAP were realized.

On the other hand, if only the "M" indicators in all sectors are considered, the total energy savings in 2018 are 382 ktoe, of which almost 60% are from the industry sector. Compared to 2015, in 2018, energy savings increased by 162%. Detailed data on savings by all indicators are displayed in Appendix.

¹ The reference consumption is the average energy consumption in the period 2002 - 2006

Figure 1.1. Final energy savings by sectors and subsectors using detailed indicators

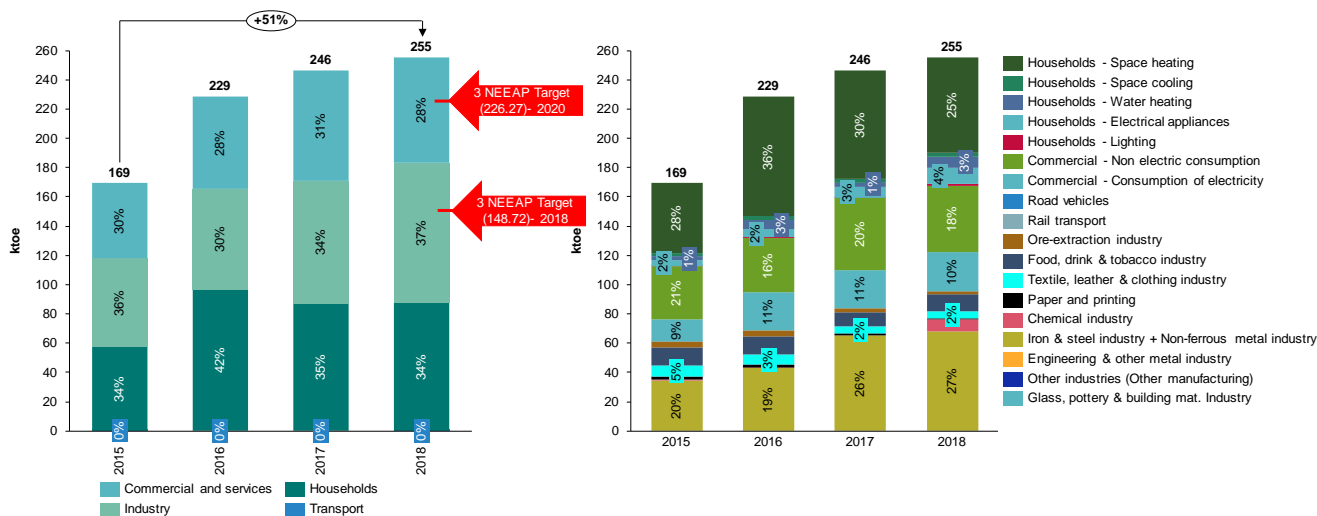
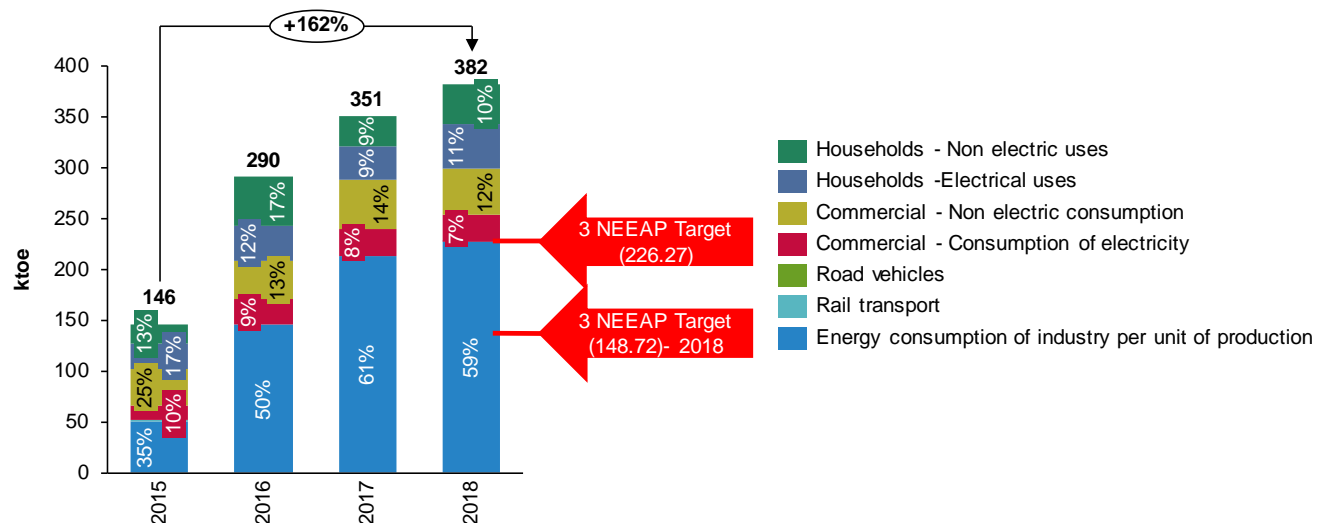


Figure 1.2. Final energy savings by subsectors using “M” indicators



On the other hand, a calculation is made of the savings using the bottom-up approach. A total of 41 measures were examined, of which 34 had detailed data and 7 partial data. The total cumulative savings of final energy in 2018 is 180 ktoe, which is about 20% above the target for 2018, which is set in the Third NEEAP. Only in the period 2016-2018, final energy savings of around 100 ktoe were achieved.

With the implementation of 18 measures larger energy savings were achieved than those planned in the Third NEEAP, while with 6 measures, smaller savings were achieved than planned. The Energy Strategy until 2040, as well as the Draft version of the National Energy and Climate Plan define measures that differ from the measures given in the Third NEEAP. Additionally, the calculation of savings for some measures was feasible only if they were previously grouped. For that purpose, a certain grouping of measures has been done according to the Third NEEAP. What is important and should be emphasized is that the implementation of most of the measures is aimed at fulfilling the Green Scenario of the Energy Strategy. Measures that achieve the greatest energy savings are increased use of heat pumps (inverter air conditioners), as well as renovation and construction of new buildings. Since the preparation of this Action Plan started in 2019, the energy savings achieved with the implementation of the measures in 2019 have also been calculated (88.6 ktoe).

These measures used to achieve final energy savings, also contributed to the reduction of primary energy consumption. However, in addition to these measures, there are measures whose implementation achieves savings only on primary energy (Table 6). With the implementation of all the measures, in the period 2016-2018 there are savings of about 100 ktoe final energy, and in the same period the primary energy savings are double (200 ktoe, detailed table by measures is given in Appendix II).

In this NEEAP 30 measures for 2020, 2021 and 2022 are proposed (Table 7). It is planned in 2020, 2021 and 2022 that the saving will reach 156 ktoe, 213 ktoe and 271 ktoe, respectively. It is important to note that these are cumulative savings.

Table 1. Measures used to achieve final energy savings in the period 2019-2021

Measure		Achieved annual energy savings (ktoe)				
		Final energy				Primary energy
		2019	2020	2021	2022	2022
1	EE obligation schemes			15.6	18.8	25.7
2	Public awareness campaigns and network of energy efficiency (EE) info centers	2.9	24.3	28.5	33.0	113.0
3	Solar rooftop power plants					20.6
4	Solar thermal collectors	0.9	1.5	2	2.5	8.6
5	Increased use of heat pumps	23.8	48	55	62.5	145.9
6	Labeling of electric appliances and equipment	0.7	4.6	5.8	7.8	27.0
7	Replacement of windows	0.4				
8	Retrofitting of existing buildings (res+comm)	0.6	21.3	25.1	28.5	38.9
9	Construction of new residential buildings	11.1				
10	Construction of new commercial buildings	4.3				
11	Retrofitting of existing central and local self-government buildings	0.3	0.8	1.6	2.5	5.7
12	Construction of new central and local self-government buildings	0.9				
13	EE certificates for buildings	0.8	0.4	0.8	1	1.5
14	Construction of passive buildings	0.0				
15	Phasing out of incandescent lights	16.2	20.7	26.2	31.4	107.5
16	Improvement of the street lighting in the municipalities	1.7	3.2	4	4.2	14.4
17	"Green procurements"	0.3	0.3	0.4	0.7	2.4
18	Energy management in manufacturing industries	1.5	0.9	2	3.3	5.9
19	Introduction of efficient electric motors	0.6	0.3	0.5	1	3.4
20	Introduction of more advanced technologies	5.4	6.7	8.4	23.3	41.4
21	Increased use of the railway	3.2	7.9	8.6	9.2	9.2
22	Renewing of the national car fleet	7.7	10.2	19.5	28.3	28.3
23	Renewing of other national road fleet (light duty and heavy goods vehicles and buses)	1.1	0.2	0.8	1.2	1.2
24	Advanced mobility	0.8	0.7	0.8	0.9	0.9
25	Construction of the railway to Republic of Bulgaria	0.0	0	0	0	0
26	Electrification of the transport	0.0	3.4	7.2	10.4	10.4
27	Increased use of more efficient biomass stoves	3.0				
28	Increased use of central heating systems	0.4	0.4	0.6	0.8	14.2
29	Incentives Feed-in tariff					49.3
30	Incentives Feed-in premium					21.5
31	RES without incentives					6.4
32	Reduction of network losses					32
33	Biomass power plants (CHP optional)					6.3
	Total savings	88.6	155.8	213.4	271.3	741.6

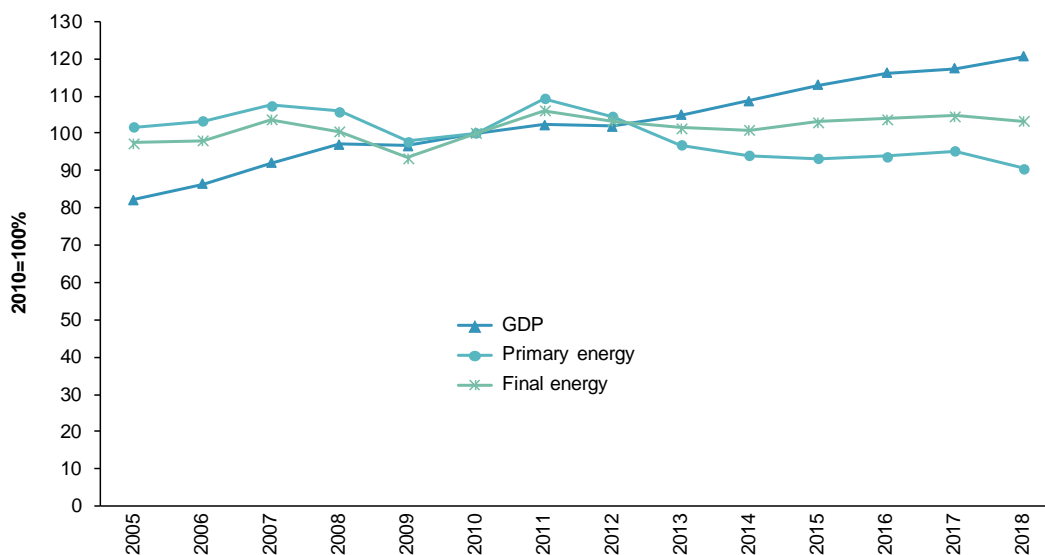
For the implementation of the fourth national energy efficiency plan, it is estimated that about 1300 mill. EUR should be spent. In 2020 it is necessary to allocate 200 mill. EUR, while for 2022 it is necessary to invest 736 mill. EUR. It is estimated that 35% of the total funds (457 million. EUR) will be provided by private companies, while about 13% will be provided by the central budget (171 million. EUR), most of which are for investments in the gas network. From the financial institutions and donors, EBRD is in the first place in providing funds, 90 mill. EUR (7%).

2 INTRODUCTION

Macedonia is a country poor in domestic energy resources, i.e. mostly biomass and coal are used. Of these two energy resources, biomass is mostly used for heating in households, while coal is used to generate electricity. On the other hand, the total amount of oil derivatives and natural gas are imported. The import dependence is increasing from year to year as a result of the increasing energy consumption in the transport sector, but also as a result of the reduction of the quality of coal, which in turn is reflected in the reduction of electricity production. Additionally, the production of electricity from coal contributes to higher greenhouse gas emissions, while the use of biomass primarily for households heating reduces the quality of ambient air. All this makes the energy sector in Macedonia quite complicated and it is necessary to find an appropriate solution that will enable mitigation of climate change, increase ambient air quality and reduce import dependence. In order to realize this, it is necessary to pay special attention to additional energy resources. One such “resource” is the energy efficiency, which is the cleanest, cheapest and safest, while other resources to which special attention should be paid are renewable energy sources primarily for the production of electricity and sanitary hot water.

In 2019, the EU adopted the Clean energy package which introduces the principle of energy efficiency first. This principle further emphasizes the role of energy efficiency at EU level, and it is applied in the Energy Strategy of Macedonia until 2040 as well as in the National Energy and Climate Plan. With the realization of this approach, additional savings in terms of costs can be realized. For example, if a household is first insulated and then a suitable heating technology is bought, significant reduction in the cost of the heating technology can be achieved. On the other hand, if first a heating technology is bought, it must have a higher installed capacity to heat the uninsulated home, and if after a while the home is insulated, it turns out that more money is spent on the heating technology because more installed capacity is installed than it is needed which means that more funds were unnecessarily spent.

In general, what is happening at the level of the European Union is reflected in Macedonia. If the period from 2005 to 2018 is analyzed, it can be noticed that there is a trend of decoupling of GDP and primary and final energy consumption. After 2012, it can be seen that GDP is growing while final energy consumption is almost at the same level, and primary energy consumption is declining. This is a result of the implementation of energy efficiency measures, but also of certain changes in the industry sector where in the period after 2012 energy-intensive companies have reduced (or some completely stopped) production in order to meet environmental standards required to obtain an A integrated permit. All industrial capacities after 2018 continued to operate, while “Jugohrom” completely stopped production.



2.1 Purpose

Macedonia has signed the Treaty for establishing the Energy Community and as a result has undertaken a number of commitments, which refer to the harmonization of national legislation in the field of energy and environment with EU legislation. With the adoption of the Law on Energy, the third energy package was transposed, as well as part of the Renewable Energy Directive. Additionally, the adoption of the Law on Energy

Efficiency transposed Directive 2012/27 / EU on energy efficiency and Directive 2010/31 / EC on the energy performance of buildings. The main task of these two directives, i.e. the Law on Energy Efficiency is to establish a framework in order to promote energy efficiency, and thus to reduce the consumption of final and primary energy.

One of the obligations of the Law on Energy Efficiency is to prepare a National Energy Efficiency Action Plan (NEEAP) which should report on the measures that have been implemented in the previous three years, but also to propose measures to reduce consumption in the period from the next three years. This is exactly the purpose of this document to review what has been realized in the period 2016-2018 and to propose measures for the period 2019-2022. This Action plan is actually the fourth in a row. Although there is a new Law on Energy Efficiency, still in the old Energy Law in which the old Energy Efficiency Directive from 2006 was transposed, there was an obligation to prepare a NEEAP. The last NEEAP was adopted in 2017 and it informed about the measures that were implemented in the period until 2015, and there was a plan for the implementation of the measures in the period 2016-2018. One of the main goals of the Fourth NEEAP is to check whether the measures envisaged under the Third NEEAP have been implemented.

2.2 Methodology

Energy savings of the implemented energy efficiency measures must be calculated and verified. Energy savings in the Fourth NEEAP are calculated using two methodologies, Top-down and Bottom-up. The methodologies used follow the Rulebook for energy audit, as well as the methodology developed within the MultEE project.

Before calculating energy savings according to any methodology, it is necessary to collect relevant data. In general, data from the reports and the online database of the State Statistical Office were used to calculate the savings according to the Top-down methodology. On the other hand, the bottom-up methodology requires knowing the specific measures that have been implemented and calculating energy savings for each of them. For that purpose, the Ministry of Economy submitted questionnaires to a number of stakeholders starting from the City of Skopje and the municipalities, Ministries, energy companies, as well as banks that have credit lines for energy efficiency. Data from about 60 entities were collected. A general remark is that it is necessary to improve the data collection system as well as trainings for the persons in charge of data entry. The Law on Energy Efficiency envisages the introduction of a data entry tool that will verify energy savings for each measure. The data provided by these 60 entities were not sufficient to calculate the savings using the bottom-up methodology. Additionally, data from the State Statistical Office, the Energy and Water Services Regulatory Commission, as well as the websites of the municipalities and other entities were also used.

3 ENERGY CONSUMPTION AND INTENSITY

3.1 Macroeconomic content

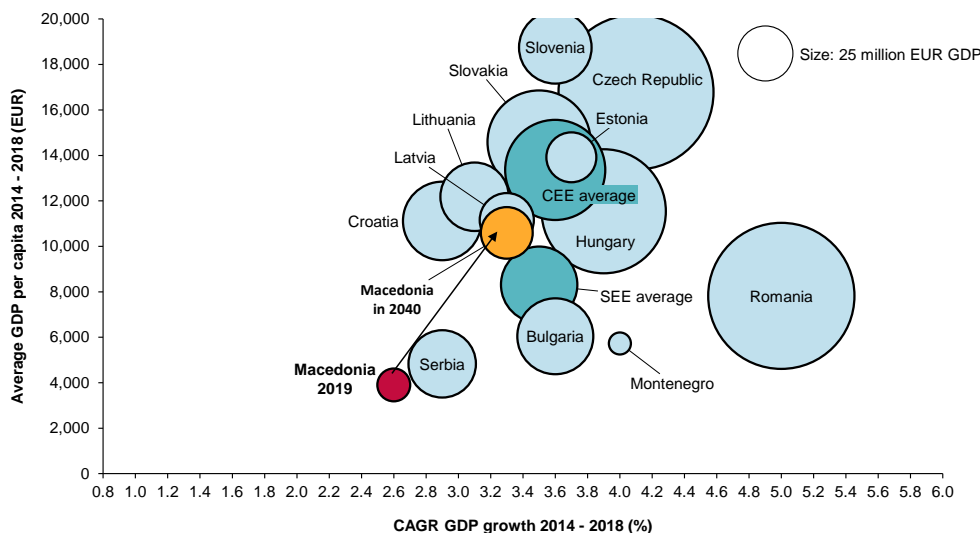
3.1.1 Introduction

North Macedonia as Energy Community Contracting Party and EU candidate country is willing to follow the European energy policy and is obliged to transpose and implement the EU energy directives and regulations. North Macedonia was granted the candidate status for entering the European Union in 2005. Since 2009, the Commission has recommended to the Council to open accession negotiations with North Macedonia. Furthermore in 2018, the Commission has also recommended that the accession negotiation will be opened with North Macedonia in 2019.

3.1.2 Gross domestic product and unemployment

GDP growth till 2040 is projected to position North Macedonia closer to today's CEE region economies. GDP, as the most important measure of a country's economic activity, shows that today North Macedonia lags behind the SEE average, as well as the CEE region. Taking into account the projections of International Monetary Fund and Ministry of Finance, it is projected that until 2040 the Macedonian real GDP growth rate will grow at an average rate of 3.3%. Such GDP growth rate could be expected for a developing country, and should lead to convergence towards levels of GDP per capita that are common for developed CEE countries today (Figure 3.1).

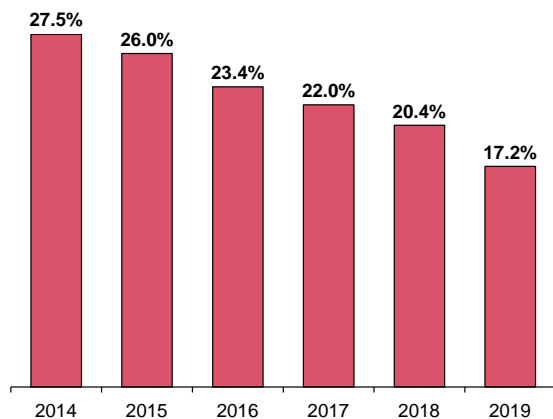
Figure 3.1 CEE and SEE GDP trends



Note: SEE includes AL, BA, BG, HR, MK, RS, ME, SI and RO; CEE includes HU, LV, LT, CZ, EE and SK; GDP growth projections for North Macedonia take into consideration growth rates of 3.3% per annum.
Source: Eurostat, Government of North Macedonia GDP projections, Expert analysis

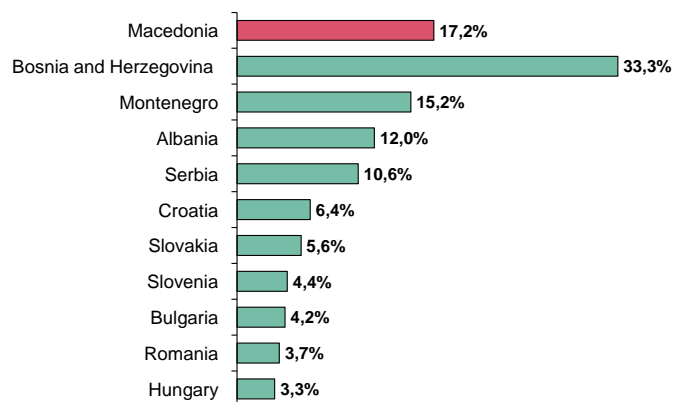
North Macedonia has the second highest unemployment rate in the region, but it is showing positive trend over the years (Figure 3.2 and Figure 3.3). In addition, employment is characterized with unfavourable gender structure, which has remained unchanged over a longer period due to unstable economic and social conditions, as well as imbalance between the available and required profiles on the labour market. The employment rate in women population in 2019 was 48.4% (315 thousand women), significantly lower than the man employment rate of 69.7% (467 thousand men), of the active population aged from 20 to 64 years.

Figure 3.2 Unemployment rate in North Macedonia, 2014 – 2019, %



Source: Eurostat, ec.europa.eu reports; Trading Economics; Expert analysis

Figure 3.3 Unemployment rate CEE and SEE, 2019, %



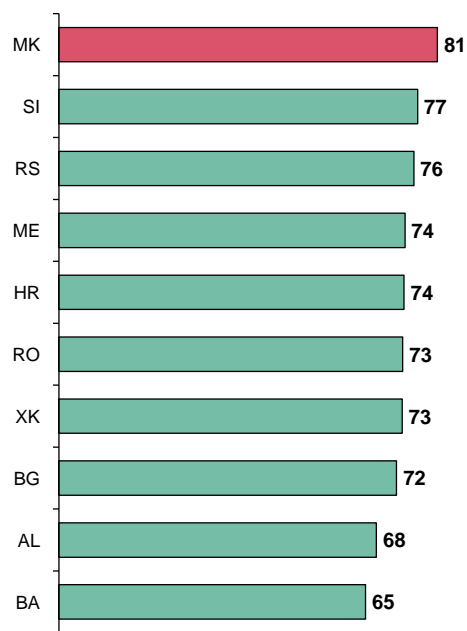
North Macedonia has a positive business environment to provide opportunities for small and medium enterprises in RES and energy efficiency. According to The World Bank Doing Business 2020 report, North Macedonia has the highest cumulative index for business environment compared to countries in the region, and in particular stands out in the fields of protecting minority investors and dealing with construction permits. Still, there is room for improvement in the other categories, especially in trading across borders as their ranking is lagging behind the countries in the region (Figure 3.4 and Figure 3.5). It is expected that future investments, including the investments in the energy sector (especially RES and energy efficiency), could have a positive impact on decreasing county’s unemployment rate as well as the economic growth.

Figure 3.4 Business environment per category, 2019

Category	Description	Global ranking (out of 190)
Starting a business	Procedures required from an entrepreneur to start a business (time and cost)	78
Dealing with construction permits	Procedures required to comply with building regulations (time and cost)	15
Getting Electricity	Time and cost to obtain electricity connection as well as supply reliability and tariff transparency	68
Registering property	Effective administration of land, necessary for formal property transfer	48
Getting loan	Considers the depth of loan information and strength of legal rights	25
Protecting minority investors	Protection from conflict of interest and shareholders rights in corp. govern.	12
Paying taxes	Considers tax rates and tax administration complexity	37
Trading across Borders	Time and cost associated with the logistical process of export and import	32
Enforcing contracts	Time and cost for resolving standardized commercial dispute through local first-instance court	47
Resolving Insolvency	Time, cost and outcome of insolvency proceedings involving local legal entities	30

Source: The World Bank – Doing Business 2020 report, Expert analysis

Figure 3.5 Business environment compared to countries in the region, 2019



3.1.3 Foreign direct investment

Energy sector can contribute to attract foreign direct investments. The process of globalization has increased the importance of foreign direct investments, especially for developing countries such as North Macedonia. Due to the limited internal financial and investment capacity the interest of all developing countries is to achieve a more favourable investment climate and better operating conditions. Additionally, entrance of new foreign companies can stimulate domestic companies to improve their business and consequently contribute in boosting overall market development. In the long run, such economic trends create positive

externalities. Foreign direct investments in North Macedonia amounted 225 million EUR per year or 107 EUR per capita which is substantially lower than the region (Figure 3.6 and Figure 3.7).

