

**GOVERNMENT OF THE REPUBLIC OF MACEDONIA**  
**MINISTRY OF ECONOMY**

**Second Energy Efficiency Action Plan of  
the Republic of Macedonia until 2015**

**April, 2014**



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Abbreviations:

BAU	Business as Usual
BEP	Building Energy Performance
BU	Bottom Up
CDM	Clean Development Mechanism
CHP	Combined Heat and Power
COGENPRO	Project for promotion of CHP
CP	Contracting Party
EARM	Energy Agency of the Republic of Macedonia
EE	Energy Efficiency
EEAP	Energy Efficiency Action Plan
EED	Energy Efficiency Directive
EEF	Energy Efficiency Fund
EMS	Energy Management System
EPBD	Energy Performance Building Directive
EPUBIL	Program for realization of EPBD in existing public buildings
ERC	Energy Regulatory Commission
ESCO	Energy Services Company
ESD	Energy Services Directive
ESP	Electricity Suppliers
ETS	EU Emission Trading Scheme
EU	European Union
EUF	European Union Funds
FI	Financial Institutions
GA	Governmental Administration
GHP	Geothermal Heat Pumps
GIZ	German International Cooperation
HCA	Heat Cost Allocator
HEP	Heating Energy Providers
INDEF:	Program-Network of industrial companies for implementation of EE
ktoe	Kilotons of oil equivalent
LED CEI	Low Emissions Development and Clean Every Investment



MD	Million Denars
MES	Ministry for Education and Sciences
MLS	Ministry of Local Self-government
MLSP	Ministry of Labor and Social Policy
MoE	Ministry of Economy
MTC	Ministry of Transport and Communications
MULS	Municipal Local Self-government
NBU	National Bottom-Up
N/D	No data
NGO	Non-Governmental Organization
NSSD	National Strategy for Sustainable Development of the Republic of Macedonia
OPP	Office for Public Procurement
PS	Private Sector
PSE	Public Sector Entities
RES	Renewable Energy Sources
RM	Republic of Macedonia
SEAP	Sustainable Energy Action Plan
SWH	Solar Water Heater collectors
TD	Top-Down
TPP	Thermal Power Plant
USAID	United State Agency for International Development

## **PREAMBLE**

The Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services (ESD) requires Member States to prepare three National Energy Efficiency Action Plans (EEAP) for the period 2008 – 2016 and report them to the European Commission. The Republic of Macedonia, as a Contracting Party to the Energy Community Treaty, also has an obligation to prepare the EEAPs, however for the period 2010-2018 due to the later accession to this process. The legal ground for preparation of EEAP is determined in the Energy Law<sup>1</sup>, which enable transposition of the requirements of ESD. The First EEAP was prepared and submitted for the period 2010-2012<sup>th</sup> and the present document represents the Second Energy Efficiency Action Plan of the Republic of Macedonia (further in the text: Second EEAP), containing measures and activities for the period 2013-2015.

The Second EEAP has been developed on the basis of requirements of Article 14.1 in Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services as the cornerstone for the EEAP development process, while the Energy Community acquis also include the Directives 2010/31/EU and 2010/30/EU<sup>2</sup>. The recommended template providing a framework for the development of this document, which is prepared by European Commission and Joint Research Centre for Member States of European Union, and is adapted by the Energy Community Energy Efficiency Task Force in October 2012, has been used.

The second EEAP for the period until 2015, considering targeted energy efficiency savings by 2018, prescribes the energy savings objectives and prescribes measures and activities for achieving intermediate energy savings target for 2015. The second EEAP analyses the achieved effects in the period 2010-2012 and, where necessary, revise the current measures and establish a new sectoral measures in order to ensure the achievement of objectives by year 2015 and 2018.

The second EEAP is prepared in order to enable approaching to EU policy for 20% reduction of primary energy consumption by 2020 compared and reaching 9% final energy consumption reduction by 2018 with the reference level of 5-year consecutive period<sup>3</sup>. It provides a framework for the development of measures to enhance energy efficiency improvement, in particular for end-use energy consumers, and platform to evaluate the energy savings resulting from the implementation of these measures.

The method and specific features of the assessment of the total and intermediate indicative targets are described in this document. Aggregate and individual data on energy consumption have been used to set the targets. These data were provided by Ministry of Economy of the Republic of Macedonia, State Statistical Office, the State Hydrometeorological Institute, data from the energy balance of the Republic of Macedonia issued by MoE, the Ministry of the

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<sup>1</sup> Energy Law (Official Gazette of the Republic of Macedonia No. 16/2011, 136/2011, 79/2013, 164/2013 and 41/2014)

<sup>2</sup> Directive on Energy Performance of Buildings (EPBD) and Directive on the Indication by Labeling and Standard Product Information of the Consumption of Energy and Other Resources by Energy-related Products, as well as a set of implementing directives/delegated acts

<sup>3</sup> Decree on indicative targets for energy saving in the Republic of Macedonia (Official Gazette of the Republic of Macedonia No. 112/2011)

Interior, Macedonian Centre for Energy Efficiency (MACEF) and academic experts from specific fields.

Preparation of the Action Plan is aimed at producing a more concise document and refreshing the data on timing for implementation of energy efficiency (EE) improvement measures, putting an emphasis on social implications of utility affordability.

For the purpose of monitoring and evaluation of the implementation of first EEAP, expert's support was provided by GZ ORF-EE, under the Project for "Regional exchange to the establishment of a monitoring platform for energy efficiency". Also GIZ provided translation of the draft second EEAP.

Within the framework of the Low Emissions Development and Clean Energy Investment (LED-CEI) Project funded by the United States Agency for International Development (USAID) and implemented by Winrock International, the Macedonian Centre for Energy Efficiency (MACEF) was engaged to support MoE and EARM in the development of the Second EEAP, which will be submitted to the Energy Community.

## Executive Summary

The development and adoption of the Second EEAP fills the requirement of the Energy Community (EnC) in terms of reporting on the activities in the previous period and the evaluation of the actual realized energy savings in relation to the objectives of the first EEAP for 2010-2012. At the same time, this document presents a foundation for preparing the next – third Action Plan, which, in turn, will analyze the implementation of this EEAP.