Figure 3.6 Foreign direct investments in North Macedonia, 2014 – 2019, mil. EUR

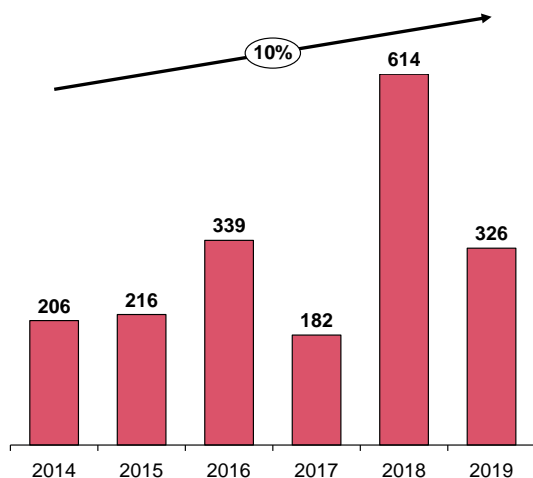
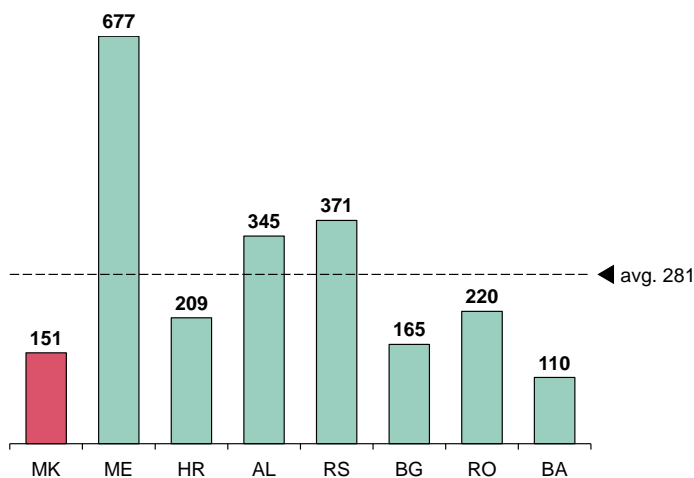


Figure 3.7 Foreign direct investments per capita – Region inflow, average 2014 – 2019, EUR



Note: Countries analysed for the region are BA, RO, BG, RS, AL, HR and ME
Source: United Nations – World Investment Report 2020, Eurostat, Expert analysis

3.2 Primary and final energy consumption

3.2.1 Past developments and progress against targets

In general, a decreasing trend can be noticed in the primary energy consumption while final energy consumption remained stable. In period 2010 – 2018, the primary energy consumption decreased for 9% mainly due to higher import of electricity and petroleum products, as well as implementation of energy efficiency measures and increased RES electricity production. The final energy consumption remained stable with few variations (a small increase of 3%) mainly due to fluctuation of industry consumption and increased consumption of fuels in transport sector (Figure 3.8 and Figure 3.9).

Figure 3.8 Primary energy consumption by fuel, 2010 – 2018*, Mtoe

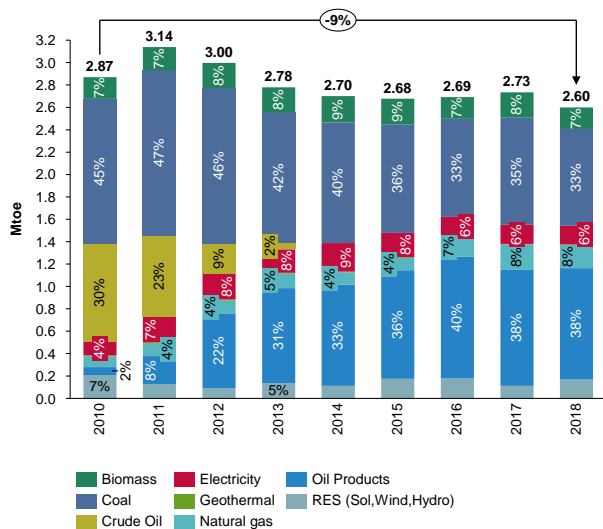
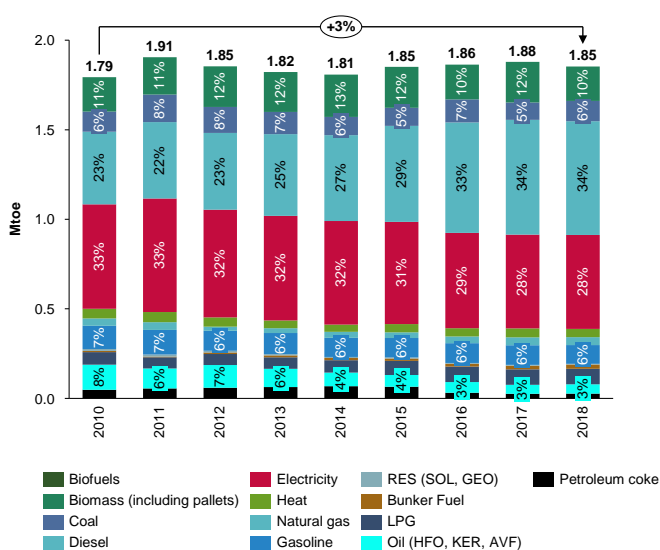


Figure 3.9 Final energy consumption by fuel, 2010 – 2018*, Mtoe



*Note: Preliminary data for 2018
Source: State Statistical Office, Energy Balances, 2010 – 2018 (MAKStat Database)

Considering the final energy consumption by sector, the increased consumption in the transport sector by 60% has reduced the share of the households and industry sectors for 30% (each) in 2010 to 26% and 22%,

respectively, in 2018 (Figure 2.10). The change in the transport consumption was caused by the recent policy in the country to allow importing of used vehicles, which resulted in higher diesel consumption (Figure 3.11).

Figure 3.10 Final energy consumption by sector, 2010 – 2018*, Mtoe

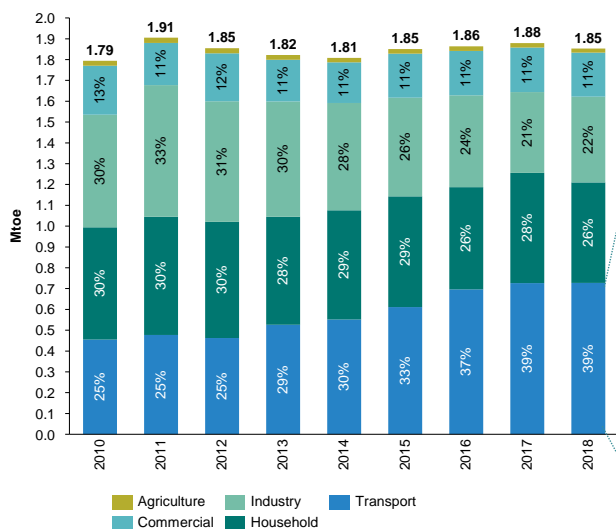
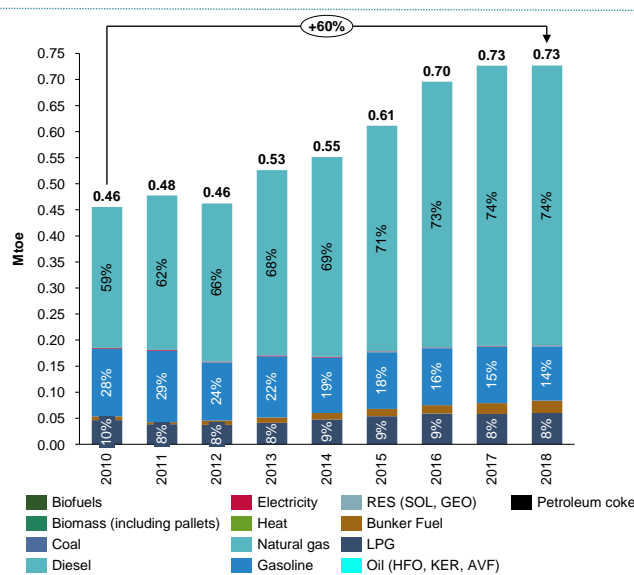


Figure 3.11 Final energy consumption by fuel in transport, 2010 – 2018*, Mtoe



Note: Preliminary data for 2018

Source: State Statistical Office, Energy Balances, 2010 – 2018 (MAKStat Database)

On the other hand, a decrease of 24% can be noticed in the energy consumption in the industry (Figure 3.12). This is mainly a result of the suspension of some factories' production until they realize the obligations under the recently established environmental policy for industrial installations. The households' consumption has remained relatively stable over the considered period (around 0.53 Mtoe), with a minor decrease of 10% in recent years, mostly due to the energy efficiency measures and in some years because of the weather conditions.

Figure 3.12 Final energy consumption by fuel in industry, 2010 – 2018*, Mtoe

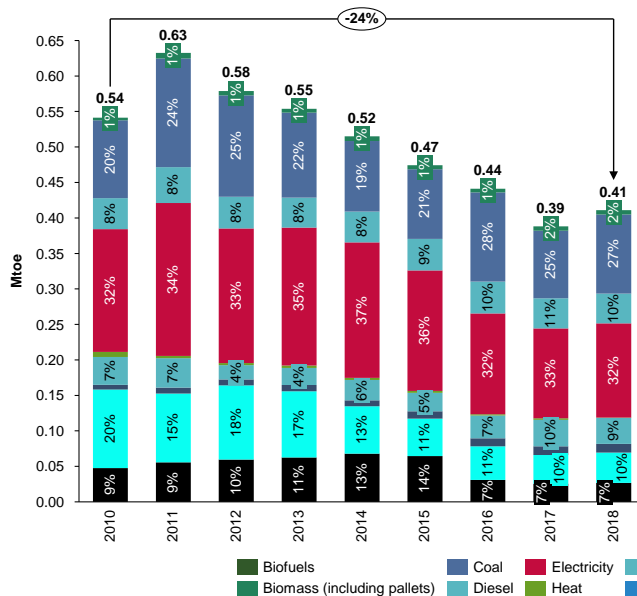
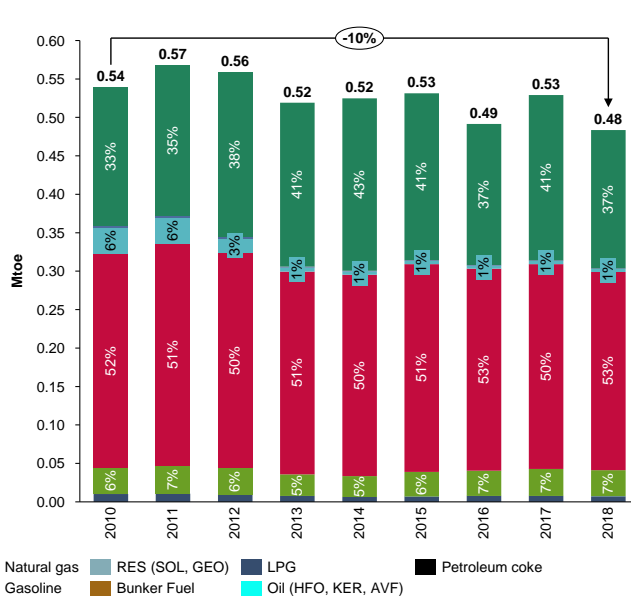


Figure 3.13 Final energy consumption by fuel in households, 2010 – 2018*, Mtoe



Note: Preliminary data for 2018

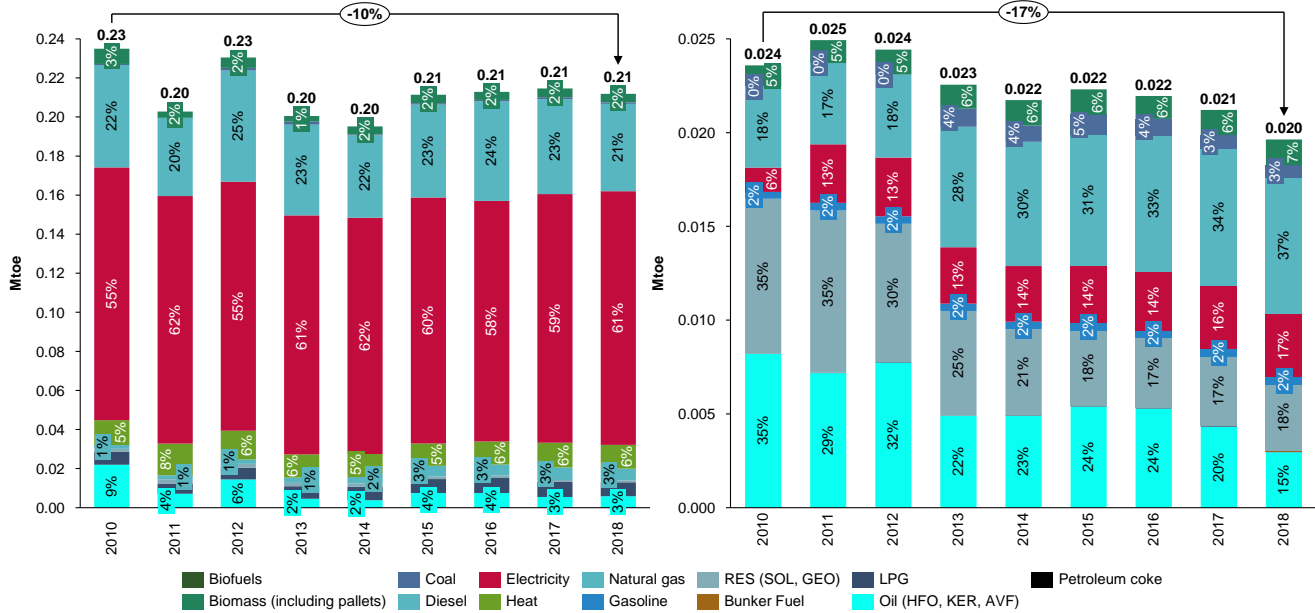
Source: State Statistical Office, Energy Balances, 2010 – 2018 (MAKStat Database)

Even though a slight variation can be noticed in the final energy consumption in the commercial and agriculture sectors, their share in the total final energy consumption remained stable, or 11% for the commercial sector and around 1 % for agriculture (Figure 3.10). Regarding fuel consumption, electricity is dominant in the commercial

sector, followed by diesel (Figure 3.14), while in the agriculture sector, the consumption of fuel oil and geothermal energy was gradually replaced with diesel and electricity.

Figure 3.14 Final energy consumption by fuel in other sectors, 2010 – 2018*, Mtoe

Figure 3.15 Final energy consumption by fuel in agriculture, 2010 – 2018*, Mtoe



Note: Preliminary data for 2018
 Source: State Statistical Office, Energy Balances, 2010 – 2018 (MAKStat Database)

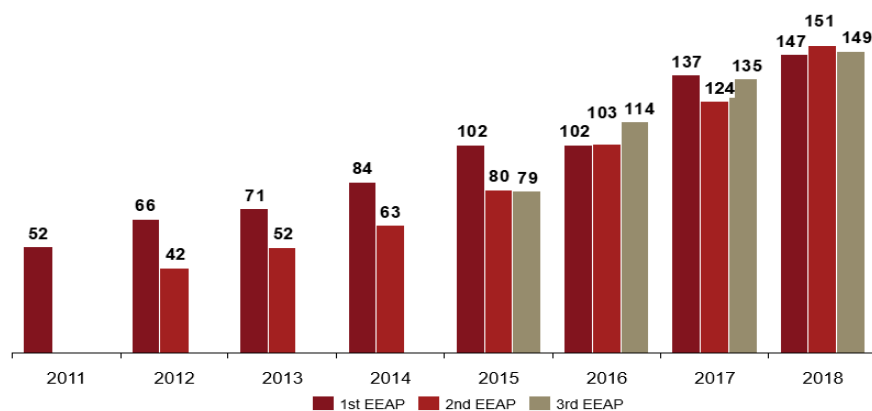
4 OVERVIEW OF NATIONAL ENERGY EFFICIENCY TARGET AND SAVINGS

4.1 National indicative energy efficiency target

The indicative target is to reduce the final energy consumption in North Macedonia for at least 9% until 2018 relative to reference consumption², or the cumulative final energy savings to be 147.2 ktoe. In the second NEEAP, a set of measures have been analysed resulting with projected cumulative final energy savings of 151.2 ktoe, which represent a reduction of 9.24% compared to the reference consumption. This implies achievement of higher savings than the indicative target. In the third NEEAP, besides the measures from the second NEEAP, two new measures are included altogether contributing to cumulative energy savings of 148.7 ktoe in 2018. This value represent 9.09% reduction compared to the reference consumption, which is slightly above the indicative target of 9%. In the third NEEAP it was assessed that achieved energy savings in 2015 amount to 79.4 ktoe, which represent 99% of the planned energy savings in 2015 (Figure 4.1).

For the first time the third NEEAP analyses the target for the primary energy consumption in 2020. The projections of primary energy consumption were made by taking the consumption in 2016 energy balance, as a base year, and assuming the annual growth rate of 2.2%. According to that, estimated primary energy consumption in North Macedonia will reach 3,014 ktoe in 2020. This means that the consumption of primary energy in North Macedonia will be within the targets set by the Energy Community (which is 3,270 ktoe for North Macedonia).

Figure 4.1 Indicative trajectories of final energy savings according to the 1st, 2nd and 3rd EEAP, ktoe



Source: 1st, 2nd and 3rd EEAP, Project team analysis

Most of the energy savings is projected to come from enhancements in transport and industry, contributing with 28.7% and 27.8% individually in 2018, but the estimates shows that the household and public sectors are also important for energy savings, with share of 19.6% and 10.4%, respectively.

The objectives set out in all previous NEEAPs were based on the methodology that was part of the old Energy Efficiency Directive (Directive 2006/32 / EC), where, as stated in the previous paragraph, a reference period was used in relation to which saving were calculated. The new Energy Efficiency Directive (Directive 2012/27/EU) stipulates that the target for 2020 should be expressed in relation to the projections for energy consumption, and the same applies to 2030. This further complicates the presentation of the target for 2020 in this document. According to the Third NEEAP, the goal for 2020 is for the primary energy consumption not to exceed 3014 ktoe, i.e. the primary energy consumption to be reduced by 256 ktoe. On the other hand, the final energy consumption should be reduced by 226 ktoe, i.e. not to exceed 1948 ktoe.

The Energy Strategy adopted in 2019 defines three scenarios for the transition of the energy system in Macedonia (Reference, Moderate and Green). The Strategy covers the period until 2040 and defines goals for 2030 and 2040. However, in order to achieve these goals, it is necessary to start implementing the measures

² The reference consumption is the average energy consumption in the period 2002 - 2006

and policies envisaged in the Strategy as early as possible. According to the data from the Strategy, the overall consumption of primary energy is not expected to exceed 2663 ktoe. Because the base year in the Strategy is 2017, the difference between the scenarios is very small, so it is predicted that the consumption in the Green Scenario will be only 30 ktoe lower compared to the reference scenario.

Within the Strategy, a Scenario has been developed in which no measures have been implemented (WOM), i.e. the approach defined in the Energy Efficiency Directive (Directive 2012/27/EU) has been followed. The goal for 2020 is to achieve primary energy savings of 94 ktoe by implementing the measures defined in the Green Scenario, i.e. to reduce the final energy consumption by 88 ktoe. Table 2 presents the targets for 2020 in accordance with the Energy Strategy and in accordance with the Third NEEAP. The estimates on key national energy production and consumption figures in 2020, according to the Green Scenario is presented in Table 3.

Table 2. Energy efficiency target for 2020, Energy strategy by scenarios and 3rd NEEAP.

	WOM	Reference	Energy Strategy		3 rd NEEAP
			Moderate	Green	
Primary energy (expected consumption)	2727	2663	2642	2633	3014
Primary energy (energy savings)		64	85	94	256
Final energy (expected consumption)	1948	1890	1874	1860	2093
Final energy (energy savings)		58	74	88	226

Table 3. Estimates of key national energy production and consumption figures in 2020

<i>Estimate of energy consumption in 2020</i>	<i>Units</i>
Total primary energy consumption in 2020	2633
Electricity transformation input (thermal power generation)	807
Electricity generation output (thermal power generation)	230
CHP transformation input	151
CHP transformation output – thermal	36
CHP transformation output – electrical	71.3
Energy distribution losses (all fuels)	98.8
Total final energy consumption	1832
Final energy consumption – Industry	453
Final energy consumption - Transport	587
Final energy consumption - Households	573
Final energy consumption - Services	219

4.2 Calculation of savings up to 2018

As stated in the introductory chapter of this NEEAP, the calculation of energy savings is done using two approaches, top-down and bottom-up, which are described in detail in the Rulebook on Energy Control. Since this Rulebook was adopted in 2013, the calculation of savings for certain measures has been made on the basis of the MULTIEE project within which the methodology for monitoring and verification of savings has been developed. These changes will be included in the Rulebook on the Monitoring and Verification Platform (MVP), which is an obligation from the Law on Energy Efficiency.

Both methodologies have been used because in Macedonia a monitoring and verification system has not been established yet, so for some sectors such as Industry and Transport there is very little data on implemented energy efficiency measures. When there is a lack of data on implemented measures, which are used in the bottom-up methodology, the top-down methodology is used. The basic idea for the future is to use the top-down methodology as little as possible, and to have as much relevant data as possible so that only the bottom-up methodology can be used, because energy savings are recognized only by these measures that can be reported, monitored and verified.

4.2.1 Top-down approach

The calculation of energy savings using the top-down methodology is done for four sectors, namely Households, Industry, Transport and Commercial and Service sector. According to the Rulebook on energy controls for each sector there are special indicators that help monitor energy savings.

The energy saving calculations do not cover only the period 2016-2018, but a complete revision of the period 2009-2015 has been made. This was done because after the preparation of the Third NEEAP, revision of the energy balances prepared by the State Statistical Office was made, as a result of the conducted survey on energy consumption in households. Additionally, in the Industry and Transport sectors additional research has been done that contributes to improving the quality of input data in the top-down methodology. Data from the State Statistical Office were generally used to calculate the savings in all four sectors, as follows:

1. Households
 - a. Енергетски биланси за период 2009-2018, потрошувачка на финална енергија во домаќинствата
 - b. Потрошувачка на енергенти во домаќинствата (публикација од ДЗС, моделирана од МАНУ во рамките на проект од Енергетската заедница)
 - c. МакСтат база на податоци >> Население >> Процени на население >> Населене на Република Македонија на 31.12, според поединечни години на возраст, по пол, по години
 - d. МакСтат база на податоци >> Животен стандард >> Анкета за потрошувачка на домаќинствата >> Структура на снабденоста на домаќинствата со трајни добра, по тип на домаќинство, по години
 - e. Публикации од 2009-2017 Потрошувачка на домаќинствата во Република Македонија
2. Commercial and Services
 - a. SSO, LABOUR FORCE SURVEY, table: Employed by sectors of activities¹⁾ and by type of ownership of the business entities
 - b. Енергетски биланси за период 2009-2018, final energy consumption in other sectors
3. Transport
 - a. Енергетски биланси за период 2009-2018, final energy consumption in transport
 - b. МакСтат база на податоци, TRANSPORT AND OTHER SERVICES,
 - c. MAKSTAT online database, Регистрирани патни моторни превозни средства по гориво, по општини, по години, број for the period 2011-2018, for the period 2009-2010 publication Transport and communication 2012
4. Industry
 - a. Енергетски биланси за период 2009-2018 State Final energy consumption in industry
 - b. State Statistical Office_Online_Database_Индекси на индустриското производство, на просек 2015 година, месечни, merge using NACE and industrial structure in %
 - c. State Statistical Office_Online_Database_Компоненти на БДП по сектори и оддели на НКД Рев.2 , по години, тековни цени (во милиони денари), Converted to (million EUR 2005)

Additionally, other data sources were used, for example for transport, data from the Ministry of Environment and Physical Planning from the COPERT software were used. For heating and cooling, the heating degree days and cooling degree days from the website www.degreedays.net were used (using temperature data from www.wunderground.com).

The table below shows the indicators used to calculate savings according to the top-down methodology. Indicators starting with the letter P are indicators that are calculated with detailed data, i.e refer to a sub-sector or part of a sector. On the other hand, the indicators starting with the letter M are calculated on the basis of simpler data and refer to the whole sector.

Based on the data sources listed above, all indicators in the Household sector, indicators M3 and M4 in the Commercial and services sector, M5 I M6 in the Transport sector and M14 and M8 in the Industry sector were calculated. In the Commercial and services sector, indicators P6 and P7 are not calculated because in Macedonia there is no data on energy consumption by sub-sectors:

- Public offices, administration and government services
- Private offices
- Health and social work
- Wholesale and retail trade
- Hotels and restaurants
- Education

It is similar in the transport sector where energy consumption needs to be divided into:

- cars
- buses
- light vehicles
- trucks
- rail
- waterways inland transport
- motorcycles

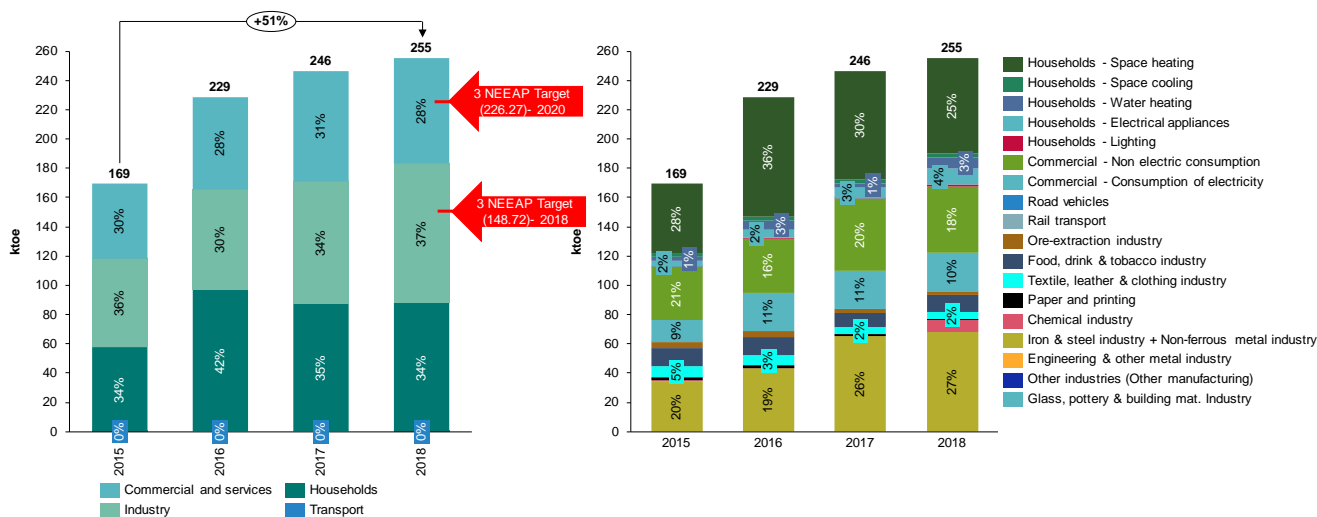
Table 4 Overview of top-down indicators used for calculation and reporting of achieved energy savings

	Indicator top-down	Name of the indicator	
Households	P1 HH	Space heating	✓
	P2 HH	Space cooling	✓
	P3 HH	Water heating	✓
	P4 HH	Electrical appliances	✓
	P5 HH	Lighting	✓
	M1 HH	Non electric uses	✓
	M2 HH	Electrical uses	✓
Commercial and services	P6 SS	Non electricity uses by sub sector (climate adjusted)	-
	P7 SS	Electricity uses by sub sector	-
	M3 SS	Non electric consumption (climate adjusted)	✓
	M4 SS	Consumption of electricity	✓
Transport	P8 TS	Cars (based on passenger km)	✓
	A1 P8 TS	<i>Cars (based on l/100 km)</i>	✓
	P9 TS	Trucks and light vehicles (based on ton-km)	✓
	A2 P9 TS	<i>Trucks and light vehicles (based on vehicle)</i>	✓
	P10 TS	Passenger rail transport	✓
	P11 TS	Rail transport of goods	✓
	P12 TS	Modal shift for passenger transport	✓
	P13 TS	Modal shift for freight transport	✓
	M5 TS	Road vehicles	✓
	M6 TS	Rail transport	✓
Industry	M7 TS	Domestic water transport	✓
	P14 IS	Energy consumption of industry per unit of production	✓
	M8 IS	Energy consumption of industry per unit of value added	✓

Depending on which indicators are used by sectors, different energy savings are obtained. If the "P" indicators are used for households and industry, and the "M" indicators are used for commercial and transport, it is obtained that the total energy savings in 2018 reached 255 ktoe, which is an increase of 51% compared to the savings achieved in 2015. Most of the savings are from the industry sector (37%), followed by the Households sector (34%) and the Commercial sector (29%). There are almost no savings in the Transport sector. If you look at the sub-sectors, the biggest savings are in the Iron and Steel sector (27%), in the household space heating sector (25%) and in the industry sector in non-electricity consumption (18%).

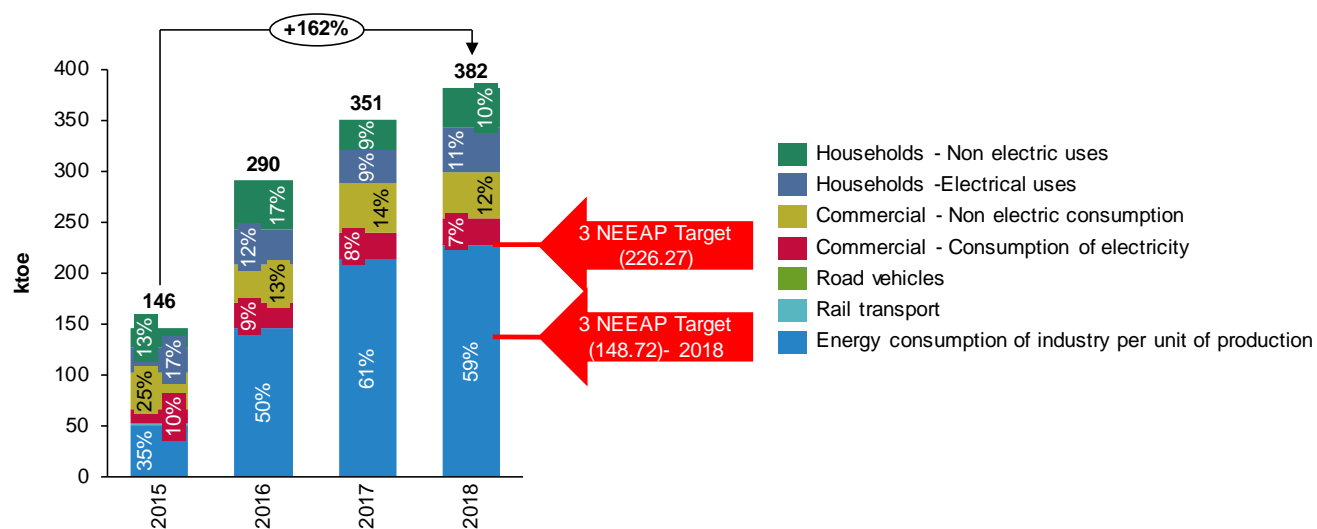
What is of particular importance is that the goal for 2018, which is given in the Third NEEAP, is achieved, ie the savings are greater than the set goal by 70%. It is even more significant that in 2018 the energy savings that were planned for 2020 in the Third NEEAP were realized.

Figure 4.2. Final energy savings by sectors and subsectors using detailed indicators



On the other hand, if only the "M" indicators in all sectors are considered, the total energy savings in 2018 are 382 ktoe, of which almost 60% are from the industry sector. Compared to 2015, in 2018, energy savings increased by 162%. Detailed data on savings by all indicators are displayed in Appendix.

Figure 4.3. Final energy savings by subsectors using "M" indicators



4.2.2 Bottom-up approach

The third NEEAP gives an overview of 31 policies and measures where majority of them are implemented as planned. The measures are divided in seven sectors: buildings, household, public, commercial, industry, energy and transport. Some of them affect several sectors and their overall savings are reported separately (as a horizontal measures). According to the third NEEAP, the implementation of four measures is even better than planned (promotional programme for wider application of solar collectors, municipal street lighting, wider application of RES, and promotion of greater use of railway). One third of the measures are partially implemented and only one not implemented (heat cost allocators).

In this NEEAP, based on the data submitted by about 60 entities including the City of Skopje and the municipalities, Ministries, energy companies, banks that have credit lines for energy efficiency and others, calculations have been made for energy savings by measures using the bottom-up methodology. Additionally, data from the State Statistical Office were used, especially in the area of construction of new and reconstruction

of existing buildings, the Regulatory Commission for Energy and Water Services, as well as the websites of the municipalities (subsidies for heat pumps, pellet stoves, bicycles) and other entities.

The table below shows all the data for which there is data and for which energy savings can be calculated. A total of 41 measures were reviewed, of which for 34 there are detailed data, and for 7 partial data. The total final energy savings in 2018 are 180 ktoe which is about 20% above the target for 2018 which is set in the Third NEEAP. Only in the period 2016-2018, final energy savings of around 100 ktoe were achieved.

With the implementation of 18 measures (marked with green in Table 5), larger energy savings were achieved than those planned in the Third NEEAP, while with 6 measures, smaller savings were achieved than planned (marked in red in Table 5). The Energy Strategy until 2040, as well as the Draft version of the National Energy and Climate Plan define measures that differ from the measures given in the Third NEEAP. Additionally, the calculation of savings for some measures was feasible only if they were previously grouped. For that purpose, a certain grouping of measures has been done according to the Third NEEAP. What is important and should be emphasized is that the implementation of most of the measures is aimed at fulfilling the Green Scenario of the Energy Strategy.

Measures that achieve the greatest energy savings are increased use of heat pumps (inverter air conditioners), as well as renovation and construction of new buildings.

Table 5. Measures used to achieve final energy savings and comparison with the projected savings from the third NEEAP

Measure	Corresponding measure in the 3 rd NEEAP	Cumulative (3 rd NEEAP)	Achieved annual energy savings - final energy (ktoe)				Achieved cumulative savings including the savings from the 3 rd NEEAP	Expected cumulative savings according to 3 rd NEEAP
			2015	2016	2017	2018	2018	2018
1	EE obligation schemes						0	
2	Public awareness campaigns and network of energy efficiency (EE) info centers	R.4.	2.7	0.82	0.82	0.97	5.31	3.85
3	Solar rooftop power plants	R.3., P.4., C.3.	7.77				33.66	15.72
4	Solar thermal collectors			0.53	0.4	0.25		
5	Increased use of heat pumps			7.2	9.04	8.47		
6	Labeling of electric appliances and equipment	R.2.	0.7	0.2	0.21	0.24	1.35	0.86
7	Replacement of windows			0	0.14	0.12	0.26	
8	Retrofitting of existing buildings (res+comm)	B.1., R.1., C.1., P.1.	19.4	0.2	0.16	0.13	32.31	30.05
9	Construction of new residential buildings			2.93	2.86	2.58		
10	Construction of new commercial buildings			0.79	0.91	0.94		
11	Retrofitting of existing central and local self-government buildings			0.18	0.07	0.08		
12	Construction of new central and local self-government buildings			0.41	0.41	0.26		
13	EE certificates for buildings			0.29	0.54	0.15	0.98	
14	Construction of passive buildings			0	0.02	0	0.02	
15	Phasing out of incandescent lights			1.35	3.37	5.4	10.12	
16	Improvement of the street lighting in the municipalities	P.3.	1.69	0.56	0.56	0.56	3.37	2.34
17	"Green procurements"	P.5.	0.22	0.05	0.05	0.1	0.42	0.36
18	Energy management in manufacturing industries	I.2.	2.98	0.5	0.5	0.5	4.48	5.3
19	Introduction of efficient electric motors	I.3.	1.42	0.2	0.2	0.2	2.02	1.77
20	Introduction of more advanced technologies	I.1., I.4.	13.7	1.8	1.8	1.8	19.1	16.1
21	Increased use of the railway	T.4.	5.16	0	1.36	0.76	7.28	18.76
22	Renewing of the national car fleet	T.1.	6.45	1.8	1.68	2.01	11.94	9.95

	Measure	Corresponding measure in the 3 rd NEEAP	Cumulative (3 rd NEEAP)	Achieved annual energy savings - final energy (ktoe)			Achieved cumulative savings including the savings from the 3 rd NEEAP	Expected cumulative savings according to 3 rd NEEAP
23	Renewing of other national road fleet (light duty and heavy goods vehicles and buses)			0.16	0.4	0.38	0.94	
24	Advanced mobility	T.3.	2.36	0.24	0.2	0.27	3.07	4.21
25	Electrification of the transport			0.02	0	0.01	0.03	
26	Increased use of more efficient biomass stoves	R.5.	0	0.18	0.32	0.73	1.23	1.12
27	Increased use of central heating systems			0.13	0.16	0.18	0.47	
28	Reduction of network losses	E.2.	3.4				3.4	7.2
	Total savings		67.95	20.54	26.18	27.09	141.76	117.59
	Additional measures reported in the annual reports							
29	Inspection of boilers/air conditioning systems	B.2.	0.06	0	0	0	0.06	0.1
30	Energy management - public buildings	P.2.	0.96	0.2	0.2	0.2	1.56	1.56
31	Rehabilitation of water supply systems and sewage systems	P.6.	0	0.05	0.05	0.1	0.2	0.02
32	Energy management	C.2.	0.75	0.15	0.15	0.2	1.25	1.45
33	Cogeneration	I.5.	5.1	8.7	5.7	8	27.5	18.2
34	Heat cost allocators	E.1.	0	0	0	0	0	0.04
35	Promotion of sustainable urban transport systems	T.2.	5.55	0.8	0.8	0.8	7.95	9.75
	Total savings of the additional measures reported in the annual reports		12.42	9.9	6.9	9.3	38.52	31.12
	Total savings in 4th NEEAP		80.37	30.44	33.08	36.39	180.28	148.71

These measures used to achieve final energy savings, also contributed to the reduction of primary energy consumption. However, in addition to these measures, there are measures whose implementation achieves savings only on primary energy (Table 6). With the implementation of all the measures, in the period 2016-2018 there are savings of about 100 ktoe final energy, and in the same period the primary energy savings are double (200 ktoe, detailed table by measures is given in Appendix II).

Table 6. Measures used to achieve only primary energy savings

	Measure	Corresponding measure in the 3 rd NEEAP	Cumulative (3 rd NEEAP)	Achieved annual energy savings - primary energy (ktoe)				Achieved cumulative savings including the savings from the 3 rd NEEAP
				2015	2016	2017	2018	2018
36	Incentives Feed-in tariff				5.61	5.61	3.67	14.89
37	RES without incentives				0.04	0.25	0.37	0.66
38	Reduction of network losses	E.2.			1.44	3.17	5.28	9.89
39	Solar rooftop power plants				0.12	0.41	0.82	1.35

As the preparation of this Action plan is in 2020, the energy savings achieved by the implementation of the measures in 2019 have also been calculated, and a plan has been made how to achieve the goals defined for 2020, 2021 and 2022. In 2019, savings of 88.6 ktoe were realized, while in 2020, 2021 and 2022 it is planned to achieve savings of 156 ktoe, 213 ktoe and 271 ktoe, respectively (Table 7). It is important to note that these are cumulative savings.

Overview of the estimates of primary and final energy savings is presented in Table 8.

Table 7. Measures used to achieve final energy savings in the period 2019-2021

Achieved annual energy savings (ktoe)

	Measure	Final energy				Primary energy
		2019	2020	2021	2022	2022
1	EE obligation schemes			15.6	18.8	25.7
2	Public awareness campaigns and network of energy efficiency (EE) info centers	2.9	24.3	28.5	33.0	113.0
3	Solar rooftop power plants					20.6
4	Solar thermal collectors	0.9	1.5	2	2.5	8.6
5	Increased use of heat pumps	23.8	48	55	62.5	145.9
6	Labeling of electric appliances and equipment	0.7	4.6	5.8	7.8	27.0
7	Replacement of windows	0.4				
8	Retrofitting of existing buildings (res+comm)	0.6	21.3	25.1	28.5	38.9
9	Construction of new residential buildings	11.1				
10	Construction of new commercial buildings	4.3				
11	Retrofitting of existing central and local self-government buildings	0.3	0.8	1.6	2.5	5.7
12	Construction of new central and local self-government buildings	0.9				
13	EE certificates for buildings	0.8	0.4	0.8	1	1.5
14	Construction of passive buildings	0.0				
15	Phasing out of incandescent lights	16.2	20.7	26.2	31.4	107.5
16	Improvement of the street lighting in the municipalities	1.7	3.2	4	4.2	14.4
17	“Green procurements”	0.3	0.3	0.4	0.7	2.4
18	Energy management in manufacturing industries	1.5	0.9	2	3.3	5.9
19	Introduction of efficient electric motors	0.6	0.3	0.5	1	3.4
20	Introduction of more advanced technologies	5.4	6.7	8.4	23.3	41.4
21	Increased use of the railway	3.2	7.9	8.6	9.2	9.2
22	Renewing of the national car fleet	7.7	10.2	19.5	28.3	28.3
23	Renewing of other national road fleet (light duty and heavy goods vehicles and buses)	1.1	0.2	0.8	1.2	1.2
24	Advanced mobility	0.8	0.7	0.8	0.9	0.9
25	Construction of the railway to Republic of Bulgaria	0.0	0	0	0	0
26	Electrification of the transport	0.0	3.4	7.2	10.4	10.4
27	Increased use of more efficient biomass stoves	3.0				
28	Increased use of central heating systems	0.4	0.4	0.6	0.8	14.2
29	Incentives Feed-in tariff					49.3
30	Incentives Feed-in premium					21.5
31	RES without incentives					6.4
32	Reduction of network losses					32
33	Biomass power plants (CHP optional)					6.3
	Total savings	88.6	155.8	213.4	271.3	741.6

Table 8. Overview of the estimates of primary and final energy savings

	Primary energy savings (ktoe)	Final energy savings (ktoe)
	Starting from 2017	Up to 2018 (including the savings from 3 rd NEEAP) Starting from 2017

2018 - Achieved	144.9	180.3	53.3
2019 - Achieved	242.6		88.5
2020 - Forecast	430.9		155.8
2021 - Forecast	561.1		213.4
2022 - Forecast	741.6		271.3

The next chapter provides a detailed description of all measures planned for implementation, what has been undertaken so far in terms of their implementation, and what is expected to be done. Additionally, the energy savings per year are given, the funds spent, as well as the planned budget.

5 MEASURES FOR IMPLEMENTING THE TARGETs

5.1 HORIZONTAL MEASURES

5.1.1 Energy efficiency obligation schemes and alternative policies and measures (Article 7)

Energy efficiency obligation schemes					
Main objective: Fulfilment of the obligation under Article 7 of the EE Directive transposed in Article 14 of the national Energy Efficiency Law					
Description: To set up the scheme the average annual final consumption for the period 2014 – 2016 is used. The measure implements the possibilities from the Article 7 of the EE Directive, i.e. Article 14 of the national Energy Efficiency Law, to exclude the transport sector consumption (paragraph 1) from the sum of the average annual consumption and reduce the consumption in the industry sector (paragraph 2).					
Information	Type		Technical, regulatory		
	Sector		All sectors (excl. transport and part of the industry according to Annex I of the Directive 2003/87/EC)		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency 		
	Methodology		Bottom-up		
	Assumptions		<p>1. Final energy savings targets of:</p> <ul style="list-style-type: none"> ▶ 0.5% in 2017 ▶ 0.7% in 2018 – 2020 <p>of the average annual energy sales to final customers in the period 2014 – 2016 excluding the customers in the transport sector as well as industries of the Annex I of the Directive 2003/87/EC</p> <p>2. Up to 30% of the costs will be covered through subsidies by the distribution companies or suppliers.</p>		
Progress of implementation	Steps taken or envisaged to achieve the action		Steps taken	Law on energy efficiency adopted	
			Steps envisaged	<ul style="list-style-type: none"> ▶ The Decree for obligation scheme, in which the obligation schemes will be elaborated in details (obligated parties, methodology for calculation of annual energy savings, targets for annual energy savings, measures for achieving the targets, etc.) should be drafted, adopted and implemented by the end of 2021. ▶ One of the recommendations given in Appendix III as a part of the guideline for the development of Building renovation strategy is to Develop an ambitious Energy Efficiency Obligation scheme which focuses on delivering holistic and deep renovation of buildings. 	
	Energy savings (ktoe)	Final energy	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario, including Construction of passive buildings	
		Primary energy	Achieved	▶ /	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
	Estimated emission reductions (Gg CO2-eq)		2018: /		▶ /
	Timeframe		2022: 43		
Timeframe		2020 - 2030			
Budget		Spent in the period 2016-2019:			
		▶ /			
		Expected for the period 2020-2022:			
		▶ 33.1 Mil. EUR			
Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Ministry of economy ▶ Energy Agency ▶ Energy Regulatory Commission ▶ Distribution system operators ▶ Suppliers and traders of electricity and gas 			

Source of finance	▶ 23.1 M€Consumers direct investments, 10 M€Private companies but reimburse through consumers bills
Progress indicators:	▶ Energy savings (ktoe/GWh) ▶ Emissions reductions (Gg CO2-eq)

5.1.2 Energy audits and management systems (Article 8)

With the adoption of the Law on energy efficiency, energy audit of large enterprises was introduced, in addition to energy audit of buildings. According to the Law, all large enterprises are obliged to carry out an energy audit every four years. Large enterprises are not obliged to carry out an energy audit when:

1. they have implemented an energy or environmental management system certified by a conformity assessment body accredited in accordance with the Law on Accreditation, which is compliant with the relevant European or International Standards (ISO), provided that the management system includes an energy audit that meets the detailed conditions prescribed in the Rulebook on Energy Audits of the Large Enterprises; or
2. the energy audit is carried out as part of an environmental management system within an integrated environmental permit issued in accordance with the environmental protection regulations, provided that the energy audits meet the detailed requirements prescribed in the Rulebook on Energy Audit of the Large Enterprises. Enterprises.

The performance of energy audit is regulated by a rulebook which should be adopted by the Minister of Economy. Also, a special rulebook regulates the energy audit of buildings. Both rulebooks are currently being developed.

5.1.3 Metering and billing information (Articles 9, 10 and 11)

The new Energy Law also introduced new rules for the supply of electricity, heat and natural gas. According to these rules, the supplier of electricity, heat and natural gas is obliged to provide insight into the bills (for 12 months).