In accordance with the proposed guide and template of the EnC, document contains:

- Evaluation of the implementation of the first EEAP;
- Proposal of sectoral energy efficiency measures which implementation will contribute to reduction in end-use energy consumption, as well as measures on the side of production, transmission and distribution of energy, which should also contribute to considerable savings of primary energy.

National framework for end-use energy savings, adopted with 1<sup>st</sup> EEAP is 66.10 ktoe by 2012. Based on the analysis of the achieved energy savings, which are based on available statistical data, it was determined that in 2012 the planned targets were not achieved. The results based on the BU method showed realization of energy savings in amount of 22.96 ktoe (1.4%) and, according to TD method, energy savings in amount of 41.94 ktoe (2.56%) as Table 0.1 shows.

*Table 0.1. National indicative target for final energy savings, projections and its achievement under first EEAP*

National indicative target in 2018 (ktoe)			147.2			
National intermediate indicative target in 2012 (ktoe )			66.10			
Sector division of target	Sector target (ktoe)		Achieved final energy savings in 2012 (ktoe)		Estimated final energy savings in 2018 (ktoe)	
	2012	2018	Total (TD)	From measures (BU)	Total (TD)	From measures (BU)
Residential	7.63	29.80	7.14	2.79	27.41	21.07
Services	4.96	17.80	4.78	1.55	33.77	33.11
Industry	40.96	66.55	21.87	10.46	57.59	32.24
Transport	12.55	32.84	8.14	8.15	28.26	24.53
<b>Total:</b>	66.10	147.2	41.94	22.96	147.03	110.95
<i>Percentage (%) (compared to ESD reference consumption)</i>	4.04%	9%	<b>2.56%</b>	1.40%	<b>8.99%</b>	6.78%

Taking into account that these results apply to the final energy savings for end users, primary energy savings are on the level of 68.85 ktoe (see Table 0.2), due to the specific features of the Macedonian energy generation infrastructures (80% electricity production in thermal power plants with efficiency of 32%).

*Table 0.2 Overview of targets and achieved/projected energy savings both in respect of primary and final energy*

Year	Primary energy		Final energy		
			ESD		EPBD
	Target (in ktoe)	Projection (ktoe)	Final energy savings target as set in the first EEAP (in ktoe)	Attained (for 2012) and projected final energy savings (for 2015 and 2018), in ktoe	Target for nearly zero energy houses (All new buildings, percentage (%) or tightening of energy performance requirements)
2012	68.85	104.69	66.10	41.94	0
2015	125.76	213.52	135.96	80.06	0
2018	229.37	310.44	146.99 (199.78)*	151.19	N/A

- The desired target, implemented into strategy documents in parallel with national indicative target of at least 9%, stipulated with Decree on indicative energy savings targets

To determine the energy savings predicted by energy efficiency measures in the period covered by the 2<sup>nd</sup> EEAP, the determined achievement of the real energy saving is based on the energy end-use, i.e. 41.94 ktoe at the end of 2012 as the new starting point for the next period. It is noteworthy that the Republic of Macedonia will achieve the national indicative target of at least 9%<sup>4</sup> (i.e. according to the second EEAP, there are possibilities for 9.24%, which represent energy savings in amount of 151.22 ktoe) by 2018. This is possible to achieve despite the fact that the estimated indicative intermediate target for 2012 was not fulfilled.

The 2<sup>nd</sup> EEAP attributes highest priority to the implementation of a well-designed and organized, detailed programs such as EPUBIL, INDEF and COGEN, which are followed by the implementation of other measures described.

New measures are introduced in the **industry and energy** sector, which were not analyzed in the 1<sup>st</sup> EEAP. These measures primarily relate to intelligent networks and the need to reduce energy consumption in the distribution of all energy types.

In addition to the energy efficiency measures, the 2<sup>nd</sup> EEAP also foresees increasing the share of **renewable energy sources as an** important measure for achieving the national goal of reducing fossil fuels consumption. This primarily concerns the increased use of solar energy for hot water preparation, but also significant attention and application of heat pumps and increased use of bio-mass. Envisaged measures are closely related to strategic documents, action plans and promotional measures for greater use of renewable energy.

The calculation of the **overall national indicative intermediate target** has been carried out according to the Ordinance for indicative energy-saving targets in the Republic of Macedonia (Official Gazzete of the Republic of Macedonia No. 112/2011), which also prescribed Methodology on setting the indicative targets, based on Annex I of the ESD 2006/32/EC. The national intermediate indicative targets for 2015 was calculated on the basis of the average final consumption of energy during the realization of 1<sup>th</sup> EEAP for which data were available and are in harmony with Strategy for improvement of the energy efficiency until 2020 (Table 0.3).

Table 0.3 National indicative targets

Indicative target in 2015 (ktoe)	80.06
Realized savings in 2012 (ktoe)	41.94

<sup>4</sup> ESD requirement and stipulated with the Ordinance on indicative energy saving targets

Sector	Sector target (ktoe)	
	2015	%
Building	5.61	7.0%
Residential	8.69	10.9%
Public sector	9.05	11.3%
Commercial	4.19	5.2%
Industry	35.06	43.8%
Transport	14.65	18.3%
Energy	2.80	3.5%
<b>Total:</b>	<b>80.06</b>	<b>100.0%</b>

A significant number of strategic documents and regulations have been adopted in the Republic of Macedonia, which are harmonized with EU legislation. Those documents contain various activities related to the implementation of EE measures. The impact of these individual actions can hardly be separated and difficult to evaluate due to their combined nature and overlapping results. For this reason, when there are no defined standards and methods for this purpose, the effect of these measures cannot be accurately assessed. the potential energy saving impact is particularly cumbersome for **horizontal and cross-sectoral measures**.

For this purpose it was applied top-down (TD) method, using energy efficiency indicators on the macro-economic level. These include: primary and final energy intensity (total and normalized with climatic corrections), adjusted final intensity (at constant structure, adjusted according to the economy, climate and structure), and CO<sub>2</sub> index (CO<sub>2</sub> intensity, CO<sub>2</sub> per capita), GDP, average income of employees and others.