5.1.4 Consumer information programs and training (Articles 12 and 17)

Public awareness campaigns and network of energy efficiency (EE) info centers		
Main objective: Implement information campaigns that will raise public awareness about the importance, effects and benefits of energy efficiency		
Description: Although a large number of campaigns for the promotion of energy efficiency by different stakeholders are provided, still there is a lack of knowledge about the benefits of the EE. Article 12 of the EE Directive, which is transposed in article 29 of the Energy Efficiency Law, stipulates that the country should take appropriate measures to promote and facilitate an efficient use of energy by small energy customers, including domestic customer. This can be done using different mechanisms. One of them is the establishment of EE info centers in the local self-governments. Following the examples from the EU, besides this measure, several others should be implemented such as:		
<ul style="list-style-type: none"> ▶ Education, starting from the kindergarten, ▶ Training of the employees in the public institutions at the central and local level, ▶ Creation of calculation tool that will show the financial and environmental effects from the implementation of a certain measure 		
Information	Type	Information
	Sector	Household and commercial consumers
	Relevant planning documents, legal and regulatory acts	▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency
	Methodology	Conducting information campaigns and opening information centers for energy efficiency. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology
	Assumptions	The savings are calculated based on the data receive from NEPTUN for the following appliances: washing machines, dishwashers and refrigerator. Calculated savings are divided in this measure and in the measure Labeling of electric appliances and equipment
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken
	<ul style="list-style-type: none"> ▶ Platform for energy efficiency, for education of the population and journalists and experience sharing of the private sector for successfully implemented EE measures implemented. ▶ Info Center for Energy of the City of Skopje opened. ▶ Free advices to the customers for reasonable consumption of electricity enabled by EVN's Customer Service Centre 	

		Steps envisaged	<ul style="list-style-type: none"> ▶ Broadcasting of TV spots, announcements, campaigns and documentary films ▶ Extension of the Platform for energy efficiency ▶ Continuous work of the existing and opening new information centers. ▶ Training of employees in educational and public institutions at central and local level for energy efficiency ▶ Preparation of promotional materials for energy efficiency that will be distributed in educational institutions, especially in kindergartens and primary schools 	
Energy savings (ktoe)	Final energy	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
		Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario	
	Primary energy	Achieved		
Estimated emission reductions (Gg CO ₂ -eq)			2018: 15.1	
Timeframe			2022: 50	
Costs			2017 - 2040	
Implementing entity			Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 106 Mil. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 37.8 Mil. EUR 	
Source of finance			<ul style="list-style-type: none"> ▶ Private sector (36.6), donors (1.2 Mill. EUR), central and local governments 	
Progress indicators:			<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reductions (Gg CO₂-eq) 	

5.1.5 Availability of qualification, accreditation and certification schemes (Article 16)

EE certificates for buildings					
Main objective: Issuing certificates for the energy efficiency class of buildings					
Description: The measure considers issuing certificates for the energy efficiency class of buildings. This measure will motivate the investors and private owners to build more energy efficient buildings, and the certificates can be used to advertise and sell them more easily.					
Information	Type		Technical		
	Sector		Households, commercial and public sector		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ Rulebook on Energy Performance of Buildings ▶ Rulebook on Energy Audits ▶ 3rd National Energy Efficiency Action Plan 		
	Methodology		Construction of energy efficient buildings of class A+, A and B. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions		The savings are calculated based on the data received from the Energy Agency for issued certificates in period 2016-2019. In addition, the savings of this measure is calculated as a difference between A+, A and B building and a building of C class (which is according to the Rulebook).		
Progress of implementation	Steps taken or envisaged to achieve the action		Steps taken	<ul style="list-style-type: none"> ▶ The Energy Efficiency Law adopted 	
			Steps envisaged	<ul style="list-style-type: none"> ▶ Adoption of Strategy for Renovation of Residential, Public and Commercial buildings ▶ Establishment of an Energy Efficiency Fund ▶ Adoption of new Rulebook on Energy Performance of Buildings ▶ Adoption of Rulebook on Energy Audits of buildings ▶ Adoption of Plan for increasing the number of nearly zero-energy buildings 	
	Energy saving	Final energy	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
				<ul style="list-style-type: none"> ▶ 2016 – 0.29 ▶ 2017 – 0.54 ▶ 2018 – 0.15 	<ul style="list-style-type: none"> ▶ 0.98

			▶ 2019 – 0.11	
		Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario, including Construction of passive buildings	
			▶ 2020 – 0.4	
			▶ 2021 – 0.8	
			▶ 2022 - 1	
	Primary energy	Achieved	▶ 2016 – 0.45	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
			▶ 2017 – 0.82	
			▶ 2018 – 0.23	
			▶ 2019 – 0.16	
	Estimated emission reductions (Gg CO2-eq)		2018: 3	
			2022: 3.3	
	Timeframe		2020– 2040	
	Budget		Spent in the period 2016-2019:	
			▶ Mil. EUR	
			Expected for the period 2020-2022:	
			▶ 56.6 Mil. EUR	
	Implementing entity		▶ Ministry of Economy, Energy Agency	
			▶ Donors and financial institutions	
			▶ Investors	
	Source of finance		▶ Private	
Progress indicators:			▶ Energy savings (ktoe/GWh)	
			▶ Emissions reduction (Gg CO2-eq)	

* the savings after 2019 are reported together with the measures Construction of passive buildings

5.1.6 Energy services (Article 18)

In 2020, few municipalities have signed a contract for the implementation of public-private partnership (ESCO) for street lighting. This measure is explained in detail in the table for Improvement of the street lighting in the municipalities.

5.1.7 Other energy efficiency measures of a horizontal nature (Articles 19 and 20)

A measure of a horizontal nature that is explained in detail in this NEEAP is Green procurement.

Energy Efficiency National Fund is introduced in the new Law on Energy efficiency, adopted in February 2020. However, a separate Law for its established is created and it is in a procedure of adoption. This fund is projected to provide financial support in the implementation of the following measures:

- Labelling of electric appliances and equipment
- Retrofitting of existing residential buildings
- Retrofitting of existing central government buildings
- Solar rooftop power plants
- Replacement of windows
- Construction of new residential and commercial buildings

More details are presented in the tables of these measures, as well as in the chapter “Funding and action plan”. In the same chapter, more details about the financial support for each of the measures is presented.

5.2 ENERGY EFFICIENCY IN BUILDINGS

5.2.1 Energy efficiency measures in the buildings sector

Solar rooftop power plants

Main objective: Increase of the domestic generation capacity from renewable energy sources and of the energy efficiency

Description: Construction of solar rooftop power plants, on private as well as public buildings, either prosumers or systems from which the overall produced electricity will be used for own purposes or will be stored. One of the possibilities for increasing the installed capacity of solar roof-top systems is through renewable energy communities

Information	Type		Technical, regulatory		
	Sector		Household, commercial and industrial sector		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Law on energy efficiency ▶ Strategy for Energy Development of North Macedonia up to 2040 ▶ Law on Energy ▶ Bylaws on renewable energy 		
	Methodology		Solar rooftop power plants construction. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions		30 MW solar capacities are envisioned to be constructed by 2022		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Rulebook on renewable energy sources adopted. ▶ Distribution grid code ▶ Through the project "Design and implementation of photovoltaic systems in rural municipalities" rooftop PV systems were installed on 108 public buildings ▶ Several companies have installed rooftop PV systems (such as Vitaminka, Makprogres, Maks, AgroGama, Maktois, Frotirka, Palteks, Alpinkom, Evropa 92, ABMG, Fikoplast, Birosef) ▶ Few hospitals in Skopje have installed rooftop PV systems (such as Polyclinic Bukrest, hospitals Bit Pazar and Cair) 		
		Steps envisaged	<ul style="list-style-type: none"> ▶ Information campaigns ▶ Amend the Energy Law, VAT Law and Rulebook on RES to improve the net-billing legal framework and make it in line with EnC guidelines on prosumers ▶ Increase the share of the rooftop power plans in the household sector, by following the example of the public and commercial entities 		
	Primary energy	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)	
		Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario		▶ 1.35
				▶ 2016 – 0.12	
				▶ 2017 – 0.41	
				▶ 2018 – 0.82	
				▶ 2019 – 2.06	
				▶ 2020 – 8.24	
				▶ 2021 – 12.37	
			▶ 2022 – 20.61		
Estimated emission reductions (Gg CO ₂ -eq)		2018: 6.14 2022: 17.5			
Timeframe		2017– 2040			
Budget		Spent in the period 2016-2019: ▶ 24.7 Mil. EUR (20 Mil. EUR from the project "Design and implementation of photovoltaic systems in rural municipalities") Expected for the period 2020-2022: ▶ 15.6 Mil. EUR			
Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Energy Regulatory Commission ▶ Ministry of Economy, Energy Agency ▶ Ministry of Finance ▶ Elektroindustrija Skopje ▶ Suppliers of electricity ▶ End-users of electricity 			
Source of finance		<ul style="list-style-type: none"> ▶ Private, donors, subsidies from national and local budget, EE fund ▶ Reimbursement of part of the costs for purchase and installation of photovoltaic panels for production of electricity up to 4 kW for own consumption for households, on a building on which it has the right of ownership or use, up to 30%, but not more than 62,000 denars per household for 2021, in the total amount of 8,000,000 denars. ▶ Public call of the Ministry of economy for subsidies of SMS in 2021. The ministry will cover 50% of the costs for installation of photovoltaic panels - closed system, for production of electricity for own needs of the enterprise with power over 5 kW. 			
Progress indicators:		<ul style="list-style-type: none"> ▶ Increase in installed capacity (MW) ▶ Increase in electricity generation (GWh) ▶ Emissions reduction (Gg CO₂-eq) 			

Solar thermal collectors

Main objective: Reduction of the energy costs and improvement of the efficiency

Description: Hot water electric heaters are one of the biggest energy consumers with a major impact on bills. On the other hand the reduced investment cost for purchasing and installation of solar thermal collectors is of great importance because it can drop consumer bills for hot water. In addition, these systems serve for energy savings and are able to satisfy at least 50% at annual level, depending on the hot water needs. Furthermore, solar thermal collectors can be used in combination with electricity and district heating systems.

Information	Type		Technical	
	Sector		Households and commercial sector	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Energy 	

			<ul style="list-style-type: none"> ▶ Law on Energy Efficiency ▶ Bylaws for renewable energy ▶ Program for promotion of renewable energy ▶ 3rd National Energy Efficiency Action Plan 				
	Methodology		Installation of solar thermal collectors. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology				
	Assumptions		<p>The savings are calculated based on the data for requests for subsidies submitted to the Ministry of Economy. The number of requests per year is the following:</p> <ul style="list-style-type: none"> ▶ 3126 in 2016 (625 reimbursed) ▶ 2472 in 2017 (1794 reimbursed) ▶ 1597 in 2018 (517 reimbursed) ▶ 1306 in 2019 (544 reimbursed) 				
Progress of implementation	Steps taken or envisaged to achieve the action		Steps taken	Reimbursement of part of the costs for purchased and installed solar thermal collectors in the amount of 30%, but not more than 300 € realized by the Ministry of Economy. Program for promotion of renewable energy sources and improvement of energy efficiency in household for 2021, adopted.			
			Steps envisaged	<ul style="list-style-type: none"> ▶ Continuation of adoption and implementation of annual programmes with incentive measures for solar thermal collectors installation 			
	Energy savings (ktoe)	Final energy	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)		
				<ul style="list-style-type: none"> ▶ 2016 – 0.53 ▶ 2017 – 0.4 ▶ 2018 – 0.25 ▶ 2019 – 0.21 	<ul style="list-style-type: none"> ▶ 1.18 		
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario			
				<ul style="list-style-type: none"> ▶ 2020 – 1.5 ▶ 2021 – 2 ▶ 2022 – 2.5 			
		Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 1.81 ▶ 2017 – 1.36 ▶ 2018 – 0.84 ▶ 2019 – 0.73 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)		
					<ul style="list-style-type: none"> ▶ 4.01 		
	Estimated emission reductions (Gg CO2-eq)			2018: 18.1 2022: 5.5			
	Timeframe			2017– 2040			
Budget			Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 4 Mil. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 5.5 Mil. EUR 				
Implementing entity			<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ End-users of heat 				
Source of finance			<ul style="list-style-type: none"> ▶ Private (5.2 Mill. EUR), central government budget (0.3 Mill. EUR), donors 				
Progress indicators:			<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq) 				

Labeling of electric appliances and equipment				
Main objective: Penetration of appliances with higher efficiency (class A++, A+, A, B)				
Description: Labelling of electric appliances and equipment to provide relevant information on the energy consumption of the products. The application of the labelling and eco-design of the products is necessary to ensure that the products sold in North Macedonia are in compliance with the EU regulations				
Information	Type		Regulatory	
	Sector		Household and commercial sector	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ Third Energy Efficiency Action Plan ▶ Rulebook on labelling consumption of energy and other resources on devices using energy. ▶ Regulation on eco-design of energy-related products 	
	Methodology		Labeling of electric appliances and equipment. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.	
	Assumptions		The savings are calculated based on the data receive from NEPTUN for the following appliances: washing machines, dishwashers and refrigerator. Calculated savings are divided in this measure and in the measure Labeling of electric appliances and equipment	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ New Rulebook on labelling consumption of energy and other resources on devices using energy adopted in September 2016 by the Ministry of Economy ▶ Draft version of the new Regulation on eco-design of products developed ▶ Market inspectors trained on the basic eco-labelling and eco-design rules and requirements stemming from the Energy Efficiency Law 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Adoption of the new Rulebook on labelling consumption of energy and other resources on devices using energy that will incorporate the latest EU technical regulations for certain products ▶ Adoption of the new Decree on eco-design of energy-related products that will incorporate the latest EU technical regulations for certain products ▶ Information campaigns that will target the producers of these products, but more importantly traders and consumers ▶ Continuous education of market and environment inspectors on this subject matter 	
	Energy savings (ktoe)	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.2 ▶ 2017 – 0.21 ▶ 2018 – 0.24 ▶ 2019 – 0.26
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario <ul style="list-style-type: none"> ▶ 2020 – 4.6 ▶ 2021 – 5.8 ▶ 2022 – 7.8
	Energy savings (ktoe)	Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 0.70 ▶ 2017 – 0.71 ▶ 2018 – 0.83 ▶ 2019 – 0.91
			Expected	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 0.65
	Estimated emission reductions (Gg CO2-eq)		2018: 3.8 2022: 23	
	Timeframe		2017– 2040	
	Costs		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 26 Mil. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 20.8 Mil. EUR 	
	Implementing entity		<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ State Market Inspectorate, State Environment Inspectorate ▶ Producers and suppliers of electrical equipment and household appliances ▶ End-users 	
Source of finance		▶ Private (19.4 Mill. EUR), EE fund (1.5 Mill. EUR)		
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reductions (Gg CO2-eq) 		

Replacement of windows				
Main objective: Replacement of old windows with new ones				
Description: The measure considers only replacement of old windows with new PVC or aluminum windows, initiated by the owners and supported by the Ministry of Economy.				
Information	Type		Technical	
	Sector		Household	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Energy Efficiency ▶ Rulebook on Energy Performance of Buildings ▶ Rulebook on Energy Audits ▶ 3rd National Energy Efficiency Action Plan 	
	Methodology		Replacement of old windows. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology. In the Energy Strategy this measure is modelled together with the measure Retrofitting of existing residential buildings	
	Assumptions		<p>The savings are calculated based on the data for requests for subsidies submitted to the Ministry of Economy. The number of requests per year is the following:</p> <ul style="list-style-type: none"> ▶ 2401 in 2017 (1327 reimbursed) ▶ 1879 in 2018 (966 reimbursed) ▶ 2471 in 2019 (979 reimbursed) 	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Financial support for replacement of old windows provided by the Ministry of Economy ▶ Call for applications for reimbursement of 50% of the costs for windows replacement and installation of PVC and aluminum windows, but not more than 500 € provided by the Ministry of Economy ▶ UNDP 2nd call for replacement of windows in municipality of Aerodrom 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Adoption of Typology of buildings in the residential sector ▶ Adoption of Strategy for Renovation of Residential, Public and Commercial buildings ▶ Adoption of new Rulebook on Energy Performance of Buildings ▶ Adoption of Rulebook on Energy Audits of buildings 	
	Energy savings (ktoe)	Final energy	Achieved	<p>Per year</p> <ul style="list-style-type: none"> ▶ 2016 – 0 ▶ 2017 – 0.14 ▶ 2018 – 0.12 ▶ 2019 – 0.15 <p>Savings in 2018 (taking into account the measures implemented in the period 2016-2018)</p> <ul style="list-style-type: none"> ▶ 0.26
			Expected*	<p>Cumulative (starting from 2016) based on the Energy Strategy – Green scenario including Construction on new residential buildings and Construction of new commercial buildings</p> <ul style="list-style-type: none"> ▶ 2020 – 21.3 ▶ 2021 – 25.1 ▶ 2022 – 28.5
	Energy savings (ktoe)	Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 0 ▶ 2017 – 0.22 ▶ 2018 – 0.41 ▶ 2019 – 0.63 <p>Savings in 2018 (taking into account the measures implemented in the period 2016-2018)</p> <ul style="list-style-type: none"> ▶ 0.63
			Estimated emission reductions (Gg CO ₂ -eq)*	2018: 48.6 2022: 73.5
	Timeframe		2017– 2040	
	Budget		Spent in the period 2016-2019: ▶ 5.4 Mil. EUR	
	Implementing entity		<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Donors and financial institutions ▶ Households 	
	Source of finance		▶ Private, donors through commercial EE loans, EE fund	
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO₂-eq) 		

* together with Replacement of windows, Retrofitting of existing buildings, Construction of new residential buildings and Construction of new commercial buildings

Retrofitting of existing buildings				
Main objective: To meet the requirements under the Energy Efficiency Law and contribute to increased energy efficiency in the residential buildings (households)				
Description: The measure considers reconstructions of residential buildings including windows replacement, initiated by the owners and/or supported by commercial banks and funds. This measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the reconstructions into operation.				
Information	Type		Technical	
	Sector		Household and commercial sector	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Energy Efficiency ▶ Rulebook on Energy Performance of Buildings ▶ Rulebook on Energy Audits ▶ 3rd National Energy Efficiency Action Plan 	
	Methodology		Retrofitting of existing buildings. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.	
	Assumptions		The reconstructed buildings meet the standard for at least C class (95 kWh/m ²). The savings are calculated based on the data from SSO for construction sector (Completed construction works and completed dwellings in housing units built by private owners and Completed construction works and completed dwellings in housing units built by construction business entities).	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ 194 apartments for collective housing were renovated (EE measures implemented) under the USAID/Habitat Project for residential energy efficiency. The total investment is around 217,000 EUR of which around 54,000 EUR are subsidized. ▶ Financial support for rehabilitation of buildings for collective housing with implementation of EE measures provided by some municipalities ▶ Call for applications for reimbursement of 50% of the costs for windows replacement and installation of PVC and aluminum windows, but not more than 500 € provided by the Ministry of Economy. ▶ Law on Energy Efficiency adopted. ▶ Program for promotion of renewable energy sources and improvement of energy efficiency in household for 2021, adopted (subsidies for windows replacement are planned) ▶ Project of UNDP for improvement of the air quality with the replacement of the wood stove and introduction of EE measures in at least 100 household from the Aerodrom municipality ▶ The Regional Energy Efficiency Programme (REEP) for the Western Balkans was established in June 2017 by the EBRD with the support of the European Union (EU) and in partnership with the Energy Community Secretariat with the aim of addressing financing, legislative, technical, and other barriers to sustainable energy investments in the region. As part of the extension of the REEP programme, the EBRD established the Western Balkans Green Economy Financing Facility (WB GEFF – Residential) with the form of credit lines for a total of up to EUR 85 million extended to Participating Financial Intermediaries in the six countries (North Macedonia, Albania, Bosnia and Herzegovina, Kosovo, Montenegro, and Serbia), for on-lending to eligible Sub-borrowers to finance residential energy efficiency investments. These energy efficiency improvements and/or renewable energy installations undertaken by private individuals in individual apartments or family houses or measures implemented on a building level by housing collectives – groups of individuals, housing associations, housing management companies. The credit lines are supported with a grant funded Investment Incentives up to 20% of the investment cost or the sub-loan amount provided to sub-borrowers to incentivize the uptake of energy efficiency and renewable energy investments. The disbursement of the sub-loans is made through four commercial banks in the country (Ohridska Bank, Sparkasse Bank, Procredit Bank, and NLB Bank). North Macedonia is a leader in the Western Balkan countries for disbursement of sub-loans and verification of completed sub-projects under WB GEFF. By the end of 2020 there were about 1,670 verified sub-projects from all partner commercial banks in North Macedonia in excess of around EUR 12 million. The average sub-loan amount was about EUR 7,200. 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Adoption of Typology of buildings in the residential sector ▶ Adoption of Strategy for Renovation of Residential, Public and Commercial buildings ▶ Establishment of an Energy Efficiency Fund ▶ Adoption of new Rulebook on Energy Performance of Buildings ▶ Adoption of Rulebook on Energy Audits of buildings ▶ Continuous Government financial support for reimbursement of costs for windows replacement 	
	Energy savings (ktroe)	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.20 ▶ 2017 – 0.16 ▶ 2018 – 0.13 ▶ 2019 – 0.15 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 0.49
			Expected*	Cumulative (starting from 2016) based on the Energy Strategy – Green scenario

			including Construction on new residential buildings and Construction of new commercial buildings	
	Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2020 – 21.3 ▶ 2021 – 25.1 ▶ 2022 – 28.5 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
			<ul style="list-style-type: none"> ▶ 2016 – 0.31 ▶ 2017 – 0.24 ▶ 2018 – 0.30 ▶ 2019 – 0.34 	▶ 0.85
	Estimated emission reductions (Gg CO2-eq)*		2018: 48.6	
	Timeframe		2022: 73.5	
	Budget		2017– 2040	
	Budget		Spent in the period 2016-2019:	
			▶ 65 Mil. EUR	
			Expected for the period 2020-2022:	
			▶ 176.7 Mil. EUR	
	Implementing entity		▶ Ministry of Economy, Energy Agency	
			▶ Donors and financial institutions	
			▶ Households	
	Source of finance		▶ Private (159.5 Mill. EUR), donors (10 Mill. EUR), EE fund (6.2 Mill. EUR), central government (1 Mill. EUR)	
Progress indicators:			▶ Energy savings (ktoe/GWh)	
			▶ Emissions reduction (Gg CO2-eq)	

* together with Replacement of windows, Retrofitting of existing buildings, Construction of new residential buildings and Construction of new commercial buildings

Construction of new residential buildings					
Main objective: Construction of new residential buildings that will meet the minimum criteria set in the Rulebook of energy performance in buildings					
Description: An energy efficient building reduces maintenance and utility costs, but, in many cases, improves durability, lessens noise, increases comfort and creates a healthy and safe indoor environment. A further goal of energy efficient construction is to limit damage to the ecosystem and reduce the use of natural resources like energy, land, water, and raw materials. This measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the building into operation					
Information	Type	Technical, regulatory			
	Sector	Households			
	Relevant planning documents, legal and regulatory acts	<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Energy Efficiency ▶ Rulebook on Energy Performance of Buildings ▶ Rulebook on Energy Audits ▶ 3rd National Energy Efficiency Action Plan 			
	Methodology	Construction of new residential buildings. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.			
	Assumptions	The savings are calculated based on the data from SSO for construction sector (Completed construction works and completed dwellings in housing units built by private owners and Completed construction works and completed dwellings in housing units built by construction business entities). The new residential buildings meet the standard for at least C class (95 kWh/m2).			
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Financial support for construction of new buildings at municipality level ▶ Specialized credit lines of the commercial banks for Energy Efficiency (data received from Komercijalna Banka and Halkbanka - credit lines of around 24 Mil. EUR) 		
		Steps envisaged	<ul style="list-style-type: none"> ▶ Adoption of Strategy for Renovation of Residential, Public and Commercial buildings ▶ Establishment of an Energy Efficiency Fund ▶ Adoption of new Rulebook on Energy Performance of Buildings ▶ Adoption of Rulebook on Energy Audits of buildings 		
	Energy savings (ktoe)	Final energy	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
			Expected*	<ul style="list-style-type: none"> ▶ 2016 – 2.93 ▶ 2017 – 2.86 ▶ 2018 – 2.58 ▶ 2019 – 2.76 	
			Cumulative (starting from 2016) based on the Energy Strategy – Green scenario including Retrofitting of existing buildings and Construction of new commercial buildings		
			<ul style="list-style-type: none"> ▶ 2020 – 21.3 ▶ 2021 – 25.1 ▶ 2022 – 28.5 		
	Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 4.45 ▶ 2017 – 4.35 ▶ 2018 – 3.92 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)	