For the implementation of the proposed set of energy efficiency measures, it was necessary to strengthen the institutional support, especially in buildings. Adoption of the Housing Law – stipulating that every multi apartment facility must operate as a legal entity – to form a community of tenants of the building or delegate the housing maintenance function to a professional organization, is a big step forward in the **legislation**, which should enable faster renovation of these buildings. Establishment of Home-Owners association will ensure higher quality of contracts with all service providers, in that direction the ESCO services, too.

**Monitoring** of the implementation of the 2<sup>nd</sup> EEAP and reporting results based on measuring and verification of energy savings are under responsibility of EARM. In order to monitor the actual energy savings and to avoid problems related to the lack of data needed to calculate the savings from individual measures, which was present in the preparation of this EEAP, the EARM and MoE have to establish an information system to track all activities of energy efficiency and energy savings assessment. Tasks can be assigned to expert teams outside EARM (outsourcing), if necessary.

Realistic and stable **funding sources** for the implementation of this EEAP have to be provided in most of the extra-budgetary sources of financing and market mechanisms. A very small part of budgetary resources (Central and Local) have to be allocated, for the preparation of the programs within the specific measures, however significant funds will be necessary for the implementation of the EPUBIL program with participation of donors and FI.

Table 0.4 summarizes **all the energy efficiency measures in the sectors of final energy consumption** in the proposed 2<sup>nd</sup> EEAP with the assigned responsibilities for implementation and the estimated funds required.

The implementation of a complex program of energy renovation of residential buildings and non-residential buildings for public and commercial purposes will require significant financial resources: the funds required by 2015 are estimated at about 7737 million denars. The State should co-finance a part of this cost due to its strategic importance, as well as its potential to significantly contribute to economic recovery and job creation, especially in the construction industry.

A more precise assessment of necessary financial resources as well as sources of financing, will be elaborated in the programs and plans for the implementation of specific energy efficiency measures identified in this EEAP.

Table 0.4 Summary of energy efficiency measures in the sectors of final energy consumption

<b>Id.</b>	<b>Title of EEI measure</b>	<b>Expected energy savings in 2015 [ktoe]</b>	<b>Expected energy savings in 2018 [ktoe]</b>	<b>Implementing body</b>	<b>Required financing in the period 2013-2015 [MDen]</b>	<b>Sources of financing</b>
B.1.	Implementation of Rulebook on energy performance of buildings	5.41	16.70	MoE, GA, PSE, MULS, PS	302.36	EEF, MULS
B.2.	Inspections of boilers/air conditioning systems	0.20	1.54	MoE, EARM	18.45	MULS, PS
R.1.	Retrofits in existing residential buildings	4.60	11.95	PS, Donors	2047.95	FI, PS, ESCO
R.2.	Electrical appliance and equipment labelling	0.50	0.66	MoE, PSE, PS	227.55	FI, PS
R.3.	Promotional Program for wider application of solar collectors	1.90	2.37	MoE	504.30	MoE, PS
R.4.	Promotional/ Informational campaign	1.69	5.12	MoE, EARM, MULS, ESP, HEP	141.45	MoE, EARM, FI, ESP, HEP (EVN, ELEM, MEPSO, BEG)
P. 1	Retrofits in existing public buildings	5.10	8.17	MoE, EEF, PSE	2170.95	EEF, FI, EUF
P. 2	Energy Management	1.60	2.57	MoE, MULS	393.60	MoE, MULS, donors
P. 3	Municipal Street lighting	1.00	1.29	MULS	448.95	MULS, ESCO, EEF
P. 4	Wider application of Renewable Energy	0.85	1.57	MoE, MULS	239.85	MULS, ESCO, EEF
P. 5	Green procurement	0.50	1.05	EARM, OPP, PSE	30.75	MULS, GA
C. 1	Retrofits in existing commercial building	2.48	4.25	PS	718.24	PS, FI, ESCO



C. 2	Energy Management	0.87	1.69	PS	249.23	PS, FI, ESCO
C. 3	Wider application of Renewable Energy	0.85	1.92	PS, MoE	243.30	PS, FI, ESCO
I.1.	Improvement of process performances	3.98	4.01	PS, EARM, MoE	317.96	PS, FI, ESCO
I.2.	Energy Management	2.55	4.87	PS, MoE, EARM	85.07	PS, FI, ESCO
I.3.	Introduction of efficient electrical motors	1.14	2.48	PS, MoE, EARM	37.82	PS, FI, ESCO
I.4.	Waste heat utilization/ CDM	9.10	21.65	PS, MoE, EARM	303.03	PS, FI, ESCO
I.5.	Co-generation	18.30	24.58	PS, MoE, EARM	424.97	PS, FI, ESCO
E.1.	Heat cost allocators	0.20	0.39	HEP, ERC	31.49	ESCO, HEP
E.2.	Inteligent network	2.60	5.50	ESP	2221.09	ESP, HEP
T. 1	Renewal of the national road vehicle fleet	6.80	10.66	PS, GA, MTC	N/D <sup>5</sup>	PS, MTC
T. 2	Promotion of sustainable urban transport systems	5.50	12.51	MoE, MTC	N/D	MULS, MTC
T. 3	Car free days	1.85	3.06	MULS, MoE	N/D	MULS
T. 4	Promotion of greater use of railway	0.50	0.66	MoE, MTC	N/D	MoE, MTC
H.1	Financial incentives	/	/	EEF	N/D	GA, MoE
H.2	EE in education, research and science	/	/	MES	N/D	GA, MES
H.3	Feeding tariffs	/	/	ERC, EARM	N/D	ESP
H.4	Credit lines	/	/	FI, Donnors	N/D	FI, EUF
SUM		80.06	151.19		11158.34	

In the Table 0.5 estimated indicative funds are given, per separate financial sources, needed to implement planned energy efficiency measures in each of the sectors.

In the Table 0.6 estimated indicative funds are given, which have to be provided by different financial sources and per separate sectors.

Table 0.7 shows necessary dynamic of investment from different sources.

Table 0.5 Investments per financial sources for each sector (in mil. Denars)

<sup>5</sup> It cannot be estimated needed funds



Sector/ Financial source	Budget of the RM <sup>6</sup>	Municip alities	EEF	ESCO compani es	Financial Instituti ons (foreign, domestic and donors)	Energy suppliers	Private sector	Total investme nts for the period 2013- 2015
<b>Buildings</b>	219.92	32.08	0.00	0	0	0	68.81	320.81
<b>Residential</b>	25.07	0	0	409.59	1141.75	84.87	1259.97	2921.25
<b>Public</b>	137.49	509.78	1098.84	672.20	865.80	0	0	3284.10
<b>Commercial</b>	0	0	0	302.69	302.69	0	605.39	1210.77
<b>Industry</b>	0	0	0	292.21	292.21	0	584.43	1168.85
<b>Energy</b>	0	0	0	23.62	0	2221.09	7.87	2252.58
<b>Mobility</b>	N/D <sup>7</sup>	N/D	0	0	N/D	0	N/D	N/D
<b>Total</b>	382.48	541.86	1098.84	1700.31	2602.45	2305.96	2526.46	11158.36

Table 0.6 Investments per years for each sector (in mil. Denars)

Sector/year	2013	2014	2015	Total
<b>Buildings</b>	60.47	130.17	130.17	320.81
<b>Residential</b>	847.39	989.78	1084.08	2921.25
<b>Public</b>	321.55	1165.91	1796.64	3284.10
<b>Commercial</b>	192.31	509.23	509.23	1210.77
<b>Industry</b>	113.55	527.65	527.65	1168.85
<b>Energy</b>	0	1126.29	1126.29	2252.58
<b>Mobility</b>	N/D <sup>8</sup>	N/D	N/D	N/D
<b>Total</b>	1535.27	4449.04	5174.06	11158.36

<sup>6</sup> For the implementation of measures and activities included in the present Action Plan, the Budget of the Republic of Macedonia has taken into consideration the budgets of the Ministry of Economy, Ministry of Transport and Communications, Ministry of Education and Science, Ministry of Health, Energy Agency of the Republic of Macedonia, Ministry of labor and social policy, Ministry of finance, SOZR, Ministry of internal Affairs and Office for execution of sanctions.

<sup>7</sup> There are no sufficient data to estimate needed funds.

<sup>8</sup> There are no sufficient data to estimate needed funds.

Table 0.7 *Investments per financial sources per year (in mil. Denars)*

Year / Financial source	Budget of the RM	Municipalities	EEF	ESCO	Financial Institutions (foreign, domestic and donors)	Energy suppliers	Private sector	Total investments for the period 2013-2015
<b>2013</b>	153.56	152.02	0	0	867.48	576.49	842.15	2591.72
<b>2014</b>	134.04	194.92	219.77	340.06	867.48	864.74	842.15	3463.16
<b>2015</b>	94.87	194.92	879.07	1360.25	867.48	864.74	842.15	5103.48
<b>Total</b>	382.48	541.86	1098.84	1700.31	2602.45	2305.96	2526.46	11158.36

The successful achievement of the envisaged measures entails full devotion of all participants in this process. The 2<sup>nd</sup> EEAP was prepared using following control list of measures necessary for effective realization:

- ❖ EE Fund implementation;
- ❖ Development of secondary legislation; building codes enforcement;
- ❖ Tariff reform;
- ❖ Incentives for wider combined EE-RES application;
- ❖ Improvement of energy efficiency statistics collection;
- ❖ Low-income assistance for EE measures implementation and
- ❖ Strengthening the institutional capacity of the State, etc.

One of the highest priorities is to urgently develop an efficient information system for monitoring and verification of activities and the size of energy savings associated with the implementation of EE measures.

Macedonia will not achieve the goals of reducing energy consumption in final consumption by 2015 without systematic and timely implementation of the measures set out in this EEAP.

## 1. OVERALL CONTEXT OF THE SECOND EEAP

The first EEAP primarily focused on the determination of measures aimed at reducing the end-use energy consumption. Energy efficiency measures in households sector (residential), administrative and commercial, industry and transport defined a number of horizontal measures.

The Agriculture sector as well as the “Energy consumption for other purposes” have not been analyzed because of their small shares in the state energy balance with 3.5 percents. However, this does not mean that in the process of preparation of the plans and programs for EE implementation at municipal level these sectors shall be neglected. This especially refers to the possibility of increased and more efficient use of biomass and geothermal energy in the regions where it is available.

A significant number of the energy efficiency improvement (EEIs) measures in the first EEAP needed be revised or grouped, shaping a new measure, or retaining the former name but supplemented with content in accordance with the requirements articulated by the European Commission via the Energy Community.

The following Table 1.1 lists the measures that are foreseen to be realized through EEAP 2; parallel display measures were provided with EEAP 1. Based on the EEAP 1 analysis of results is done realignment of certain measures that are not possible to obtain reliable information about the size of saved energy by certified instruments.

Their influence is determined by TD method. At the same time shown a link with national BU methodology is provided for monitoring and verification of achieved energy savings.

To provide a better determination of the impact of individual measures in the buildings sector, they are conditionally divided into four groups - general building that housed group measures related to legislation and binding in all other parts of the group i.e. energy audit of buildings, issuing energy performance certificates, recommendations for EE measures that could/should be taken after the pedigreed realized modernization of the building (over 30%). This includes binding measures to inspect heating systems over 20 kW, and systems of air conditioning capacity over 12 kW.