			▶ 2019 – 4.20	▶ 12.73
	Estimated emission reductions (Gg CO2-eq)*		2018: 48.6 2022: 73.5	
	Timeframe		2017– 2040	
	Budget		Spent in the period 2016-2019: ▶ 940 Mil. EUR (total investment including construction and implementation of EE standard) Expected for the period 2020-2022: ▶ 176.7 Mil. EUR (only for implementation of EE standard)	
	Implementing entity		▶ Ministry of Economy, Energy Agency ▶ Ministry of Transport and Communication ▶ Donors and financial institutions ▶ Investors (households)	
	Source of finance		▶ Private (159.5 Mill. EUR), donors (10 Mill. EUR), EE fund (6.2 Mill. EUR), central government (1 Mill. EUR)	
Progress indicators:			▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq)	

* together with Replacement of windows, Retrofitting of existing buildings, Construction of new residential buildings and Construction of new commercial buildings

Construction of new commercial buildings					
Main objective: Construction of new commercial buildings with aim to meet the objectives of the EE Directive and the Energy Efficiency Law					
Description: This measure considers construction of new commercial buildings including insulation and energy efficient windows initiated by the owners and/or supported by commercial banks and funds.					
Information	Type		Technical		
	Sector		Commercial sector		
	Relevant planning documents, legal and regulatory acts		▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Energy Efficiency ▶ Rulebook on Energy Performance of Buildings ▶ Rulebook on Energy Audits ▶ 3 rd National Energy Efficiency Action Plan		
	Methodology		Retrofitting of existing commercial buildings. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology		
	Assumptions		The savings are calculated based on the data from SSO for construction sector (Completed construction works and completed dwellings in housing units built by private owners and Completed construction works and completed dwellings in housing units built by construction business entities). The new commercial buildings meet the standard for at least C class (95 kWh/m2).		
Progress of implementation	Steps taken or envisaged to achieve the action		Steps taken	▶ Specialized credit lines of the commercial banks for Energy Efficiency (data received from Halkbanka - credit lines of around 170,000 EUR)	
			Steps envisaged	▶ Adoption of Strategy for Renovation of Residential, Public and Commercial buildings ▶ Establishment of an Energy Efficiency Fund ▶ Adoption of new Rulebook on Energy Performance of Buildings ▶ Adoption of Rulebook on Energy Audits of buildings	
	Energy savings (ktoe)	Final energy	Achieved	Per year ▶ 2016 – 0.79 ▶ 2017 – 0.91 ▶ 2018 – 0.94 ▶ 2019 – 1.66	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 2.64
			Expected*	Cumulative (starting from 2016) based on the Energy Strategy – Green scenario including Retrofitting of existing buildings and Construction of new residential buildings ▶ 2020 – 21.3 ▶ 2021 – 25.1 ▶ 2022 – 28.5	
	Energy savings (ktoe)	Primary energy	Achieved	▶ 2016 – 1.76 ▶ 2017 – 2.05 ▶ 2018 – 2.11 ▶ 2019 – 3.72	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 5.92
			Estimated emission reductions (Gg CO2-eq)*	2018: 48.6 2022: 73.5	
	Timeframe		2020– 2040		
Budget		Spent in the period 2016-2019: ▶ 290 Mil. EUR (total investment including construction and implementation of EE standard) Expected for the period 2020-2022: ▶ 176.7 Mil. EUR (only for implementation of EE standard)			

Implementing entity	<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Ministry of Transport and Communication ▶ Ministry of Finance ▶ Commercial building owners
Source of finance	▶ Private (159.5 Mill. EUR), donors (10 Mill. EUR), EE fund (6.2 Mill. EUR), central government (1 Mill. EUR)
Progress indicators:	<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq)

* together with Replacement of windows, Retrofitting of existing buildings, Construction of new residential buildings and Construction of new commercial buildings

Construction of passive buildings				
Main objective: After 31.12.2022 all new building should be nearly zero-energy buildings				
Description: The measure considers construction of new passive buildings in compliance with the EU Directive 2010/31/EU. This measure will provide issuing of certificates for energy performance of buildings.				
Information	Type		Technical, regulatory	
	Sector		Households and commercial sector, central government and local self-government buildings	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ Rulebook on Energy Performance of Buildings ▶ Rulebook on Energy Audits ▶ 3rd National Energy Efficiency Action Plan 	
	Methodology		Construction of passive buildings. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.	
	Assumptions		Construction of new passive buildings, while meeting the standard for at least A+ class (15 kWh/m ²). The savings are calculated based on the data for building certificates (A+ certificates were considered).	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	▶ The Energy Efficiency Law adopted	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Adoption of Strategy for Renovation of Residential, Public and Commercial buildings ▶ Establishment of an Energy Efficiency Fund ▶ Adoption of new Rulebook on Energy Performance of Buildings ▶ Adoption of Rulebook on Energy Audits of buildings ▶ Adoption of Plan for increasing the number of nearly zero-energy buildings 	
	Energy savings	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0 ▶ 2017 – 0.02 ▶ 2018 – 0 ▶ 2019 – 0 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 0.02
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario, including EE certificates for buildings <ul style="list-style-type: none"> ▶ 2020 – 0.4 ▶ 2021 – 0.8 ▶ 2022 – 1
	Energy savings	Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 0 ▶ 2017 – 0.03 ▶ 2018 – 0 ▶ 2019 – 0 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 0.03
			Estimated emission reductions (Gg CO2-eq)	2018: 0.1 2022: 3.3
	Timeframe		2020– 2040	
	Budget		Spent in the period 2016-2019: / Expected for the period 2020-2022: ▶ 56.6 Mil. EUR (only for implementation of EE standard)	
	Implementing entity		<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Ministry of Transport and Communication ▶ Donors and financial institutions ▶ Investors 	
	Source of finance		▶ Private	
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq) 		

* the savings after 2019 are reported together with the measures EE Certificates for buildings

Phasing out of incandescent lights	
Main objective: Improve the efficiency of lighting following the EU policies.	

Description: Governments around the world have passed measures to phase out incandescent light bulbs for general lighting in favour of more energy-efficient lighting alternatives. The goal is to improve energy efficiency, rather than forbid the use of incandescent technology. This measure includes replacing conventional incandescent light bulbs with halogen ones, compact fluorescent (CFL) and LED.				
Information	Type		Regulatory, policy	
	Sector		Households	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ Commission Regulation(EC) No 244/2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps ▶ Rulebook for labelling of energy consumption and other resources for product that use energy ▶ Decree on eco product design ▶ 3rd National Energy Efficiency Action Plan 	
	Methodology		Introducing a Regulation that will prohibit sales of incandescent light bulbs. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.	
	Assumptions		It is assumed that a Regulation will be adopted on prohibiting sales of incandescent light bulbs, its implementation will start in 2022, and it is assumed that there will be 2-3 years of transition period. The savings are calculated based on the data from the Household Survey conducted by SSO for the number of households that are using incandescent lights. It is assumed that the average number of bulbs per household is 20 and that in the period 2016-2019 around 15% of the total number of incandescent lights is replaced with LED lights.	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	The price of LED lights is decreasing and is approaching the price of incandescent lights.	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Adoption of new Decree on eco-design of energy-related products in which the most recent EU implementing measures (technical regulations) related to non-directional, fluorescent and high intensity discharge lamps (lights) will be transposed and possibly prohibit sales of incandescent light bulbs in a certain transition period. ▶ Information campaign targeting lamps suppliers and consumers 	
	Energy savings (ktoe)	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 1.35 ▶ 2017 – 3.37 ▶ 2018 – 5.40 ▶ 2019 – 7.42 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 10.12
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario <ul style="list-style-type: none"> ▶ 2020 – 20.7 ▶ 2021 – 26.2 ▶ 2022 – 31.5
		Primary energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 4.62 ▶ 2017 – 11.55 ▶ 2018 – 18.48 ▶ 2019 – 25.41 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 34.65
			Expected	
	Estimated emission reductions (Gg CO ₂ -eq)		2018: 156.5 2022: 83	
	Timeframe		2017– 2040	
	Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 2.3 Mil. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 20.7 Mil. EUR 	
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Ministry of Economy, Energy Agency ▶ End-users 	
Source of finance		<ul style="list-style-type: none"> ▶ Private (14.9 Mill. EUR), central government (2.8 Mill. EUR), local-self government (2.8 Mill. EUR), donors (0.2 Mill. EUR) 		
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO₂-eq) 		

5.2.2 Building renovation strategy (Article 4)

Development of building renovation strategy

Main objective: Fulfilment of the obligation from the Law on energy efficiency

Description: With the growing effects of climate change, the need to decarbonise all sectors of the economy, including the building stock, is increasingly important. Past efforts to encourage uptake of individual insulation measures is no longer adequate – buildings need to be deeply renovated, including the incorporation of renewable energy technologies, in order to achieve high levels of energy performance. At the same time, upstream energy supplies need to be fully decarbonised to achieve net zero emissions

The implementation of building retrofit measures is highly dependent from the development of building renovation strategy. The focus is on providing a comprehensive framework of policies (used collectively to include support mechanisms, legislation, financial and fiscal measures, actions, communication plans, obligations and other types of measure) that addresses the full spectrum of building typologies and ownership types. At the same time, the strategy is designed to be compliant with the requirements of the EU Energy Performance of Buildings Directive (EPBD) Article 2a on Long Term Renovation Strategies (LTRS), which North Macedonia will need to comply with once accession talks have concluded.

To be truly effective, a renovation strategy must have the wholehearted support across government at the highest level as well as among key stakeholders. It cannot be considered as solely the responsibility of one department but should be considered as a means of achieving multiple strategic goals: improving economic development, employment, industrial strategy, skills, health, energy security and environmental protection.

In order to support the Ministry of economy in the process of Building renovation strategy development, in Appendix III of the Program for the realization of the energy Strategy a detailed steps and a lot of recommendations are provided.

Information	Type		Regulatory, policy		
	Sector		Energy		
	Relevant planning documents, legal and regulatory acts		▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040		
	Methodology		/		
	Assumptions		/		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	Habitat for Humanity Macedonia is currently developing a Residential Building Stock Energy Assessment for the country based on the TABULA methodology. This is the first step towards preparing a National Building Renovation Strategy.		
		Steps envisaged	▶ Starting the process of development of building renovation strategy ▶ Implementation of the recommendation provided in the Appendix III of the Program for the realization of the energy Strategy ▶ Enter into discussion with EU, EBRD and World Bank to identify funding opportunities, credit lines and technical assistance that can support the financing of the renovation transition.		
	Energy savings (ktoe)	Final energy	Achieved	/	/
			Expected	/	/
		Primary energy	Achieved	/	/
	Estimated emission reductions (Gg CO₂-eq)		/		
	Timeframe		2021– 2023		
	Budget		▶ 0.2 Mill. EUR		
	Implementing entity		▶ Government of the Republic of North Macedonia ▶ Ministry of economy ▶ Ministry of Finance ▶ Ministry of Environment and Physical Planning		
	Source of finance		▶ Donors		
Progress indicators:		▶ Strategy adopted			

5.3 ENERGY EFFICIENCY IN PUBLIC BODIES

5.3.1 Central and local government buildings (Article 5)

Retrofitting of existing central and local self-government buildings															
Main objective: Retrofitting of existing public buildings with aim to meet the objectives of the EE Directive and the Energy Efficiency Law															
Description: Having in mind the situation with the energy performance of the public buildings at central and local self-government level and the role that they should play, it is essential to boost their renovation. Article 5 of the EE Directive is of great importance because it can be a starting point for the retrofit expansion. This measure considers reconstruction including insulation and windows replacement of existing public buildings. Local self-government should be encouraged by the central government renovation strategy, so they can put special attention on buildings under their competence.															
Information	Type		Technical, regulatory												
	Sector		Central government and local self-government buildings												
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ Rulebook on Energy Performance of Buildings ▶ Rulebook on Energy Audits ▶ 3rd National Energy Efficiency Action Plan 												
	Methodology		Retrofitting of existing public buildings. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.												
	Assumptions		The specific consumption from the National Program for EE in public buildings (Draft version) is considered (average 214 kWh/m ² annually). The savings are calculated based on the data from SSO for construction sector (Value of construction works performed by construction business entities in thousands of denars, for public buildings, according to the Nomenclature of buildings). The renovated public buildings meet the standard for at least C class (95 kWh/m ²).												
	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Draft National Program for energy efficiency in public buildings in the Republic of Macedonia (Phase I) was developed under the GEF Sustainable Energy Project ▶ “Resilient Skopje” – Climate Change Strategy for the City of Skopje developed. ▶ Law on Energy Efficiency adopted. ▶ Development of a list of public buildings at governmental level ▶ Project for rehabilitation of student dormitories in the Republic of North Macedonia started, which is financed with a loan from KfW 												
		Steps envisaged	<ul style="list-style-type: none"> ▶ Adoption of Typology of buildings in the public sector ▶ Adoption of Strategy for Renovation of Residential, Public and Commercial buildings ▶ Establishment of an Energy Efficiency Fund ▶ Adoption of new Rulebook on Energy Performance of Buildings ▶ Adoption of Rulebook on Energy Audits of buildings ▶ Regular adoption of energy efficiency programmes and plans by the municipalities and reports on their implementation ▶ Fully-fledged information system on monitoring and management of energy consumption and MVP tool 												
Progress of implementation	Energy savings (ktoe)	Final energy	<table border="1"> <tr> <td>Achieved</td> <td>Per year</td> <td>Savings in 2018 (taking into account the measures implemented in the period 2016-2018)</td> </tr> <tr> <td></td> <td> <ul style="list-style-type: none"> ▶ 2016 – 0.18 ▶ 2017 – 0.07 ▶ 2018 – 0.08 ▶ 2019 – 0.14 </td> <td> <ul style="list-style-type: none"> ▶ 0.33 </td> </tr> <tr> <td>Expected</td> <td>Cumulative (starting from 2017) based on the Energy Strategy – Green scenario, including Construction of new central and local self-government buildings</td> <td></td> </tr> <tr> <td></td> <td> <ul style="list-style-type: none"> ▶ 2020 – 0.8 ▶ 2021 – 1.1 ▶ 2022 – 2.5 </td> <td></td> </tr> </table>	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)		<ul style="list-style-type: none"> ▶ 2016 – 0.18 ▶ 2017 – 0.07 ▶ 2018 – 0.08 ▶ 2019 – 0.14 	<ul style="list-style-type: none"> ▶ 0.33 	Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario, including Construction of new central and local self-government buildings			<ul style="list-style-type: none"> ▶ 2020 – 0.8 ▶ 2021 – 1.1 ▶ 2022 – 2.5 	
		Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)											
		<ul style="list-style-type: none"> ▶ 2016 – 0.18 ▶ 2017 – 0.07 ▶ 2018 – 0.08 ▶ 2019 – 0.14 	<ul style="list-style-type: none"> ▶ 0.33 												
Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario, including Construction of new central and local self-government buildings														
	<ul style="list-style-type: none"> ▶ 2020 – 0.8 ▶ 2021 – 1.1 ▶ 2022 – 2.5 														
Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 0.41 ▶ 2017 – 0.16 ▶ 2018 – 0.19 ▶ 2019 – 0.32 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)												
			<ul style="list-style-type: none"> ▶ 0.76 												
Estimated emission reductions (Gg CO ₂ -eq)		2018: 11.6 2022: 9.1													
Timeframe		2020– 2040													
Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 51.5 Mil. EUR (total investment including construction and implementation of EE standard) Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 44.5 Mil. EUR (only for implementation of EE standard)* 													
Implementing entity		<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Ministry of Finance ▶ Local self-government ▶ Municipal public enterprises ▶ Donors and financial institutions 													

Source of finance	▶ Central government budget (15.4 Mill. EUR), local self-government budget (21.1 Mill. EUR), donors (8 Mill. EUR)
Progress indicators:	▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq)

**This measure includes budget for Construction of new central and local self-government buildings*

Construction of new central and local self-government buildings				
Main objective: Construction of new public buildings that meet the objectives of the EE Directive and the Energy Efficiency Law				
Description: Having in mind the situation with the energy performance of the public buildings at central and local self-government level and the role that they should play, it is essential to construct new central and local self-governmental buildings that are in accordance with the EE Directive. Article 5 of the EE Directive is of great importance because it can be a starting point for the retrofit expansion.				
Information	Type	Technical		
	Sector	Central government and local self-government buildings		
	Relevant planning documents, legal and regulatory acts	<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ Rulebook on Energy Performance of Buildings ▶ Rulebook on Energy Audits ▶ 3rd National Energy Efficiency Action Plan 		
	Methodology	Construction of new public buildings. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions	The savings are calculated based on the data from SSO for construction sector (Value of construction works performed by construction business entities in thousands of denars, for public buildings, according to the Nomenclature of buildings). The renovated public buildings meet the standard for at least C class (95 kWh/m2).		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Draft National Program for energy efficiency in public buildings in the Republic of Macedonia (Phase I) was developed under the GEF Sustainable Energy Project ▶ “Resilient Skopje” – Climate Change Strategy for the City of Skopje developed. 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Adoption of Typology of buildings in the public sector ▶ Adoption of Strategy for Renovation of Residential, Public and Commercial buildings ▶ Establishment of an Energy Efficiency Fund ▶ Adoption of new Rulebook on Energy Performance of Buildings ▶ Adoption of Rulebook on Energy Audits of buildings ▶ Adoption of Law on Debt of Republic of North Macedonia with a Loan from the International Bank for Reconstruction and Development - World Bank under a Loan Agreement for Financing the Energy Efficiency Project in Public Sector 	
	Energy savings (ktoe)	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.41 ▶ 2017 – 0.41 ▶ 2018 – 0.26 ▶ 2019 – 0.23 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 1.08
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario, including Retrofitting of existing central and local self-government buildings <ul style="list-style-type: none"> ▶ 2020 – 0.8 ▶ 2021 – 1.1 ▶ 2022 – 2.5
	Energy savings (ktoe)	Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 0.94 ▶ 2017 – 0.94 ▶ 2018 – 0.58 ▶ 2019 – 0.53 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 2.46
			Estimated emission reductions (Gg CO2-eq)	2018: 11.6 2022: 9.1
	Timeframe		2020– 2040	
	Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 144 Mil. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 44.5 Mil. EUR (only for implementation of EE standard)* 	
	Implementing entity		<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Ministry of Finance ▶ Local self-government ▶ Municipal public enterprises ▶ Donors and financial institutions 	
	Source of finance		▶ Central government budget (15.4 Mill. EUR), local self-government budget (21.1 Mill. EUR), donors (8 Mill. EUR)	
Progress indicators:		▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq)		

**This measure includes budget for Retrofitting of existing central and local self-government buildings*

5.3.2 Other measures implemented by public bodies

Improvement of the street lighting in the municipalities				
Main objective: Reduce the costs and increase the quality of the street lighting.				
Description: The cost of street lighting, including electricity and maintenance, can have a huge impact on the budget of the municipalities. In addition, having in mind that a lot of manufacturers work on daily bases on improvement of the light bulbs, new opportunities are being opened for the municipalities. The inefficient light bulbs should be replaced, purchasing new ones that comply with criteria of belonging to the highest EE class possible (LED lamps).				
Information	Type	Technical		
	Sector	Local self-government		
	Relevant planning documents, legal and regulatory acts	<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ Rulebook for labelling of energy consumption and other resources for product that use energy ▶ Decree on eco product design ▶ Law on Concessions and Public Private Partnership 		
	Methodology	Replacement of the mercury lamps with sodium and LED lamps. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology		
	Assumptions	For calculating the savings, based on the feasibility studies and public procurement contracts of the municipalities, the average number of replaced bulbs is calculated (around 170 bulbs yearly per municipality).		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Street lighting replaced in some municipalities ▶ Promotional activities for the implementation of public-private partnership (PPP) taken ▶ Fully-fledged information system on monitoring and management of energy consumption and MVP tool 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Continuing the promotional activities for the implementation of PPP ▶ Adoption of new Rulebook on labelling of the energy and other resources consumption of products that use energy ▶ Adoption of a new Decree on the Eco-Design Requirements for Energy Related Products ▶ Adoption of Decree for Regulation of the Energy Services Contracts ▶ Adoption of Guidelines containing instructions regarding the energy services contracts, procedures and documents for preparation and initiating the procedure for selection of ESCOs by the public sector entities, and in particular by the local self-government units, methodologies and rules related to the assessments of possible energy savings, including models for feasibility studies and other matters in relation to the energy services and the activities of the ESCOs in the Republic of North Macedonia 	
	Energy savings	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.56 ▶ 2017 – 0.56 ▶ 2018 – 0.56 ▶ 2019 – 0.56 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 1.68
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario <ul style="list-style-type: none"> ▶ 2020 – 3.2 ▶ 2021 – 4 ▶ 2022 – 4.2
	Energy savings	Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 1.92 ▶ 2017 – 1.92 ▶ 2018 – 1.92 ▶ 2019 – 1.92 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 5.76
			Estimated emission reductions (Gg CO ₂ -eq)	2018: 26.1 2022: 20.3
	Timeframe		2017– 2040	
	Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 3 Mil. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 1.8 Mil. EUR 	
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Energy Agency ▶ Local self-government 	
	Source of finance		<ul style="list-style-type: none"> ▶ Central and local government budget (0.9 Mill. EUR), ESCO companies-PPP (0.9 Mill. EUR) 	
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO₂-eq) 		

5.3.3 Purchasing by public bodies (Article 6)

"Green procurements"					
Main objective: Application of energy efficiency criteria ("greening") in public procurement procedures					
Description: According to Article 6 from the EE Directive, central governments can purchase only products, services and buildings with high energy-efficiency performance. Intensified activities should take place to ensure legal and technical knowledge and skills of public sector entities for inclusion and evaluation of requirements for energy efficiency in public procurement procedures by applying the criteria of most economically advantageous tender.					
Information	Type		Regulatory		
	Sector		Public bodies		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ Rulebook for labelling of energy consumption and other resources for product that use energy ▶ Decree on eco product design ▶ Law on Concessions and Public Private Partnership 		
	Methodology		Implementation of Green procurement (energy efficiency criteria). Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions		In the absence of data, the savings are used from the annual reports of the Energy Agency.		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Law on Energy Efficiency adopted ▶ Law on Public procurement adopted 		
		Steps envisaged	<ul style="list-style-type: none"> ▶ Drafting and adopting the following bylaws from the Law on Energy efficiency: <ul style="list-style-type: none"> ▶ Decree on eco-design of energy related products, ▶ Rulebook on Eco-labelling of energy related products, ▶ Rulebook on energy performance of buildings and ▶ Rulebook on green procurements that will include methodology for determining the energy efficiency level of other products as foreseen in the article 13 of the EE Law ▶ Organizing specialized trainings for contracting authorities on this subject matter ▶ Developing model technical specifications for purchase of certain energy related products of general use that will include green and energy efficiency criteria, thus facilitating the procurement process 		
	Energy savings	Final energy	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario	
	Energy savings	Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 0.17 ▶ 2017 – 0.17 ▶ 2018 – 0.34 ▶ 2019 – 0.34 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
			Expected	<ul style="list-style-type: none"> ▶ 2020 – 0.3 ▶ 2021 – 0.4 ▶ 2022 – 0.7 	
	Estimated emission reductions (Gg CO2-eq)		2018: 3.1 2022: 2.5		
	Timeframe		2017– 2040		
	Budget		Spent in the period 2016-2019: ▶ / Expected for the period 2020-2022: ▶ 0.8 Mil. EUR		
	Implementing entity		<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Public Procurement Bureau ▶ Large contracting authorities on central and local level 		
Source of finance		▶ Central and local government budget			
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq) 			

5.4 ENERGY EFFICIENCY IN INDUSTRY

5.4.1 Main policy measures addressing energy efficiency in industry

Energy management in manufacturing industries					
Main objective: Efficient management of manufacturing processes in industry aiming to increase production using the same energy consumption.					
Description: This measure considers implementation of obligatory energy audits of large companies and implementation of ISO 50001 standard, as well as advanced measurement and introduction of new IT technologies. This will enable prevention of defects, better process control and quicker response times in manufacturing using advanced data analysis and predictive technologies.					
Information	Type		Regulatory, technical		
	Sector		Industry		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Law on energy efficiency ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 		
	Methodology		Implementation of the ISO 50001 standard. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions		The calculations are taken from the annual report of the Energy Agency		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Promotion of ISO 50001 standards completed ▶ Training on implementation of energy management in industry organized ▶ Certificates for energy auditors issued ▶ USAID project for energy management in industry realized in 17 companies ▶ UNIDO/GEF Project in which one of the activities is Program for energy management in industrial companies according to ISO 50001 standard and the UNIDO Methodology. Initial results achieved in 12 companies and additionally Program for replications of the energy management systems realized in 5 companies. 		
		Steps envisaged	<ul style="list-style-type: none"> ▶ Continuation of the implementation of ISO 50001 standard in more industrial companies (manufacturing industries). ▶ Drafting and adopting the Rulebook on energy audits in large companies based on and with the content prescribed in article 16 of the EE Law ▶ Implementation of obligatory energy audits. 		
	Energy savings	Final energy	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario	▶ 2018 – 1.5
				<ul style="list-style-type: none"> ▶ 2016 – 0.5 ▶ 2017 – 0.5 ▶ 2018 – 0.5 ▶ 2019 – 	
				<ul style="list-style-type: none"> ▶ 2020 – 0.9 ▶ 2021 – 2 ▶ 2022 – 3.3 	
		Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 0.9 ▶ 2017 – 0.9 ▶ 2018 – 0.9 ▶ 2019 – 0.9 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
					▶ 2018 – 2.7
		Estimated emission reductions (Gg CO ₂ -eq)		2018: 11.2 2022: 13	
		Timeframe		2017– 2040	
	Budget		Spent in the period 2016-2019: ▶ / Expected for the period 2020-2022: ▶ Mil. EUR		
	Implementing entity		<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Private companies 		
	Source of finance		▶ Private, donors through commercial EE loans		
	Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO₂-eq) 		

Introduction of efficient electric motors					
Main objective: Increase the competitiveness of the industrial products through improvement of the efficiency in the production process and reducing the resources.					
Description: Electric motors are responsible for a high share of the total electricity consumption in industries. This measure considers replacement of the obsolete machines currently in use, with new more efficient motors.					
Information	Type		Technical		
	Sector		Industry		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Law on energy efficiency ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 		
	Methodology		Installation of efficient electric motors. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions		The calculations are taken from the annual report of the Energy Agency		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	New efficient electric motors installed in a number of companies.		
		Steps envisaged	Replacement of the existing electric motors with more efficient		
	Energy savings	Final energy	Achieved	Per year ▶ 2016 – 0.2 ▶ 2017 – 0.2 ▶ 2018 – 0.2 ▶ 2019 – 0.2	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 0.6
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario ▶ 2020 – 0.3 ▶ 2021 – 0.5 ▶ 2022 - 1	
		Primary energy	Achieved	▶ 2016 – 0.68 ▶ 2017 – 0.68 ▶ 2018 – 0.68 ▶ 2019 – 0.68	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 2
			Estimated emission reductions (Gg CO2-eq)	2018: 9.3 2022: 4.3	
	Timeframe		2017– 2040		
	Budget		Spent in the period 2016-2019: ▶ / Expected for the period 2020-2022: ▶ 6.8 Mil. EUR		
	Implementing entity		<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Private companies 		
	Source of finance		▶ Private		
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq) 			

Introduction of more advanced technologies				
Main objective: Introduction of more advanced technologies in the industrial processes that will also enable use of more environmental friendly fuels.				
Description: Advanced industrial technologies present major opportunities for further reduction of the energy consumption and potentially lower costs as well as environmental benefits. In addition, they can help various industries to progress at a much faster rate.				
Information	Type		Technical	
	Sector		Industry	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Law on energy efficiency ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 	
	Methodology		Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.	
	Assumptions		The calculations are taken from the annual report of the Energy Agency	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Construction of gas transmission network in Macedonia ▶ Klechovce-Valve station 5 (Stip), finished in 2016 ▶ Valve station 5(Stip)-Negotino, finished in 2019 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Finishing the construction of gas transmission network in Macedonia <ul style="list-style-type: none"> ○ Negotino (Kavadarci)-Bitola, 90% realized June 2020 ○ Skopje-Tetovo-Gostivar, 53.1% realized November 2019 ○ Gostivar-Kicevo, in a process of obtaining building permit (by 2022) ○ Kicevo-Ohrid (to be finished by 2025) ○ Valve station 5 (Stip)-Radovis-Strumica ▶ Inventory on the companies where coal or natural gas 	
	Energy savings	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 1.8 ▶ 2017 – 1.8 ▶ 2018 – 1.8 ▶ 2019 – 1.8 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 5.4
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario <ul style="list-style-type: none"> ▶ 2020 – 6.7 ▶ 2021 – 8.4 ▶ 2022 – 23.3
		Primary energy	Achieved	<ul style="list-style-type: none"> ▶ 2016 – 3.2 ▶ 2017 – 3.2 ▶ 2018 – 3.2 ▶ 2019 – 3.2 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 9.6
			Estimated emission reductions (Gg CO2-eq)	2018: 40.4 2022: 78
	Timeframe		2017– 2040	
	Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ / Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 56.7 Mil. EUR 	
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Energy Regulatory Commission ▶ Ministry of Environment and Physical Planning ▶ Ministry of Economy, Energy Agency ▶ Private investors 	
	Source of finance		▶ Private	
Progress indicators:		<ul style="list-style-type: none"> ▶ Increase in installed capacity (MW) ▶ Increase in electricity generation (GWh) ▶ Emissions reduction (Gg CO2-eq) 		

5.5 ENERGY EFFICIENCY IN TRANSPORT

5.5.1 Energy end-use efficiency measures in transport

Increased use of the railway				
Main objective: Improve the energy efficiency in the transport sector using cheap and efficient railway transport.				
Description: Although the rail transport is cheap, official statistical data show that in the last three years there is a downward trend. Using this mode of transport as one of the most efficient can also improve the competitiveness of the companies. Therefore, at least several listed measures should be implemented, aiming to return the utilization level of this transport as of three years ago, and further increase it. The measure includes:				
<ul style="list-style-type: none"> ▶ implement raising awareness campaigns ▶ invest in stations and improve the “access to the stations” ▶ increase the network security and expand the network coverage 				
Information	Type	Technical, information		
	Sector	Transport		
	Relevant planning documents, legal and regulatory acts	<ul style="list-style-type: none"> ▶ Law on energy efficiency ▶ National Transport Strategy ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Railway System ▶ Law on Safety of Railway System 		
	Methodology	Conducting campaigns and modernization of the railway. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions			
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ 150 freight cars and six compositions consisting of a locomotive and passenger cars ordered by the Government as part of a project with the European Bank for Reconstruction and Development (EBRD). Some of these have already been received and put into use. ▶ Campaigns for cheaper/free driving of certain categories of passengers (young people, pensioners, etc.) carried out 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Arrival and putting into use of other commissioned wagons ▶ Implement promotional campaigns for raising public awareness ▶ Continuing the campaigns for cheaper/free driving ▶ Enabling additional conditions for companies ▶ Improve the “access to the stations” ▶ invest in stations ▶ Liberalize the railway passenger transport ▶ increase the network security and expand the network coverage 	
	Energy savings	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – / ▶ 2017 – 1.36 ▶ 2018 – 0.76 ▶ 2019 – 1.06 Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 2.12
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario <ul style="list-style-type: none"> ▶ 2020 – 7.9 ▶ 2021 – 8.6 ▶ 2022 – 9.2
		Primary energy	Achieved	▶ Same as final
	Estimated emission reductions (Gg CO ₂ -eq)		2018: 6.6 2022: 30	
	Timeframe		2020– 2040	
	Budget		Spent in the period 2016-2019: ▶ / Expected for the period 2020-2022: ▶ 42.1 Mill. EUR	
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Ministry of Transport and Communications ▶ Ministry of Economy, Energy Agency ▶ JSC Macedonian Railway Transport ▶ End-users ▶ Private companies 	
	Source of finance		▶ Central government budget	
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Increase of passenger km in railway transport (pkm) ▶ Increase of tones km in railway transport (tkm) ▶ Emissions reduction (Gg CO₂-eq) 		

Renewing of the national car fleet					
Main objective: Use of more advanced technologies in order to slow down the growing energy consumption in the transport sector, which is complex and with limited capabilities of energy use reduction					
Description: Increased use of new and more efficient technologies in the transport sector.					
Information	Type		Regulatory, policy, information		
	Sector		Transport		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ National Transport Strategy ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on vehicles ▶ Law on vehicle tax ▶ Law on Value Added Tax 		
	Methodology		Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions		The savings are calculated based on the data form SSO for number of vehicles per year of production. Vehicles produced in the period 2016-2019 are considered in this measure, plus 20% of the vehicles whose first registration is in the period 2016-2019. For the calculation of the budget of this measure, it is assumed that an average price of purchased vehicle is 12,000 EUR.		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Law on vehicles adopted (August 2019) ▶ Law on vehicle tax adopted ▶ Excise duty of diesel fuel is increased ▶ Bylaws from Law on vehicle tax adopted 		
		Steps envisaged	<ul style="list-style-type: none"> ▶ Reduction of VAT from 18% to 5% for hybrid and electric vehicles ▶ Direct subsidizing of hybrid vehicles, ▶ Gradual equalization of the excise duties of diesel fuel and petrol ▶ Obligations of public institutions to purchase vehicles with low CO2 emissions (up to 90 gCO2/km by 2020 and 50 gCO2/km by 2025). ▶ Increase the EURO standard for import of cars 		
	Energy savings	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 1.80 ▶ 2017 – 1.68 ▶ 2018 – 2.01 ▶ 2019 – 2.16 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario	
		Primary energy	Achieved	▶ Same as final	
	Estimated emission reductions (Gg CO2-eq)		2018: 17.1		
	Timeframe		2022: 89		
	Budget		2020– 2040		
	Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 480 Mil. EUR (vehicles purchasing) Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 134 Mil. EUR 		
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Ministry of Transport and Communications ▶ Ministry of Finance ▶ Ministry of Economy, Energy Agency ▶ End-users 		
Source of finance		<ul style="list-style-type: none"> ▶ Private (92 Mill. EUR), central government budget (22 Mill. EUR), local-self government (20 Mill. EUR) 			
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq) 			

Renewing of other national road fleet (light duty and heavy goods vehicles and buses)					
Main objective: Reduction of the local air pollution					
Description: This measure anticipates introduction of a regulation that will enable renewal of the vehicle fleet of light duty and heavy goods vehicles and buses.					
Information	Type		Regulatory, policy		
	Sector		Transport		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ National Transport Strategy ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on vehicles ▶ Law on road transport ▶ Law on vehicle tax 		
	Methodology		Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions		The savings are calculated based on the data form SSO for number of buses, light duty and heavy goods vehicles per year of production. Vehicles produced in the period 2016-2019 are considered in this measure.		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	▶ The city of Skopje purchased 33 new CNG buses in 2020 (10 Mil. EUR)		
		Steps envisaged	<ul style="list-style-type: none"> ▶ Successive implementation of EURO standards (EU new standard is a EURO 6, while in Macedonia is EURO 4) for import of new EE vehicles ▶ Raise the minimum standard for the passenger transport vehicles from eco category 3 to eco category 2 		
	Energy savings	Final energy	Achieved	Per year ▶ 2016 – 0.16 ▶ 2017 – 0.40 ▶ 2018 – 0.38 ▶ 2019 – 0.34	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 0.94
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario ▶ 2020 – 0.2 ▶ 2021 – 0.8 ▶ 2022 – 1.2	
		Primary energy	Achieved	▶ Same as final	
	Estimated emission reductions (Gg CO2-eq)		2018: 2.9 2022: 3.7		
	Timeframe		2020– 2040		
	Budget		Spent in the period 2016-2019: ▶ / Expected for the period 2020-2022: ▶ 15.8 Mil. EUR		
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Ministry of Transport and Communications ▶ Ministry of Economy, Energy Agency ▶ Association of road transport carriers ▶ Private companies 		
	Source of finance		▶ Private (5.8 Mill. EUR), EBRD (10 Mill. EUR)		
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq) 			

Advanced mobility					
Main objective: Reduction of the local air pollution					
Description: The measure includes conducting campaigns/providing subsidies and systems for use of new or rented bicycles, electric scooters, promoting walking, and introduction of parking policies that would reduce the use of cars in the city area. People, especially in smaller towns where a lot of them use cars for short distances, would increase the use of bicycles/electric scooters or walking.					
Information	Type		Regulatory, technical, information		
	Sector		Transport		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ National Transport Strategy ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Decisions made by municipalities to subsidize buying of new bicycles 		
	Methodology		Implementation of campaigns/subsidies, parking policies. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions		<p>The savings are calculated based on the data for subsidies for bicycles and electric scooter in the period 2016-2019 provided by the following:</p> <ul style="list-style-type: none"> ▶ City of Skopje ▶ Center ▶ Karpos ▶ Aerodrom ▶ Cair ▶ Negotino ▶ Bitola ▶ Kavadarci <p>In total in the period 2016-2019 around 17,500 bicycles and around 300 electric scooters were subsidized.</p>		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Subsidies and campaigns for buying new bicycles/electric scooters implemented ▶ Systems for bicycles renting implemented ▶ Bicycles tracks constructed ▶ Zonal parking implemented ▶ New multi-level car parks constructed 		
		Steps envisaged	<ul style="list-style-type: none"> ▶ Continue the implementation of the campaigns and subsidies for buying new bicycles/electric scooters and renting bicycles ▶ Continue the construction of new bicycles tracks 		
	Energy savings	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.24 ▶ 2017 – 0.20 ▶ 2018 – 0.27 ▶ 2019 – 0.29 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 0.71
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario <ul style="list-style-type: none"> ▶ 2020 – 0.7 ▶ 2021 – 0.8 ▶ 2022 – 0.9 	
	Energy savings	Primary energy	Achieved	▶ Same as final	
			Estimated emission reductions (Gg CO ₂ -eq)	2018: 2.7 2022: 2.6	
	Timeframe		2017– 2040		
	Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 2.9 Mil. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 2 Mil. EUR 		
	Implementing entity		<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Local self-government ▶ End-users 		
	Source of finance		▶ Private (1.4 Mill. EUR), local government budget (1.6 Mill. EUR)		
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO₂-eq) 			

Construction of the railway to Republic of Bulgaria				
Main objective: By connecting the Republic of North Macedonia with the Republic of Bulgaria with railway line, additional low-cost and environment friendly means of transport will be available, which will extend the export to external markets, not just in the neighboring countries but in the Southeast Europe and Turkey region, using the railway transport, as well as decrease the use of fuels in transport sector.				
Description: The construction of this railway line started decades ago, but it was halted for many years. According to the Memorandum for development of railway network signed in 2017 between the Republic of North Macedonia and Republic of Bulgaria, the construction of the railway is foreseen to be completed on both territories				
Information	Type		Technical, policy	
	Sector		Transport	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Work Program of the Government of the Republic of North Macedonia ▶ National Transport Strategy 	
	Methodology		Construction of the railway. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.	
	Assumptions		/	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ In 2017, EU awarded 70 mil. EUR grant to the Government for construction of this railway line ▶ First phase (Kumanovo - Beljakovce) is under construction, 67% constructed by the end of 2019 ▶ Since the construction of the first phase was cancelled, new tender was published for both the first and the second phase in February 2021 (North Macedonia: Rail Corridor VIII, First And Second Section Re-Tender Eastern Part Of Railway Corridor VIII, First Section Kumanovo-Baljakovce And Second Section, Beljakovce – Kriva Palanka). 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Finishing the construction of the railway and putting it into operation ▶ Tender for the third phase (Kriva Palanka – Deve Bair) to be announced. 	
	Energy savings (ktoe)	Final energy	Achieved	/
			Expected	/
	Energy savings (ktoe)	Primary energy	Achieved	/
			Expected	/
	Estimated emission reductions		/	
	Timeframe		2019– 2040	
	Budget		50 Mil. EUR	
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Ministry of Transport and Communications ▶ Ministry of Economy, Energy Agency 	
	Source of finance		▶ EBRD	
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Increase of the tonnes km in the railway transport (tkm) ▶ Emissions reduction (Gg CO2-eq) 		

Electrification of the transport				
Main objective: Transition from society based on fossil fuels to low carbon society, where the renewable energy and electrification of the transport will play the most important role				
Description: Increased the share of electric vehicles in the vehicles fleet.				
Information	Type		Regulatory, policy, information	
	Sector		Transport	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ National Transport Strategy ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on vehicles ▶ Law on vehicle tax 	
	Methodology		Introducing a Regulation that will prohibit the purchase of cars with a standard lower than EURO6. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.	
	Assumptions		According to the data from SSO, in 2019 there are in total 51 electric vehicles and 86 electric two wheelers in the country. In the absence of data the number of plug-in vehicles is not considered.	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Chargers installed at specific locations in the City of Skopje ▶ Law on vehicles adopted (August 2019) ▶ Law on vehicle tax and bylaws adopted ▶ Exemption from paying vehicle tax on import of electric vehicles ▶ Reservation of Greenparking in all public parking lots ▶ Base the methodology for calculation of vehicle tax on import on CO2 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Development of studies for determining the best locations for installation of electric vehicles chargers from the aspect of the power grid. ▶ Program for subsidizing new vehicles should be adopted ▶ Direct subsidizing of electric vehicles, 5000 EUR per vehicle ▶ Obligation to place fast chargers at all gas stations on motorways (at every 100 km) ▶ Development of strategy for electrification of the transport sector ▶ Development of strategy for introduction of hydrogen 	
	Energy savings (ktoe)	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.02 ▶ 2017 – 0.00 ▶ 2018 – 0.01 ▶ 2019 – 0.01
			Expected	Cumulative (starting from 2017) based on the Energy Strategy – Green scenario <ul style="list-style-type: none"> ▶ 2020 – 3.4 ▶ 2021 – 7.2 ▶ 2022 - 10.4
		Primary energy	Achieved	▶ Same as final
	Estimated emission reductions (Gg CO2-eq)		2018: 0.1 2022: 30	
	Timeframe		2020– 2040	
	Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 0.9 Mil. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 100 Mil. EUR 	
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Municipalities and the city of Skopje ▶ Ministry of Transport and Communications ▶ Private owners ▶ Electricity TSO and DSO 	
	Source of finance		▶ Private (91.5 Mill. EUR), central government budget (8 Mill. EUR), local self government (0.5 Mill. EUR)	
Progress indicators:		<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq) 		

5.6 PROMOTION OF HIGH-EFFICIENCY COGENERATION AND DISTRICT HEATING AND COOLING (Article 14)

5.6.1 Current situation regarding cogeneration

At the moment, in Macedonia there are three CHP on natural gas, of which one big of 230 MW, and two smaller, each of 30 MW. All of them are located in Skopje. In the period 2016-2019, the heat production from CHP has increased by 2-3 times compared to 2015. This is a result of the reduction of natural gas price in Macedonia. Also, the electricity production from CHP in 2019 achieved almost 1000 GWh, while in 2015 it was around 200 GWh. In addition to this, in this NEEAP 15 MW biomass power plants are considered (with an option to be CHP). In the Strategy for energy development, as well as in the Program for its realization a construction of 450 MW natural gas CHP is envisioned. The main problem is to find a proper location for heat supply. One of the possibilities is replace one unit of TPP Bitola.

5.6.2 Current situation regarding efficient heating and cooling networks

Increased use of central heating systems					
Main objective: Reduction of the local air pollution, as household heating is one of the main sources for local pollution.					
Description: Increased use of the existing central heating systems through implementation of information campaigns for connecting new consumers, including those who have been disconnected from the system in the past.					
Information	Type	Technical, information			
	Sector	Households and commercial			
	Relevant planning documents, legal and regulatory acts	<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ Study for determining the techno-economic optimal and environmentally sustainable structure of heating and implementation of the central supply of sanitary hot water in the City of Skopje 			
	Methodology	Implementation of information campaigns. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.			
	Assumptions	The savings in this measure are calculated based on the data for the number of consumers connected on the central heating systems in Skopje, published by the Energy Regulatory Commission in their annual reports.			
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Studies for analysis of the central heating system and implementation of central supply of sanitary hot water developed ▶ Information campaigns for re-connection of the previously disconnected consumers and attraction of new consumers implemented ▶ Reduced the VAT from 18% to 5% 		
		Steps envisaged	<ul style="list-style-type: none"> ▶ Continuing the implementation of the information campaigns ▶ Enlargement of Heat Distribution network in Skopje ▶ Development of the District Heating in Municipality of Bitola 		
	Energy savings (ktoe)	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.13 ▶ 2017 – 0.16 ▶ 2018 – 0.18 ▶ 2019 – 0.07 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 0.47
			Expected	Cumulative (starting from 2017) based on the Energy Strategy –Green scenario <ul style="list-style-type: none"> ▶ 2020 – 0.4 ▶ 2021 – 0.6 ▶ 2022 – 0.8 	
	Energy savings (ktoe)	Primary energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 2.39 ▶ 2017 – 2.90 ▶ 2018 – 3.15 ▶ 2019 – 1.23 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) ▶ 8.45
			Estimated emission reductions (Gg CO ₂ -eq)	2018: 19.5 2022: 1.2	
	Timeframe	2019– 2040			
	Costs	Spent in the period 2016-2019: / Expected for the period 2020-2022: ▶ 3.3 Mil. EUR			
	Implementing entity	<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Balkan energy Dooel Skopje ▶ JSC Skopje Sever ▶ GES AD Skopje 			

		<ul style="list-style-type: none"> ▶ “Energetika” –Skopje, subsidiary to JSC Power Plants of North Macedonia (JSC ESM-Skopje) ▶ Private investors
	Source of finance	▶ Private
Progress indicators:		<ul style="list-style-type: none"> ▶ Increase of heat consumption (form central heating systems) (GWh) ▶ Increase in the number of consumers connected to the central heating system ▶ Emissions reduction (Gg CO2-eq)

5.6.3 Evaluation of the potential use of high-efficiency cogeneration and efficient district heating and cooling

During the preparation of this document, there is no assessment of the potential for application of high-efficiency cogeneration and efficient district heating and cooling, nor is there a study that can determine that. Currently, such a study is being prepared as part of the Program for the realization of the Energy Strategy. The first step was to develop a methodology and heat mapping of the cities in North Macedonia. Besides Skopje, the highest potential for introduction of high-efficient cogeneration power plants have Tetovo, Kumanovo and Bitola.

5.6.4 Procedure and methodology for conducting a cost–benefit analysis

For the purpose of the development of this NEEAP, modeling is made of the energy system in Macedonia, using the MARKAL model. It is a least-cost optimization model, which means that all measures that are proposed in this NEEAP are the most cost-effective ones.