Table 1.1. Connection between energy savings measures determined in EEAP 1, EEAP 2 and BU methodology

Energy saving measures in EEAP 2	National BU Method for energy savings calculation	Sector		Energy saving measures in EEAP 1
		N 2	N 1	
Implementation of BEP into new buildings (EPB certificates) - Energy audit	Building regulations for new residential buildings	B.1.	R	Social Housing
			R	BEP certificates - New buildings (heating, solar collectors, new appliances, lighting)
	Residential condensing boilers in space heating		R	New efficient individual boilers for central heating
			A/C	BEP certificates
Inspections of boilers/air conditioning systems	Biomass boilers	B.2.	A/C	Inspections of boilers/air conditioning systems
Retrofits in existing residential buildings	Improvement of the building (envelope of residential buildings)	R.1.	R	EE Retrofits in existing buildings
	Domestic Hot Water - Heat Pumps..		R	Efficient Wood fuel furnaces
Electrical appliance and equipment labelling	Energy efficient cold appliances and washing machines	R.2.	R	Electrical appliance and equipment labelling
			R	Social Housing
			R	BEP certificates - New buildings (heating, solar collectors, new appliances, lighting)
Promotional Program for wider application of solar collectors	Domestic Hot Water - Solar water heaters	R.3.	R	Solar collectors for existing buildings
Promotional campaign		R.4.	R	Promotional /Info campaign
Retrofits in existing public	Non residential space	P. 1	A/C	Education sector refurbishment

buildings	heating improvement in case of heating distribution by a water loop.		A/C	Hospitals refurbishment
	Improvement of lighting systems (tertiary sector)..		A/C	Information campaigns and EE Municipal network
	Improvement of central air conditioning (tertiary sector).		A/C	Electrical appliance and equipment labelling
Energy Management		P. 2	A/C	Energy management
Municipal Street lighting		P. 3	A/C	Street lighting
Wider application of Renewable Energy (solar, bio mass)		P. 4	A/C	Solar collectors and GHP
Green procurement	Office equipment..	P. 5	/	New measure
Retrofits in existing commercial building	Improvement of the building (envelope of residential buildings)	C. 1	A/C	Education sector refurbishment
			A/C	Hospitals refurbishment
Energy Management	Energy audits.	C. 2	A/C	Energy management
			A/C	Electrical appliance and equipment labelling
Wider application of Renewable Energy	Domestic Hot Water - Heat Pumps..	C. 3	A/C	Solar collectors and GHP
Improvement of process performances	Variable speed drives	I.1.	I	Improvement of process performances
			I	Fuel type change
			I	Compressed air supply
Energy Management	Energy audits	I.2.	I	Energy Auditing
	Improvement of lighting systems (tertiary sector)		I	Improved Lighting
			I	Improved heating systems
			I	Energy performance of non-residential buildings
			I	Good house keeping
Introduction of efficient electrical motors	Energy-efficient motors.	I.3.	I	Variable speed drives
Waste heat utilization/ CDM		I.4.	I	CDM
			I	Waste heat utilization (non CDM)
Co-generation		I.5.	I	Co-generation
Heat allocators	Smart meters in households	E.1.	R	Heat allocators
Intelligent network		E.2.	/	New measure
Renewal of the national road vehicle fleet	Vehicle energy efficiency	T. 1	T	Renewal of the national road vehicle fleet

Promotion of sustainable urban transport systems	Ecodriving	T. 2	T	Promotion of sustainable urban transport systems
			T	Fuel quality and fuel economy standards
Car free days		T. 3	T	Car free days
Promotion of greater use of railway for intercity travel and transport	Modal shifts in passenger transport.	T. 4	T	Promotion of greater use of railway for intercity travel

Significant changes have been made in the industrial sector, where with the measure "Improving the characteristics of processes" are enveloped some previously defined specific measures. In particular it relates to measure *change the type of fuel*. The accelerated construction of the distribution network for natural gas will enable the industry to move towards modernization of equipment and processes, which will ensure decreased energy consumption per unit of product, reducing the production of damaged/low quality products and achieving higher quality in shorter time. As an added value to this process is the reduced emission of pollutants in the environment.

Is equally impact the measure concerning the modernization of installations for the production of compressed air, for which no specific data information in the field of statistics.

Grouping of many predefined measures into measure Energy Management is very important. If the previous period was particularly important given the energy audit of buildings, in the future will pay particular attention to energy audit of industrial processes and application of system for Energy Management in Industry. The grounds are defined by ISO 50001, which is a natural extension of ISO 9000 and ISO 14000. It was already started the process of training of a certain number of companies, by implementing a 3-year project funded by USAID. Good Management involves primarily, as a very first step, Energy Audit of the process and naturally measures to improve the process of lighting, heating, insulation of industrial buildings and proper maintenance of buildings and equipment.

As new measures are introduced Intelligent Networks that services the energy supply to end consumers and energy consumption smart meters. It deserve to discuss belonging of the combined heat and power production (CHP) – in the industry sector as a measure of efficient production and supply of energy (emphasizing supply), or in the energy production sector. It is also necessary to define a single common methodology for determining and valorization of energy savings in this cogeneration process.

The basic conclusion regarding the implementation of EEAP 1 is that goals are not achieved. More reasons contributed to miss reaching this level.

The Rulebook on Energy Performance of Buildings and Rulebook on energy audit (in buildings sector and in the industry sector) were prepared and adopted with some delay. The global financial crisis, which coincided with the beginning of the realization of the first EEAP, coupled with the delay in the preparation of secondary legislation, and delayed formation of the Energy Efficiency Fund, which was supposed to be the "driving force" for the implementation of the Action Plan, had a strong negative impact on the predicted dynamics of the measures envisaged.

These unfavorable circumstances and weak administrative capacity of the institutions tasked with the EEAP implementation, resulted in only partial realization of the expected benefits envisaged in the Action Plan.

The impact of municipal building refurbishment, measures envisaged in the public lighting systems and especially the increased use of solar water collectors is forecasted.

### 1.1. Implementation of the First EEAP and highlights of the Second EEAP

The implementation of the first EEAP started in unfavorable economic conditions caused by the financial crisis that had left and adverse impact on financial institutions around the world. These global processes had considerably affected the Macedonian economy as well, as manifested by reduction of contracts from foreign partners of Macedonian companies, reducing the level of the production and the resulting lack the financial resources for investments.

The EE measures prescribed for 2012 in the first EEAP were planned to achieve 4,04% (66,10 ktoe) reduction of energy consumption in relation to the baseline (5-year average of energy consumption) defined in strategic documents of the State.

This goal was not accomplished. It were realized almost 63.44% of planed savings. According to the assessment and valorization of national savings by national Bottom-Up method (NBU), only 1.40% (22.96 ktoe) savings were achieved, whereas estimates on the basis of top-down (TD) method indicated 2.56% (41.94 ktoe) energy saving (see Table 1.3.1). Such differences between results of applied methods occur because of limited access to results of achievements at the side of end-users. The qualitative and quantitative summary evaluation of 1<sup>st</sup> EEAP implementation is shown in the Table 1.1.-1.