5.6.5 Other measures to promote efficient heating and cooling

Biomass power plants (CHP optional)				
Main objective: Increase of the domestic generation capacity from renewable energy sources				
Description: This measure considers construction of distributed small sized biomass power plants (CHP optional) with stimulation through feed-in tariffs. Beside increasing the RES share with this CHPs, they should also contribute in increasing the flexibility of the electricity system and ensuring the security of supply. It is envisioned that industrial and municipal solid waste will be used, as well as waste biomass but taking into account the sustainability of the biomass at national level.				
Information	Type		Technical	
	Sector		Electricity producers	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Law on Energy Efficiency ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Energy ▶ Decree on RES Support Measures ▶ Decision for total installed capacity for preferential producers of electricity ▶ Rulebook on preferential producers that use feed-in tariff 	
	Methodology		Biomass power plants construction. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology	
	Assumptions		The savings are calculated based on the data provided by the annual reports of the Energy Regulatory Commission. In the period 2016-2019 0.6 MW biomass power plants were constructed.	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Decree on the measures for support of electricity generation from renewable energy sources adopted (5.04.2019). ▶ Decision on the total installed capacity for preferential producers of electricity adopted (5.04.2019). ▶ Temporary status of preferential producer granted to 3.15 MW (28 December 2020) 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Amend the Decree on the measures for support of electricity generation from renewable energy sources to provide different treatment (tariff amount, period, etc.) for CHP plants that use industrial and municipal solid waste ▶ Implement the plan for development / construction of regional landfills ▶ Attract the investors ▶ Construction of power plants 	
	Energy savings	Final energy	Achieved	/
			Expected	/
		Primary energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – / ▶ 2017 – /

			<ul style="list-style-type: none"> ▶ 2018 – / ▶ 2019 – 1.25 	▶ /
		Expected	Cumulative (starting from 2017) based on the Energy Strategy –Green scenario	
			<ul style="list-style-type: none"> ▶ 2020 – 1.25 ▶ 2021 – 4.18 ▶ 2022 – 6.25 	
	Estimated emission reductions (Gg CO2-eq)		2018: /	
	Timeframe		2020– 2040	
	Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 1.1 Mill. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 8.5 Mil. EUR 	
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Energy Regulatory Commission ▶ Ministry of Environment and Physical Planning ▶ Ministry of Economy, Energy Agency ▶ Private investors 	
	Source of finance		▶ Private	
Progress indicators:			<ul style="list-style-type: none"> ▶ Increase in installed capacity (MW) ▶ Increase in electricity generation (GWh) ▶ Emissions reduction (Gg CO2-eq) 	

Increased use of heat pumps				
Main objective: More efficient use of electricity				
Description: Phasing out heating devices with resistive heaters and their replacement with heat pumps in compliance with EU Climate and Energy Policy.				
Information	Type		Technical, Regulatory, policy	
	Sector		Households and commercial sector	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on energy efficiency ▶ 3rd National Energy Efficiency Action Plan ▶ EU Climate and Energy Policy 	
	Methodology		Adopting a Decision that will prevent the sale of heating devices with resistive heaters. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology	
	Assumptions		The savings in this measure are calculated based on the data for requests for subsidies from the Ministry of Economy, city of Skopje, municipalities of Gazi Baba, Aerodrom, Kocani, Gostivar and Bitola. The total number of submitted requests in 2019 are 2100. Additionally, the data provided by NEPTUN for the number of sold air conditioners inverters are used.	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Energy Efficiency Law adopted ▶ Program for promotion of renewable energy sources and improvement of energy efficiency in household for 2021, adopted (subsidies are planned) ▶ Starting from 2019 the City of Skopje and other municipalities (Aerodrom, Kocani, Kavadarci, Bitola) are subsidizing heat pumps. In total 2103 households are subsidized for heat pumps in 2019. ▶ The state-owned power generation company Power Plants of North Macedonia (JSC ESM-Skopje) has allocated funds of €10 million for subsidizing the households who replace their inefficient stoves and boilers based on firewood, coal, and oil with high-efficiency heat pumps (inverter air conditioners). Hence, each household which replaced their inefficient stoves and boilers with high-efficiency heat pumps will be reimbursed for up to €1,000. This subsidy is available for households only in the cities with the highest air pollution in the country, including Bitola, Kicevo, Tetovo, and Skopje. Subsidies for purchasing of high-efficiency heat pumps are provided to 5,200 households in Skopje, 2,500 households in Bitola, 1,500 households in Tetovo, and 800 households in Kičevo, during 2020. ▶ Project of UNDP for improvement of the air quality with the replacement of the wood stove and introduction of EE measures in at least 100 household from the Aerodrom municipality 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Adopting a Decision to ban the sale of heating devices with resistive heaters. ▶ Adopting a Rulebook for RES Equipment installers ▶ Between 100-150 households in the municipality of Aerodrom will be subsidized under UNDP project for implementing EE measures including installation of heat pumps ▶ Continuation of reimbursement of part of the costs for purchased and installed heat pumps by the Ministry of Economy and the municipalities 	
	Energy savings	Final energy	Achieved	Per year
			<ul style="list-style-type: none"> ▶ 2016 – 7.20 ▶ 2017 – 9.04 	

			<ul style="list-style-type: none"> ▶ 2018 – 8.47 ▶ 2019 – 6.28 	▶ 24.71
		Expected	Cumulative (starting from 2017) based on the Energy Strategy –Green scenario <ul style="list-style-type: none"> ▶ 2020 – 48 ▶ 2021 – 55 ▶ 2022 – 62.5 	
	Primary energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 17.72 ▶ 2017 – 19.72 ▶ 2018 – 19.11 ▶ 2019 – 16.72 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 56.55
Estimated emission reductions (Gg CO2-eq)			2018: 255.5 2022: 185	
Timeframe			2017– 2040	
Budget			Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ ~17.5 Mil. EUR (only inverters without A/C) Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 32.4 Mil. EUR 	
Implementing entity			<ul style="list-style-type: none"> ▶ Ministry of Economy, Energy Agency ▶ Municipalities ▶ End-users 	
Source of finance			▶ Private (29.1 Mill. EUR), local government budget (3.3 Mill. EUR), donors (0.33 Mill. EUR)	
Progress indicators:			<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq) 	

Increased use of more efficient biomass stoves					
Main objective: More efficient use of biomass					
Description: Phasing out inefficient biomass stoves, as well as other inefficient heating technologies and their replacement with more efficient biomass stoves.					
Information	Type		Technical		
	Sector		Households and commercial sector		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Energy Efficiency ▶ EU Climate and Energy Policy ▶ 3rd National Energy Efficiency Action Plan 		
	Methodology		Replacement of stoves. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology		
	Assumptions		The savings in this measure are calculated based on the data for requests for subsidies from the Ministry of Economy, city of Skopje, municipalities of Gazi Baba, Aerodrom, Kocani, Kavadarci and Bitola. The total number of submitted requests per year are: <ul style="list-style-type: none"> ▶ 2016 – 343 ▶ 2017 – 614 ▶ 2018 – 1032 ▶ 2019 - 2633 		
Progress of implementation	Steps taken or envisaged to achieve the action		Steps taken	Reimbursement of part of the costs for purchased and installed pellet stoves, realized by the Ministry of Economy, city of Skopje, municipalities of Gazi Baba, Aerodrom, Kocani, Kavadarci and Bitola.	
			Steps envisaged	Continuation of the subsidies for reimbursement of part of the costs for more efficient biomass stoves.	
	Energy savings (ktoe)	Final energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.18 ▶ 2017 – 0.32 ▶ 2018 – 0.73 ▶ 2019 – 1.94 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 1.23
			Expected	In the Energy Strategy this measure is modelled together with the measure Public awareness campaigns and network of energy efficiency (EE) info centers	
	Energy savings (ktoe)	Primary energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.51 ▶ 2017 – 0.92 ▶ 2018 – 2.08 ▶ 2019 – 5.49 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 3.51
			Estimated emission reductions (Gg CO2-eq)		2018: 9.5
Timeframe			2017– 2040		
Budget			Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 5.7 Mil. EUR 		

	Expected for the period 2020-2022:
	▶ /
Implementing entity	▶ Ministry of Economy, Energy Agency ▶ Municipalities ▶ End-users
Source of finance	▶ Private, EE fund, incentives from the central and local government budget, donors
Progress indicators:	▶ Energy savings (ktoe/GWh) ▶ Emissions reduction (Gg CO2-eq)

5.7 ENERGY EFFICIENCY IN TRANSFORMATION, TRANSMISSION, DISTRIBUTION AND DEMAND RESPONSE (Article 15)

5.7.1 Energy efficiency criteria applicable to network tariffs and regulations (Article 15)

Incentives Feed-in tariff				
Main objective: Increase of the domestic generation capacity from renewable energy sources				
Description: Construction of new small hydro power plants, wind and biogas with feed-in tariffs that will stimulate their construction.				
Information	Type		Technical	
	Sector		Electricity producers	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia ▶ Renewable Energy Action Plan ▶ Law on Energy ▶ Decree on RES Support Measures ▶ Decision for total installed capacity for preferential producers of electricity ▶ Rulebook on preferential producers that use feed-in tariff ▶ Decision for national mandatory target for share of RE in gross energy consumption 	
	Methodology		Small hydro, wind and biogas power plants. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.	
	Assumptions		<p>The savings are calculated based on the data provided by the annual reports of the Energy Regulatory Commission. In the period 2016-2019 the following capacities are constructed:</p> <ul style="list-style-type: none"> ▶ 21.7 MW Small hydro power plants ▶ 0.05 MW Photovoltaic power plants ▶ 3 MW Biogas power plant 	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Regulation on feed-in tariffs adopted (17.04.2013) ▶ Decree on the measures for support of electricity generation from renewable energy sources adopted (5.04.2019). ▶ Decision on the total installed capacity for preferential producers of electricity adopted (5.04.2019). ▶ Temporary status of preferential producer granted to (28 December 2020) <ul style="list-style-type: none"> ▶ 114 MW wind power plants (JSC ESM-Skopje 13 MW Bogdanci, THOR 36 MW, Sveti Nikole/Stip, Kaltun 34 MW Demir Kapija/Gevgelija, EUROING 30 MW Bogdanci) ▶ 4 MW biogas power plants ▶ 27 MW small hydro power plants 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ New feed-in tariffs to be granted based on “first come - first served” rule to the producers of electricity from eligible RE technologies until the quota determined for each technology in the Decision on the total installed capacity for preferential producers of electricity is reached ▶ Possibility of waiving the granted feed-in tariff in exchange for acquiring ownership or extended concession period of the constructed SHPP to be reviewed and possibly permitted by the relevant law ▶ Construction of power plants 	
	Energy savings (ktoe)	Final energy	Achieved	/
			Expected	/
Primary energy		Achieved	<p>Per year</p> <ul style="list-style-type: none"> ▶ 2016 – 5.61 ▶ 2017 – 5.61 ▶ 2018 – 3.67 ▶ 2019 – 4.03 	<p>Savings in 2018 (taking into account the measures implemented in the period 2016-2018)</p> <ul style="list-style-type: none"> ▶ 14.89
		Expected	<p>Cumulative (starting from 2017) based on the Energy Strategy –Green scenario</p> <ul style="list-style-type: none"> ▶ 2020 – 14.98 ▶ 2021 – 26.08 ▶ 2022 – 49.28 	
Estimated emission reductions (Gg CO2-eq)		2018: 67.3 2022: 40		
Timeframe		2017– 2040		

Budget	Spent in the period 2016-2019: ▶ 55.5 Mill. EUR Expected for the period 2020-2022: ▶ 115 Mill. EUR
Implementing entity	▶ Government of the Republic of North Macedonia ▶ Energy Regulatory Commission ▶ Ministry of Environment and Physical Planning ▶ Ministry of Economy, Energy Agency ▶ Private investors
Source of finance	▶ Private
Progress indicators:	▶ Increase in installed capacity (MW) ▶ Increase in electricity generation (GWh) ▶ Emissions reduction (Gg CO2-eq)

Incentives feed-in premium

Main objective: Increase of the domestic generation capacity from renewable energy sources

Description: Construction of solar and wind power plants with feed-in premium tariffs to stimulate their construction.

Information	Type	Technical, regulatory		
	Sector	Electricity producers		
	Relevant planning documents, legal and regulatory acts	<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Energy ▶ Decree on RES Support Measures ▶ Decision for total installed capacity for preferential producers of electricity ▶ Decision for national mandatory target for share of RE in gross energy consumption ▶ Annual Programme for financial support of production of electricity from RES 		
	Methodology	Solar and wind power plants construction. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions			
	Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Decree on the measures for support of electricity generation from renewable energy sources adopted (5.04.2019). ▶ Decision on the total installed capacity for preferential producers of electricity adopted (5.04.2019). ▶ Public call on awarding an agreement for right to use premium for electric power produced from photovoltaic power plant constructed on land owned by the Republic of North Macedonia (21.07.2019) ▶ Public call on awarding the right to use a premium for electricity generated and sold from photovoltaic power plants built on land not owned by the Republic of North Macedonia or on land owned by the Republic of North Macedonia on which right to use has been established (2.10.2019) ▶ Based on the conducted tenders, the right to use feed-in premiums was granted for PV power plants with total of 60 MW installed capacity
Steps envisaged			<ul style="list-style-type: none"> ▶ Construction of solar power plants ▶ New public call on awarding an agreement for right to use premium for electric power produced from photovoltaic power plant constructed on land owned by the Republic of North Macedonia ▶ New public call on awarding the right to use a premium for electricity generated and sold from photovoltaic power plants built on land not owned by the Republic of North Macedonia or on land owned by the Republic of North Macedonia on which right to use has been established 	
Energy savings (ktoe)		Final energy	Achieved	/
			Expected	/
		Primary energy	Achieved	/
			Expected	Cumulative (starting from 2017) based on the Energy Strategy –Green scenario <ul style="list-style-type: none"> ▶ 2020 – ▶ 2021 – 5.5 ▶ 2022 – 21.5
Estimated emission reductions (Gg CO2-eq)		2018:		
		2022:	49	
Timeframe		2019– 2030		
Budget		Spent in the period 2016-2019: ▶ / Expected for the period 2020-2022: ▶ 63 Mill. EUR		
Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Energy Regulatory Commission ▶ Ministry of Economy ▶ Private investors 		

	Source of finance	▶ Private
Progress indicators:		<ul style="list-style-type: none"> ▶ Increase in installed capacity (MW) ▶ Increase in electricity generation (GWh) ▶ Emissions reduction (Gg CO2-eq)

5.7.2 Facilitation and promotion of demand response (Article 15)

Large hydro power plants				
Main objective: Increase of the domestic generation capacity from renewable energy sources				
Description: Construction of new large hydro power plants, according to the dynamic defined in the Energy Strategy: <ul style="list-style-type: none"> ▶ Vardar valley – 2025-2030 ▶ Chebren – 2029 ▶ Tunnel Vardar – Kozjak, Veles and Gradec ▶ Globochica II – 2035 				
Information	Type		Technical	
	Sector		Electricity producers	
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Development plan of JSC ESM-Skopje (JSC Power Plants of North Macedonia). 	
	Methodology		Large hydro power plants construction. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.	
	Assumptions		/	
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Feasibility/pre-feasibility studies developed ▶ Chebren feasibility study developed ▶ Prequalification public call for construction of HPP Chebren through public-private partnership announced 	
		Steps envisaged	<ul style="list-style-type: none"> ▶ Tender announcement for HPP Chebren ▶ Invitation for tenders for construction of the others hydro power plants, selection of the best bidder and commencement of the construction. 	
	Energy savings	Final energy	Achieved	/
			Expected	/
		Primary energy	Achieved	No savings in the period up to 2019
			Expected	No savings are expected in the period 2020-2022
	Estimated emission reductions (Gg CO2-eq)		2018: /	
	Timeframe		2020– 2040	
	Budget		Spent in the period 2016-2019: ▶ / Expected for the period 2020-2022: ▶ /	
	Implementing entity		<ul style="list-style-type: none"> ▶ JSC ESM-Skopje (JSC Macedonian Power Plants). ▶ Ministry of Environment and Physical Planning ▶ Energy Agency, Ministry of Economy 	
Source of finance		▶ Public private partnership, ESM		
Progress indicators:		<ul style="list-style-type: none"> ▶ Increase in installed capacity (MW) ▶ Increase in electricity generation (GWh) ▶ Emissions reductions (Gg CO2-eq) 		

RES without incentives					
Main objective: Increase of the domestic generation capacity from renewable energy sources					
Description: Construction of wind, solar and biogas power plants without incentives. According to the Energy Strategy this measure is planned to start after 2021, although there is already small capacity that is constructed and commission in the period 2016-2019.					
Information	Type		Technical, regulatory		
	Sector		Electricity producers		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Strategy for Energy Development of the Republic of North Macedonia up to 2040 ▶ Law on Energy ▶ Bylaws for renewable energy 		
	Methodology		Wind, solar and biogas power plants construction. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology.		
	Assumptions		/		
Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Decree on the measures for support of electricity generation from renewable energy sources adopted (5.04.2019). ▶ Decision on the total installed capacity for preferential producers of electricity adopted (5.04.2019). ▶ Electricity grid code adopted ▶ 7.3 MW of RES without incentives are already constructed and commissioned ▶ Construction of 10 MW Oslomej PV started ▶ Tender for Public Private Partnership for PV Oslomej of at least 80 MW published 		
		Steps envisaged	<ul style="list-style-type: none"> ▶ Start with construction of 80 MW PV Oslomej ▶ Finish the construction and commission on 10 MW PV Oslomej ▶ Technical and environment impact assessment studies for 20 MW in Bitola and 10 MW Oslomej 2, supported by EBRD ▶ Technical and environment impact assessment studies for 160 MW, supported by KfW ▶ Technical and environment impact assessment studies for 100 MW, supported by IFC 		
	Energy savings (ktoe)	Final energy	Achieved	/	
			Expected	/	
		Primary energy	Achieved	Per year <ul style="list-style-type: none"> ▶ 2016 – 0.04 ▶ 2017 – 0.25 ▶ 2018 – 0.37 ▶ 2019 – 2.04 	Savings in 2018 (taking into account the measures implemented in the period 2016-2018) <ul style="list-style-type: none"> ▶ 0.66
			Expected	Cumulative (starting from 2017) based on the Energy Strategy –Green scenario <ul style="list-style-type: none"> ▶ 2020 – 2.66 ▶ 2021 – 6.36 ▶ 2022 – 6.4 	
	Estimated emission reductions (Gg CO2-eq)		2018: 3 2022: 5		
	Timeframe		2021– 2040		
	Budget		Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 5.8 Mil. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 33.5 Mil. EUR 		
	Implementing entity		<ul style="list-style-type: none"> ▶ Government of the Republic of North Macedonia ▶ Energy Regulatory Commission ▶ Ministry of Transport and Communications ▶ Electricity TSO and DSO ▶ Electricity Market Operator ▶ Ministry of Economy, Energy Agency ▶ JSC Power Plants of North Macedonia (JSC ESM-Skopje) ▶ Private investors 		
Source of finance		▶ EBRD (7.5 Mill. EUR), PPP (26 Mill. EUR)			
Progress indicators:		<ul style="list-style-type: none"> ▶ Increase in installed capacity (MW) ▶ Increase in electricity generation (GWh) ▶ Emissions reduction (Gg CO2-eq) 			

5.7.3 Energy efficiency in network design and regulation (Article 15)

Reduction of network losses					
Main objective: Reduction of losses in electricity and heat networks					
Description: Technical measures for reducing distribution electricity losses comprise of overhead lines replacement with underground (where possible), transition to 20 kV voltage level, installation of new transformation stations to shorten the low voltage lines, as well as automation and remote network management. All these improvements will contribute to better SAIDI and SAIFI indicators. For the heating sector, technical measures include continuous replacement of existing heat pipelines with pre-insulated ones and optimization of the substation operations through automatic control.					
Information	Type		Technical		
	Sector		Electricity and heat distribution operators		
	Relevant planning documents, legal and regulatory acts		<ul style="list-style-type: none"> ▶ Law on energy efficiency ▶ Strategy for Energy Development in the Republic of North Macedonia ▶ Rulebook for the manner and conditions for determining a regulated maximum revenue and regulated average tariffs for electricity transmission, organization and management of the electricity market and electricity distribution ▶ Rulebook on regulation of prices for heat energy and system services ▶ Development plan of Balkan Energy Group (BEG) 		
	Methodology		Technical interventions on the distribution network. Bottom-up modeling and least-cost optimization using the MARKAL model. IPCC Methodology		
	Assumptions		The savings in this measure are calculated based on the data received from Elektodistribucija Skopje, as well as annual reports of the Energy Regulatory Commission.		
	Progress of implementation	Steps taken or envisaged to achieve the action	Steps taken	<ul style="list-style-type: none"> ▶ Development plan of the electricity transmission system for the period 2020 – 2029 (MEPSO AD – October 2019) ▶ Development plan of the electricity distribution system for the period 2021-2025 (Elektrodistribucija Ltd. Skopje - October 2021) ▶ A General investment plan in electricity distribution network is developed for the next 20 years. ▶ Implementing measures for operation improvement and losses reduction in the heat distribution system 	
Steps envisaged			<ul style="list-style-type: none"> ▶ Replacement of obsolete and unreliable 400 kV and 110 kV primary equipment with an average age of over 30 years (switches, circuit breakers, measuring transformers and surge arresters) and replacement of secondary equipment (relay protection, remote control systems and management, power supply, electricity metering) ▶ Replacement old electric transformer with new transformers at 20 kV voltage level ▶ Reduction of the reactive power in the power network ▶ Rehabilitation of the hot water distribution network, replacement of the existing pumps in the heating substations with new energy efficient pumps and other measures for energy efficiency improvement (modernization of the SCADA system, integration of the distribution networks). ▶ Installation of modern equipment for regulation and monitoring in the heating substations for control and reduction of the consumed heat ▶ Construction of new and reconstruction of old 10 (20) and 35 kV overhead transmission lines with cables with large cross sections, in order to reduce losses and possible unwanted interruptions due to external influences, ▶ Procurement and installation of DTR 10.5 (21) /0.42 kV with reduced losses and more efficient energy transformation according to the latest European norms, ▶ Construction and reconstruction of low voltage networks with large cross-section cables, in order to reduce losses, ▶ Application of technology for fast detection and detection of errors in the network ▶ Use of standardized and confidential equipment for performing the EE distribution process. ▶ Implementations of the Strategy for reconstruction/revitalization of the electricity transmission network developed by MEPSO. (Sopotnica-Bitola, Kicevo-Sopotnica, Oslomej-Kicevo ▶ Oslomej-Gostivar, Strumica 1-Strumica 2, Valandovo-Strumica 2, Dubrovo-Valandovo) 		
Energy savings (ktoe)		Final energy	Achieved	/	
			Expected	/	
		Primary energy	Achieved	Per year	Savings in 2018 (taking into account the measures implemented in the period 2016-2018)
			Expected	Cumulative (starting from 2017) based on the Energy Strategy –Green scenario	
		<ul style="list-style-type: none"> ▶ 2016 – 1.44 ▶ 2017 – 3.71 ▶ 2018 – 5.28 ▶ 2019 – 13.42 	<ul style="list-style-type: none"> ▶ 9.89 		
		<ul style="list-style-type: none"> ▶ 2020 – 11 			

			<ul style="list-style-type: none"> ▶ 2021 – 30 ▶ 2022 – 32
Estimated emission reductions (Gg CO2-eq)			2018: 43.2 2022: 107
Timeframe			2017– 2040
Budget			Spent in the period 2016-2019: <ul style="list-style-type: none"> ▶ 14.7 Mill. EUR Expected for the period 2020-2022: <ul style="list-style-type: none"> ▶ 24 Mil. EUR
Implementing entity			<ul style="list-style-type: none"> ▶ Electricity transmission System Operator ▶ Electricity distribution companies ▶ Heat distribution companies
Source of finance			▶ Private (Electricity and heat distribution companies)
Progress indicators:			<ul style="list-style-type: none"> ▶ Energy savings (ktoe/GWh) ▶ Emissions reductions (Gg CO2-eq)

6 Funding and action plan

In the period 2016-2019, around 2.2 billion EUR were spent for the implementation of energy efficiency measures presented in this plan. It should be noted that these funds are obtained only from verified data sources, such as SSO, Ministry of economy, Energy regulatory commission, NEPTUN database, City of Skopje, Municipalities. Of these EUR 2.2 billion, the major costs were in the following sections:






- 1 billion EUR construction residential and commercial
- 200 mill EUR construction public building (central and local)
- ~ 130 mill EUR for energy efficiency appliances
- ~ 480 mill EUR for new cars
- power plants with feed-in tariff 55.5 mill. EUR
- Pellet stove (only from subsidies) – 5.7 mill EUR (~3 in 2019)
- Solar thermal collectors 4 mill EUR (only from subsidies)
- Bikes - 3 mill EUR

According to the financial analyzes made as part of the Program for realization of the strategy 2021-2025, it shows that there is a big gap in the part of the necessary funds for realization of the planned investments and the possibilities and the capacity of the domestic economy. To bridge this gap, it is necessary to make maximum mobilization of private capital, both from domestic and foreign sources. In addition, it is important for all domestic and foreign financial institutions to be involved in providing funds for the implementation of the measures, but it is also necessary to fully mobilize donors.

6.1 Access to Finance

In the Program for realization of the strategy, the part for access to finance is elaborated in detail, which largely corresponds to this NEEAP. Namely, North Macedonia has an opportunity to benefit from increasing access to funds that support green energy. In general, there are several options at disposal to finance the development of the energy sector in North Macedonia (Figure 6.1). With the growing development of small-scale RES and EE measures, financial support via national budget will play an important role for stimulating households and SMEs. In terms of European funds, North Macedonia as a pre-accession country can benefit from multiple donor funds that support RES and EE, as well as support for regional connectivity initiatives under EnC. Although the country is eligible to use a significant amount of funds from international institutions and donors, access to EU funds and programs will substantially increase after North Macedonia joins the EU. Funding programs of international financial institutions and donors (e.g. EBRD, WB-IFC, USAID, GIZ, UNDP and EIB) have been used in the past by the country for development and construction of energy projects.