Table 1.1-1 Overview of measures with evaluation of their implementation

Code	Title of EEI measure	Realized energy savings in 2012 [ktoe]	Expected energy savings in 2012 [ktoe]	Expected energy savings in 2018 [ktoe]	Status in relation to 1 <sup>st</sup> EEAP	Recommendation
<b>RESIDENTIAL SECTOR</b>		<b>7.14</b>	<b>7.62</b>	<b>40.52</b>		
R 1	Social housing	0.06	0.26	0.93	Partially implemented	Continue implementation
R 2	New buildings (heating, solar collectors, new appliances, lighting)	2.12	2.98	8.87	Partially implemented	Continue implementation
R 3	Solar collectors in existing buildings	1.46	0.42	2.02	Implemented as planned	Continue implementation
R 4	Heat Allocators	0	0.37	1.38	Not implemented	Continue implementation
R 5	Efficient wood furnaces	0.44	0.49	6.36	Partially implemented	Measure to be repealed/ replaced with new
R 6	Promotional/Info campaign	0.99	1.08	7.56	Implemented as horizontal measure	Continue implementation
R 7	New efficient individual boilers	ND	0.39	1.97	Not implemented	Measure to be repealed/ replaced with new
R 8	EE Retrofits in existing buildings	2.07	1.63	11.43	Partially implemented	Continue implementation
<b>COMMERCIAL/SERVICE SECTOR</b>		<b>4.78</b>	<b>4.96</b>	<b>24.19</b>		

CA 1	Education sector	2.01	0.70	3.00	Partially implemented	Measure to be repealed/ replaced with new
CA 2	Municipal Street lighting	0.66	0.11	0.92	Implemented as planned	Continue implementation
CA 3	Hospitals	0.56	1.5	3.61	Partially implemented	Measure to be repealed/ replaced with new
CA 4	Solar collectors/GHP	0.46	0.66	2.49	Partially implemented	Continue implementation
CA 5	Influence of BEP certificates	0.08	1.15	7.55	Partially implemented	Continue implementation
CA 6	Inspections of boilers/air conditioning systems	0.00	0.3	1.1	Not implemented	Measure to be repealed/ replaced with new
CA 7	Information campaigns and Municipal network of EE	0.3	0.11	1.71	Partially implemented	Continue implementation
CA 8	Energy management	0.63	0.30	2.30	Not implemented	Continue implementation
CA 9	Electrical appliance and equipment labelling	0.07	0.10	1.50	Partially implemented	Measure to be repealed/ replaced with new
<b>INDUSTRIAL SECTOR</b>		<b>21.87</b>	<b>40.96</b>	<b>90.45</b>		
I 1	Improvements of process performances	3.1	6.00	5.00	Partially implemented	Continue implementation
I 2	Co-generation	12.98	25.1	38.60	Partially implemented	Continue implementation
I 3	Energy Auditing	0.16	0.30	0.65	Not implemented as planned	Continue implementation
I 4	Energy performance of non-residential buildings	0.08	0.15	0.35	Measure to be repealed/ replaced with new	Continue implementation
I 5	Improved lighting	0.06	0.11	0.25	Measure to be repealed/ replaced with new	Continue implementation
I 6	Improved heating systems	0.16	0.30	0.40	Measure to be repealed/ replaced with new	Continue implementation
I 7	Fuel type change	0.31	0.60	0.80	Measure to be repealed/ replaced with new	Continue implementation
I 8	CDM	1.45	2.80	26.00	Not implemented as planned	Continue implementation
I 9	Waste heat utilization (non CDM)	1.29	2.50	8.00	Measure to be repealed/ replaced with new	Continue implementation
I 10	Variable speed drives	0.52	1.00	3.90	Partially implemented	Continue implementation
I 11	Compressed air supply	0.05	0.1	0.50	Measure to be repealed/ replaced with	Continue implementation



					new	
I 12	Good house keeping	1.03	2.00	6.00	Measure to be repealed/ replaced with new	Continue implementation
<b>TRANSPORT SECTOR</b>		<b>8.14</b>	<b>12.56</b>	<b>44.63</b>		
T 1	Renewal of the national road vehicle fleet	3.73	2.18	14.11	Partially implemented	Continue implementation
T 2	Promotion of sustainable urban transport systems	3.25	5.02	14.93	Partially implemented	Continue implementation
T 3	Fuel quality and fuel economy standards	0.52	2.39	7.54	Partially implemented	Measure to be repealed/ replaced with new
T 4	Car free days	0.4	0.39	1.05	Partially implemented	Measure to be repealed/ replaced with new
T 5	Promotion of greater use of railway for intercity travel	0.25	2.58	6.99	Partially implemented	Continue implementation
Total realized in 2012		<b>41.94</b>				
Total from measures (BU):			<b>22.96</b>	<b>151.2</b>		
Intermediate target for 2012:		<b>66.10</b>				
Target for 2018:				<b>147.2</b>		

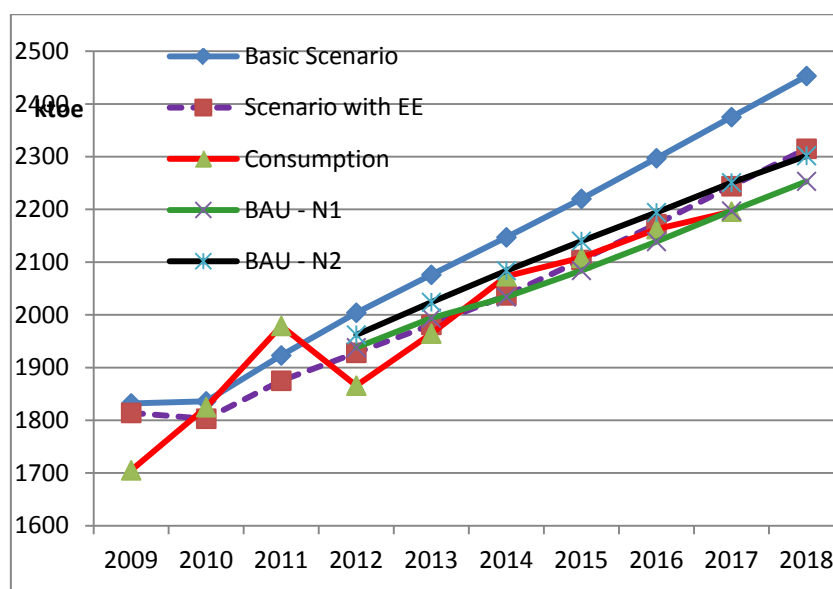


Figure 1.1.1 Energy savings related to energy development scenario and assumed energy savings with EEAP 1 and EEAP 2

Realization (implementation) of the measures to reduce the energy consumption of end users in the **residential sector** is realized in the amount of 81.36%. More reasons influencing this



situation, but as the dominant must underline the global financial situation in the period 2000-2012, with all its negative implications.