Figure 6.1 Financing options in the energy sector for North Macedonia (illustrative)

Financing options	Institutions	Typical areas covered in energy sector	+ Pros	- Cons
 National budget	<ul style="list-style-type: none"> State / Ministries (including funds) Municipalities 	<ul style="list-style-type: none"> RES and EE projects, development of new technologies, etc. Beneficiaries: public, private entities and natural persons 	<ul style="list-style-type: none"> Rapid procedure More suitable for simple tenders and clear objectives 	<ul style="list-style-type: none"> Restricted budget Lack of flexibility in form and number of bidders
 European funds	<ul style="list-style-type: none"> Pre-accession funds Post-accession funds 	<ul style="list-style-type: none"> RES and EE projects, infrastructure projects, regulatory and market functioning improvement Beneficiaries: public and private entities 	<ul style="list-style-type: none"> High added-value to project profitability Large amount of funds available after accession to EU 	<ul style="list-style-type: none"> Complex and strict process to receive and spend funds Lack of flexibility
 International financial institutions and donors	<ul style="list-style-type: none"> WB-IFC USAID GIZ EBRD, EIB Others 	<ul style="list-style-type: none"> RES and EE projects, infrastructure projects, regulatory and market functioning improvement Beneficiaries: public and private entities (incl. SMEs) 	<ul style="list-style-type: none"> Convenient for capital intensive projects Financial leverage and cheaper interest rate vs. commercial banks 	<ul style="list-style-type: none"> Complex and strict process Risk of insolvency
 Commercial banks	<ul style="list-style-type: none"> National banks International banks 	<ul style="list-style-type: none"> RES and EE measures, conventional source projects, etc. Beneficiaries: public and private entities 	<ul style="list-style-type: none"> Convenient also for smaller investments Financial leverage 	<ul style="list-style-type: none"> Complex and strict process Higher interest rates Risk of insolvency Larger collateral needed
 Equity	<ul style="list-style-type: none"> Domestic and international co. Private and public co. ESCO 	<ul style="list-style-type: none"> Could cover wide range of energy projects Beneficiaries: public and private entities 	<ul style="list-style-type: none"> Enable private and public partnerships Leverage from sharing know-how and experience 	<ul style="list-style-type: none"> Complex process

Source: European Commission, Energy Community, EBRD, EIB, Project team analysis

Among the various forms of attracting private capital for financing the development of the energy sector, the public-private partnership (PPP) has a special place. Therefore, it is necessary the Government rapidly to start the process of implementing the World Bank recommendations for the PPP framework in the Republic of North Macedonia:

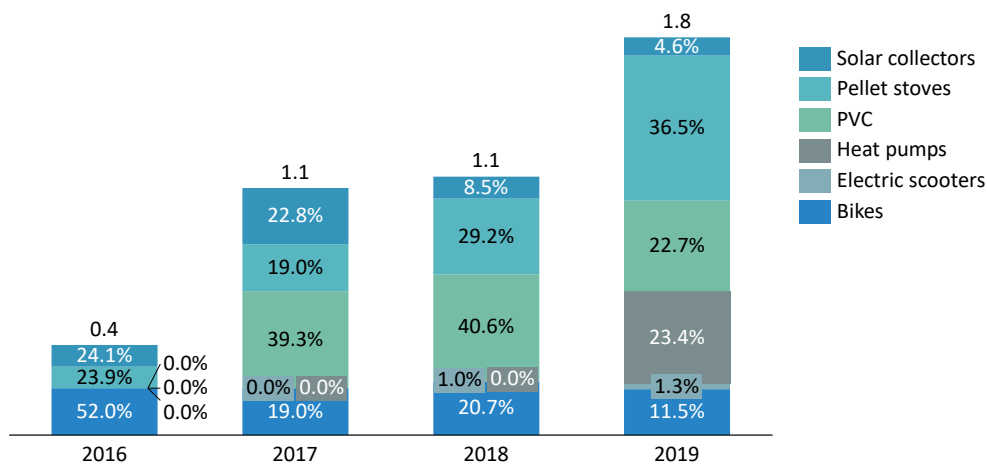
1. adoption of a PPP Policy and Strategy at a high level;
2. separation of concessions for the extractive industry from the existing Law on PPP;
3. strengthening the capacity of the Ministry of Economy for objective evaluation of PPP projects, from economic and legal aspects, as well as ensuring strong and effective monitoring and reporting on the projects progress; strengthening the capacity of the Ministry of Finance to assess the fiscal implications of the PPP;
4. capacity building for development and management of projects implemented through PPPs in the units of local self-government and ensuring transparency in the overall process of project implementation through PPPs (public procurement, public register for PPPs, published rules, guides, instructions, etc.).

6.1.1 The importance of subsidies for the implementation of the National energy efficiency action plan

One of the mechanisms that proved to be quite attractive for the citizens and the business sector, and at the same time contributed to achieving solid results are the subsidies. In the period 2016-2019, in North Macedonia, a total of EUR 87.34 million were allocated in the form of subsidies for energy efficiency and renewable energy sources. Of the total subsidies allocated to the energy sector (EUR 87.34 million), EUR 4.41 million were allocated for energy efficiency (Figure 6.2), while EUR 82.93 million were allocated for subsidies for renewable energy sources through the feed-in tariff mechanism.

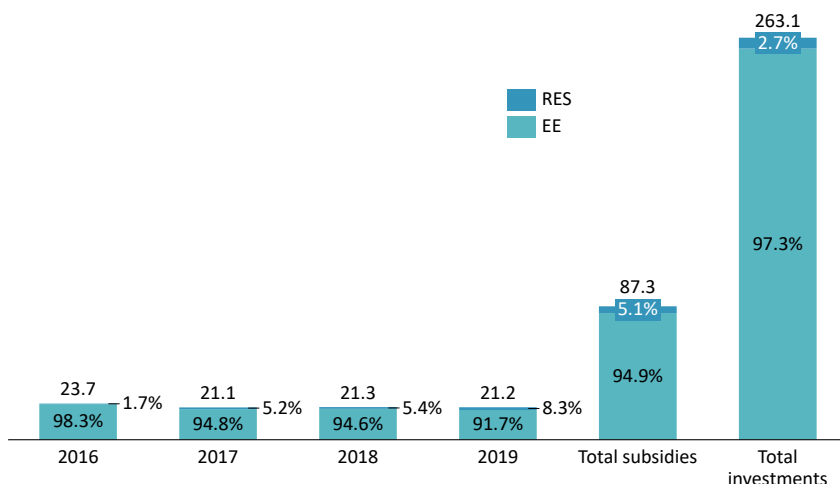
In the part of implementation of energy efficiency measures it can be noticed from Figure 6.2 that every year the level of subsidies increases and in 2019 the subsidies reached around 1.8 mill. EUR. Most of these funds are allocated for pellet stoves, PVC windows and heat pumps.

Figure 6.2. Subsidies in different energy efficiency measures



Based on the data for allocated subsidies, estimates were made for the realized investments in the energy sector for the same period (2016-2019). In the period 2016-2019, the investments in the field of energy efficiency are estimated to about 7 mill. EUR, while the investment in RES are estimated to 260 mill. EUR (covering a period from 2010-2019 because the RES subsidies-FIT includes the power plants that are already built). **In fact in the energy sector, as it was previously mentioned, subsidies deliver significant positive effects, much higher than the amount of subsidies in some other sectors, as is the case with agriculture.**

Figure 6.3. Estimated investments in RES and EE



6.1.2 Action plan

For the implementation of the fourth national energy efficiency plan, it is estimated that about 1300 mill. EUR should be spent. The table below shows by years how much the investments should be and where the funds will be provided for the implementation of each of the measures. In 2020 it is necessary to allocate 200 mill. EUR, while for 2022 it is necessary to invest 736 mill. EUR. It is estimated that 35% of the total funds (457 million. EUR) will be provided by private companies, while about 13% will be provided by the central budget (171 million. EUR), most of which are for investments in the gas network. From the financial institutions and donors, EBRD is in the first place in providing funds, 90 mill. EUR (7%).

The implementation of the action plan largely depends on the ongoing cooperation between central and local government. For that purpose, coordination and communication of the activities between them is needed.

Table 9. Action plan for the period 2020-2022

	Investments				Source of finance											Note
	2020	2021	2022	Total investment (2020-2022)	Consumers direct investments (mainly households)	EE fund	Central gov.	Local-self gov.	Donors	PPP	Private companies	EBRD	EIB	KfW	WBIF	
Energy efficiency obligation schemes		16.6	16.5	33.1	23.2						9.9					The investment from the private companies will be reimbursed through the consumers bills
Labelling of electric appliances and equipment	5.9	5.4	9.5	20.8	19.4		1.5									EE fund should be used for subsidies for vulnerable consumers
Increased use of heat pumps	10.0	6.4	16.3	32.6	29.1			3.3	0.3							It is assumed that in the following years (as in 2019) again 20% will be subsidized, with a maximum of 50% of the investment from the municipalities and the city of Skopje.
Public awareness campaigns and network of EE info centers	9.20	10.78	17.84	37.8	36.6				1.2							1.2 Mil. EUR for campaigns, and the other investments are for the more efficient technologies
Retrofitting of existing residential buildings	25.0	31.1	33.7	89.7	72.4		1.1		16.3							At annual level 0.36 Mil. EUR subsidies according to Program for promotion of renewable energy sources and improvement of energy efficiency in household (0.36*3=1.08). Additionally, 25 Mil. EUR HABITAT project in a phase of realization. Around 2500 households (vulnerable consumers) are subsidized with 70% of the investments using the EE fund.
Retrofitting of existing central government buildings	7.4	8.0	8.0	23.4		4.0	15.4							4.0		25 mil. EUR for this purpose is a loan from the World Bank + 3 mil. EUR IPA2 (to the EE fund), for which it is assumed that about 4 mil. EUR will be spent by 2023, the

	Investments				Source of finance											Note
	2020	2021	2022	Total investment (2020-2022)	Consumers direct investments (mainly households)	EE fund	Central gov.	Local-self gov.	Donors	PPP	Private companies	EBRD	EIB	KfW	WBIF	
																remaining funds are from the budget of the central government. The project for energy efficient rehabilitation of student dormitories in the Republic of Northern Macedonia, which is financed with a loan from KfW in the amount of 20 million euros and a grant in the amount of 4.8 million euros.
Retrofitting of existing local self-government buildings	7.1	7.0	7.0	21.1		0.5		20.6								0.5 million EUR provided as funds from the World Bank
Retrofitting of existing commercial buildings	19.6	14.7	21.2	55.5							55.5					Could be supported with credits from commercial banks.
Construction of new energy efficient buildings	8.8	10.5	12.3	31.6	31.6											
Construction of passive buildings	17.3	22.9	16.4	56.6	56.6											Municipalities can support this measure by utility tax exemption or property tax reduction.
Phasing out of incandescent lights		6.6	14.1	20.7	10.1		2.8	2.8	0.2		4.8					0.2 Mil. EUR to support the vulnerable customers in the transitional period
Improvement of the street lighting in the municipalities	0.3	1.0	0.5	1.8				0.9		0.9						Implemented mainly through ESCO companies, and part of the funds for EE will be used
“Green procurements”	0.0	0.0	0.8	0.8			0.45	0.35								
Introduction of efficient electric motors	1.9	2.2	2.6	6.8							6.8					
Introduction of more advanced technologies	4.2	2.7	49.7	56.7							56.7					
Increased use of the railway	15.3	14.4	12.5	42.1			42.1									
Renewing of the national car fleet	30	45	59	134.0	14		22	20			78					12 Mil. EUR from the central government are subsidies for vulnerable consumers (800

	Investments				Source of finance											Note
	2020	2021	2022	Total investment (2020-2022)	Consumers direct investments (mainly households)	EE fund	Central gov.	Local-self gov.	Donors	PPP	Private companies	EBRD	EIB	KfW	WBIF	
Renewing of other national road fleet	0.0	11.8	4.0	15.8							5.8	10				households * 5000 EUR each year) The city of Skopje has loan of 10 mill EUR from EBRD.
Advanced mobility	0.68	0.68	0.68	2.0	1.4			0.6								In the period 2016-2019 around 17,500 bicycles and around 300 electric scooters were subsidized. The subsidies at the yearly level are around 230000 €. It is assumed that the same rate of subsidies will continue in the period up to 2022.
Construction of the railway to Republic of Bulgaria			50	50.0								50				
Electrification of the transport	13	27	60	100.0	44.5		13	0.5			42					12 Mil. EUR from the central government are subsidies for consumers (800 households * 5000 EUR each year)
Increased use of central heating systems	1.1	1.1	1.1	3.3							3.3					
Solar thermal collectors	1.8	1.9	1.7	5.5	4.3		0.3				0.9					0.3 Mil. EUR are subsidies from the Central government (similar to the level of subsidies given in the period 2016-2019)
Reduction of network losses	8	8	8	24.0							24					
Construction of 400 kV electricity transmission interconnection Macedonia-Albania (Bitola-Elbasan)	1.9	14.7	16.3	32.9								22			10.9	
Develop of Macedonia-Greece natural gas cross-border infrastructure			18	18.0									7.2		10.8	
Develop gas transmission network		36	36	72.0			72									

	Investments				Source of finance											Note
	2020	2021	2022	Total investment (2020-2022)	Consumers direct investments (mainly households)	EE fund	Central gov.	Local-self gov.	Donors	PPP	Private companies	EBRD	EIB	KfW	WBIF	
Develop a gas distribution network			75	75.0						75						
Construction of PV power plants in Oslomej 1 (10 MW)		4	3.5	7.5								7.5				
Construction of PV power plants in Oslomej 3 PPP (100 MW)			26	26.0						26						
Incentives feed-in tariff - wind PP Bogdanci2 (14 MW)		7	10	17.0										17		
Incentives feed-in tariff - wind PP THOR (36 MW)		5	22	27.0							27					
Incentives feed-in tariff - wind PP Kaltun (34 MW)			15	15.0							15					
Incentives feed-in tariff - wind PP EUROING (30 MW)			13	13.0							13					
Incentives feed-in tariff - biogas PP (4 MW)		4	4	8.0							8					
Incentives feed-in tariff - small HPP (27 MW)	8	13	14	35.0							35					
Biomass power plants (CHP optional)	3.5	2.5	2.5	8.5							8.5					
Incentives feed-in premium - phase I (60 MW)		15	27	42.0							42					
Incentives feed-in premium - phase II (60 MW)			21	21.0							21					
Solar rooftop power plants		6.5	9.1	15.6	15.6											
Total	200	363	736	1299.1	359	5	171	49	18	102	457	90	7	21	22	
Share of the source of finance					28%	0%	13%	4%	1%	8%	35%	7%	1%	2%	2%	

In addition to the direct funds needed for the implementation of the measures, there are a number of documents and activities that need to be done in the period until 2022, for the implementation of which it is necessary to allocate certain funds. The table below gives a list of a number of activities and documents to be done by 2022. About 2 Mill EUR (Table 10) are required for their realization. Funds have already been provided for some of the activities. Most of the funds are allocated for the preparation of feasibility judges.

Table 10. Finance needed for development of studies, legal acts and activities

Document/activity	Price	Currency	Source
Decree for obligation scheme			
Rulebook on labelling consumption of energy and other resources on devices using energy adopted	11,000	EUR	USAID
Regulation on eco-design of energy-related products	5,000	EUR	USAID
Decision to ban the sale of heating devices		EUR	
Rulebook for RES Equipment installers	6,000	EUR	USAID
Rulebook on technical specification of RE equipment eligible for support measures	2,000	EUR	USAID
National Building Renovation Strategy	200,000	EUR	EBRD
Development of topology	30,000	EUR	GIZ, HABITAT
Bylaws on energy performances of buildings and energy audits	50,000		
Energy efficiency program and plans by the municipalities			
Incentivization of the public buildings local self-government	1,000,000	EUR	EBRD
Feasibility study for reconstruction of public buildings	600,000	EUR	WBIF
Decree on energy performance contracts			
Promotional activities for the implementation of public-private partnership			
Develop and implement projects for railway network reconstruction and expansion, as well as for renewal of train			
Draft amendments to the VAT Law and Excise Duty Law related to VAT and excise duty rates on hybrid and electrical vehicles	3,000	EUR	
Raise the minimum standard for the passenger transport			
Development of studies for determining the best locations for installation of electric vehicles chargers from the aspect of the power grid	200,000	EUR	Part the National conservancy, other donors
Providing legal and regulatory framework for proper functioning of the market participant engaged in the demand response operations	50,000	EUR	
Implementation of the Directive 2018/2001 on the promotion of the use of energy from renewable sources	40,000	EUR	
Implementation of the Directive 2019/944 on common rules for the internal market for electricity		EUR	
Implementation of the Regulation 2019/943 on the internal market for electricity		EUR	
Total	2,197,000		

6.2 Institutional Responsibility

Ministry of Economy has the main role in the implementation of the Strategy for energy development, Program for the realization of the strategy as well as National plan for energy efficiency. Almost each measure involves the Ministry, in some cases to great, in others to less extent. This requires from the Ministry to have high capacity in terms of number, experience and quality of the staff. Ministry of Economy has the appropriate internal organization - State Advisor on Energy and Energy Sector with three units, as well as around 10 employees to take these roles and responsibilities. However, many experienced employees left the Ministry, thus leaving this sector with mostly inexperienced staff, who cannot timely and efficiently manage the implementation of the measures.

The Energy Agency has been given mandate to work on the energy efficiency measures, but lack human resources. For many years the number of staff in the Agency is not increasing (12 employees in total), while the number and complexity of tasks they need to perform do increase. Especially, technical staff (engineers) that should perform the core functions of the Agency is deficient.

Therefore, capacities the Ministry of Economy – Energy Sector and the Energy Agency has to be strengthened in order for all planning energy documents to be implemented. For that purpose, additional persons must be employed or outsourced. These new employees must have engineering background and certain years of experience. They might be new employees in the public sector or attracted from other public institutions through the so-called institute mobility of public administration. Even if these two institutions fill the vacant posts, they also need to plan and allocate budget for outsourcing the implementation of certain measures or specific steps as part of the measures, especially those referring to analysis, drafting, developing of systems, public campaigns etc.

Appendix I: Detailed energy savings reported with top-down methodology

Table 11. Final energy savings in Household by indicators

		2015	2016	2017	2018
M1	Non-electric uses	18.5	48.2	30.9	39.8
M2	Electrical uses	25.3	34.1	31.6	43.4
	Total 1 with minimum indicators	43.8	82.3	62.5	83.3
P1	Space heating	48.1	82.2	74.0	64.8
P2	Space cooling	2.2	2.3	2.7	3.1
P3	Water heating	2.3	6.4	2.7	7.3
P4	Electrical appliances	4.0	5.4	7.5	11.4
P5	Lighting	0.4	0.8	0.5	1.0
	Total 2 with preferred indicators	57.1	97.1	87.3	87.6

Table 12. Final energy savings in Commercial and Services sector by indicators

		2015	2016	2017	2018
M3	Non electric consumption (climate adjusted)	35.9	37.0	48.9	45.5
M4	Consumption of electricity	15.3	26.1	26.3	26.6
	Total 1 with minimum indicators	51.1	63.1	75.2	72.0

Table 13. Final energy savings in Transport sector by indicators

		2015	2016	2017	2018
M5	Road vehicles	0.0	0.0	0.0	0.0
M6	Rail transport	0.3			0.0
M7	Domestic water transport				
	Total 1 energy savings (Minimum)	0.3	0.0	0.0	0.0

Table 14. Final energy savings in Industry sector by subsectors (Indicator P14)

		2015	2016	2017	2018
P14	Ore-extraction industry	3.6	3.7	2.9	2.1
P14	Food, drink & tobacco industry	12.4	12.5	9.7	11.6
P14	Textile, leather & clothing industry	8.1	7.2	4.8	4.7
P14	Paper and printing	1.6	1.6	1.3	1.2
P14	Chemical industry	0.8	0.4	0.0	7.8
P14	Iron & steel industry + Non-ferrous metal industry	34.4	43.2	65.1	68.2
P14	Engineering & other metal industry	0.0	0.0	0.0	0.0
P14	Other industries (Other manufacturing)				
P14	Glass, pottery & building mat. Industry	0.0	0.0	0.0	0.0
	Total with preferred indicators	60.9	68.6	83.9	95.6
P14	Energy consumption of industry per unit of production	50.7	144.9	212.9	226.5

Table 15. Final energy savings in Industry sector by subsectors (Indicator P8)

		2015	2016	2017	2018*
M8	Ore-extraction industry	13.5	6.0	22.5	
M8	Food, drink & tobacco industry	46.0	47.2	45.4	
M8	Textile, leather & clothing industry	5.6	5.6	6.4	
M8	Paper and printing	3.2	3.8	3.4	
M8	Chemical industry	3.0	2.3	0.6	
M8	Iron & steel industry + Non-ferrous metal industry				
M8	Engineering & other metal industry	18.8	18.2	17.5	
M8	Other industries (Other manufacturing)	3.4	0.7	1.3	
M8	Glass, pottery & building mat. Industry	38.0	19.0	7.5	
M8	Total with minimum indicators	131.4	102.8	104.6	
M8	Energy consumption of industry per value added	0.0	51.2	125.9	

- no data for 2018

Appendix II: Primary energy savings by measures

	Measure	Achieved annual energy savings - final energy (ktoe)			
		2016	2017	2018	2019
1	EE obligation schemes	/	/	/	/
2	Public awareness campaigns and network of energy efficiency (EE) info centers	2.8	2.8	3.3	3.6
3	Solar rooftop power plants	0.1	0.4	0.8	2.1
4	Solar thermal collectors	1.8	1.4	0.8	0.7
5	Increased use of heat pumps	17.7	19.7	19.1	16.7
6	Labeling of electric appliances and equipment	0.7	0.7	0.8	0.9
7	Replacement of windows	0.0	0.2	0.4	0.6
8	Retrofitting of existing buildings (res+comm)	0.3	0.2	0.3	0.3
9	Construction of new residential buildings	4.5	4.4	3.9	4.2
10	Construction of new commercial buildings	1.8	2.1	2.1	3.7
11	Retrofitting of existing central and local self-government buildings	0.4	0.2	0.2	0.3
12	Construction of new central and local self-government buildings	0.9	0.9	0.6	0.5
13	EE certificates for buildings	0.5	0.8	0.2	0.2
14	Construction of passive buildings	/	/	/	/
15	Phasing out of incandescent lights	4.6	11.6	18.5	25.4
16	Improvement of the street lighting in the municipalities	1.9	1.9	1.9	1.9
17	"Green procurements"	0.2	0.2	0.3	0.3
18	Energy management in manufacturing industries	0.9	0.9	0.9	0.9
19	Introduction of efficient electric motors	0.7	0.7	0.7	0.7
20	Introduction of more advanced technologies	3.2	3.2	3.2	3.2
21	Increased use of the railway	0	1.4	0.8	1.1
22	Renewing of the national car fleet	1.8	1.7	2.0	2.2
23	Renewing of other national road fleet (light duty and heavy goods vehicles and buses)	0.2	0.4	0.4	0.3
24	Advanced mobility	0.2	0.2	0.3	0.3
25	Electrification of the transport	0.02	0	0.01	0.01
26	Increased use of more efficient biomass stoves	0.5	0.9	2.1	5.5
27	Increased use of central heating systems	2.4	2.9	3.2	1.2
28	Incentives Feed-in tariff	5.6	5.6	3.7	4.0
29	RES without incentives	0	0.3	0.4	2.0
30	Reduction of network losses	1.4	3.2	5.3	13.4
31	Biomass power plant (CHP optional)	/	/	/	1.3
Total savings		55.12	68.9	76.21	97.51

This action plan enters into force on the day of its adoption.

No.

09, 2021
Skopje

President of the Government
of the Republic of North Macedonia,

Zoran Zaev