In the sector of construction of social housing (measure R1) is manifested by reducing the number of apartments constructed, i.e. with the realization of only 23%. This measure is projected to continue, with the expectation to reach previously planned levels.

Higher achievement is the measure R2 (construction of buildings, installation of energy efficient light bulbs and improved insulation) with achievement of 58.72%. Market conditions influencing investors to implement EE measures although it was not ordered by the Rulebook on energy performance of buildings, due to its late entry into force. This measure is disaggregated (divided) into EEAP because the impact of EPB Regulations as horizontal extent and impact of buildings in the public and commercial sectors.

Good information campaigns, financial incentives and market conditions contributed to overcoming the expectations of saving energy by installing solar collectors (measure R3) be exceeded by 347.62%. The measure continues with increased expectations for saving energy in the future.

The application of heat allocators (measure P4) is not realized as expected for two reasons. The first is the decision of the ERC that installation of this equipment can be achieved only if 80% of the owners of the apartments agree, which is difficult to achieve. The second reason is the way the price of the energy consumed is formed. The fixed part of price is determined depending on the projected engaged power (participating with 33% in energy price), rather than real spent quantity of energy. It causes considerably to reduce the financial effects of implementation of this measure because decreasing of energy consumption is not properly financially expressed due to the fixed part of the established price (financial savings reduced by 33%).

Statistical Office of the Republic of Macedonia has no specific information on the number of sold wood stoves (R5 measure), either for boilers for individual central heating (measure R7). For this reason, the estimated values of these measures are shown together in the frame of the measure R8 - EE Retrofits in existing buildings, which is very close to the real situation. Modernization/ weatherization of existing facilities is conducted based on the growing awareness of the need for energy conservation, as well as due to the pressure caused by the continued growth in the price of energy. Jointly, these three measures allowed savings which are 119% compared to expectations of a single measure R8.

Results in **the commercial and service sector** are in general more favorable compared to the results in the residential sector (achievements in the amount of 94.76% to 81.36%). The main reason is considerably participation of international financial institutions in the financing of modernization of schools and kindergartens (CA1 measure) and partly in hospitals (CA3 measure). Savings energy in the sector of education is realized with 225.71% compared to expected values in EEAP 1, but in the sector of hospitals only with 13.33%.

Public lighting, due to the short pay-back period, considerably exceeded expectations (4.4 times higher savings than anticipated).

There were realized expectations and to measure CA 4 - for the application of solar collectors (112% realization). Planned is a considerably greater share of this measure in the next period.

In this sector adversely affect the delay of the adoption of the Rulebook on EPB, too. The implementation of measures CA 5 and CA 6 is with 54% and 20% respectively, compared to expectations. Although no orders to obey the EPB norms, they were unofficially implemented, because of economic logic - to reduce energy costs. The second reason is that

international institutions to donate / participate in the cost of implementation of EE measures, require to accomplish energy audits of buildings.

Permanent growing cost of energy were "forced" managers of public and commercial facilities to pay special attention to organizing the management of energy consumption and thereby achieve the expectations set by EEAP 1 (measure CA 8 common with measure CA 9).

Financial problems in the region had maximum consequences in the **industrial sector**. It was realized only 51.69% of the expected energy savings. Primary, reduction of energy savings was caused by the delay entry into operation of two cogeneration power plants. Sensitively influenced by the relatively small difference in the price of electricity and natural gas, continuous operation of these power plants was disabled.

In the **transport sector** was realized 65% of assumed energy savings. The best results were achieved with renewal of the vehicles (realization of 171.1%). The measure of the government to allow import of used cars (second hand), enabled many citizens and companies to replace their old vehicles older than 15- 20 years, with relatively newer, with considerably better performances.

The condition caused by that diminished energy savings is unfavorable in terms of expectations, but in real terms to the financial ability of the stakeholders. On the Figure 1.1.1 displayed is comparatively expected developments in the sector of final energy consumption under baseline (BAU) scenario and Scenario with strengthened implementation of EE measures (Energy Development Strategy of the Republic of Macedonia till 2030). Shown is the expected change in energy consumption by State Energy Balance, adopted by the Government of the Republic of Macedonia (red line on the figure) and the state of consumption if implemented measures provided for in the first EEAP (green line labeled BAU-H1) and the situation is expected if the measures are applied provided the second EEAP (black line labeled BAU-H2).

The measures envisaged in the second EEAP allowing reaches indicative target of 9%, while by the implementation of measures in first EEAP will be realized reduction in final energy consumption for 12.21%. Prediction of scenario with stronger EE measures and forecasts by second EEAP match the 2018.

The second EEAP includes a restructured presentation of measures which were provided in the first EEAP, their grouping, and forecasted new measures stipulated by the latest EU directives and recommendations. The commercial and service sector from the first EEAP is divided into two parts - (i) public sector and (ii) commercial sector, due to the different conditions in the implementation of the measures. In the public sector the measures are binding, whereas in the commercial sector those are predominantly voluntary, and should be driven by market forces and economic rationale.

To achieve successful implementation of the envisaged measures, it is necessary to provide dedicated engagement of all participants in this process.

There are many barriers and limiting factors to the broader application of measures to improve the energy efficiency and energy savings in the industrial sector. Commercial barriers are also a major obstacle to improving energy efficiency, as they can prevent access to technologies and the spread of efficient energy use practices. These include in particular:

- energy prices that do not reflect the real costs of energy, as they do not include the externalities;
- institutional and legal barriers and

- lack of or incomplete information which often hampers the use of cost-effective and energy-efficient technology.

Some of the typical existing barriers in the industry are:

- Frequent poor ability to assess opportunities for improving energy performance;
- Often small share of energy costs in the overall production costs;
- Saving potential is estimated as too low;
- Energy consumption is not a topic considered on top management level;
- Missing know-how or lack of awareness in the companies;
- Core business diverting attention and priority, while energy-related issues are of secondary importance;
- Lack of up-front capital investment resources and willingness to invest for measures with pay-back time is higher than 3 years, and most of the EE investments in the industrial sector are characterized with longer pay-back periods;
- The management would rather pay higher operational costs, to ensure even limited profit to the company, rather than to invest in new equipment, which will have to pay back over a certain period of time before it starts yielding financial savings;
- The public funding is scarce and the fiscal space getting tighter because of the global financial and economic crisis and
- The sectoral specifics of data confidentiality and commercial secret for competitiveness reasons prevent networking, sharing of success stories, benchmarking, demo-projects, etc. in the private sector.

The EEAP was prepared using following control list of measures necessary for effective realization:

- EE Fund implementation;
- Development of secondary legislation; building codes enforcement;
- Tariff reform;
- Incentives for wider combined EE-RES application;
- Improvement of energy efficiency statistics collection;
- Low-income assistance;
- Strengthening the institutional capacity of the State and local institutions, etc.

Government stimulus measures to accelerate the implementation as well as economic market conditions of implementing energy efficiency measures, will move participants from private sector. This would require the Government to implement the following:

- Constant financial support for energy efficiency measures.
- Continued support to implementation of primary and secondary legislation related to energy efficiency.
- Creating and putting into operation the Energy Efficiency Fund.
- Efficient transparent control and monitoring of the accomplishment of targets.

*The highest priority is to immediately establish an efficient information system for monitoring and verification activities to document and verify the quantity of energy savings associated with the implementation of EE measures.*

Anticipated goals by 1<sup>st</sup> EEAP, according to the distribution between sectors are shown in Table 1.1.1.2, and actual results and expectations according EEAP 2 in Table 1.1.1.3.

Table 1.1.1.2 Indicative sectors targets according EEAP 1

Indicative target in 2015 (ktoe)	135.96	
National intermediate indicative target in 2012 (ktoe )	66.10	
Sector	Sector target (ktoe)	
	2015	%
Residential	20.41	15.0%
Services	14.85	10.9%
Industry	72.49	53.3%
Transport	28.21	20.7%
<b>Total:</b>	<b>135.96</b>	<b>100.0%</b>

Table 1.1.1.3 Indicative sectors targets according EEAP 2

Indicative target in 2015 (ktoe)	80.06	
Realized savings in 2012 (ktoe )	41.94	
Sector	Sector target in 2015	
	In ktoe	In%
Buildings	5.61	7.01%
Residential	8.69	10.85%
Public sector	9.05	11.31%
Commercial	4.19	5.24%
Industry	35.06	43.79%
Transport	14.65	18.30%
Energy	2.80	3.50%
<b>Total:</b>	<b>80.06</b>	<b>100.0%</b>

Unfavorable changes in financial conditions worldwide and in Macedonia, delayed development and adoption of the Rulebook on energy performance of buildings, as well as non-sufficient capacity of institutions responsible for monitoring and verifying the amount of final energy savings, contributed to lower the indicative target in the 2015th of 80.06 ktoe, to decreased for almost 56 ktoe in terms of 1<sup>th</sup> EEAP.

Reduction is manifested in all sectors. In the buildings sector expected saving of final energy decreased from 35 ktoe to over whole value of 27.6 ktoe in that there are all counted expected savings from measures related to buildings (residential, public, commercial and administrative, industrial) (Figure 1.1.2).

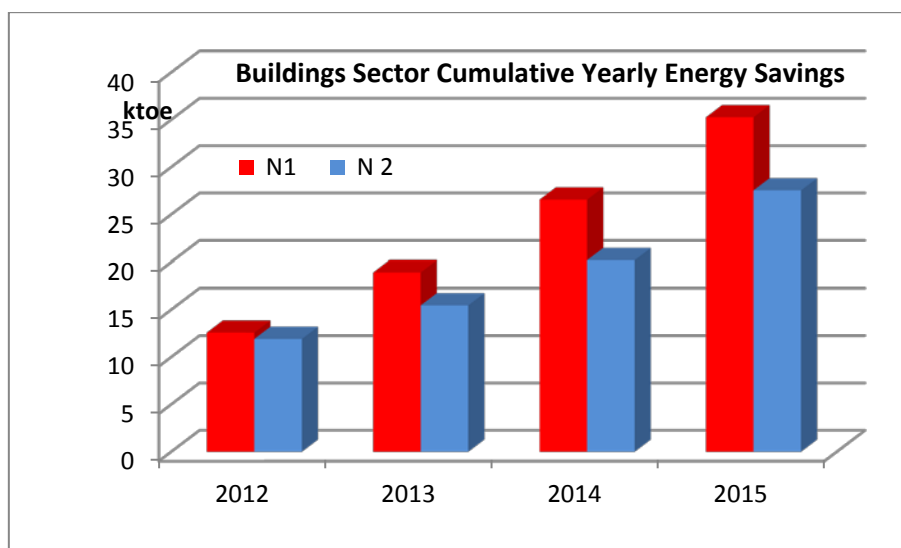


Figure 1.1.2 Cumulative energy savings difference between the first (N1) and second (N2) EEAP in the buildings sector

The difference in the industrial sector is significant, because with the first EEAP was expected reduction in energy consumption of 72.49 ktoe, and in the second EEAP such expectations are reduced to a level of 37.86 ktoe, whereas this value refers to the sectors Industry and Energy. The main reason is the delay in the start of operation of the two CHP plants, as well as adverse movements in the price of natural gas (Figure 3.3.2) relative to the price of electricity, which prevented their regular operations.

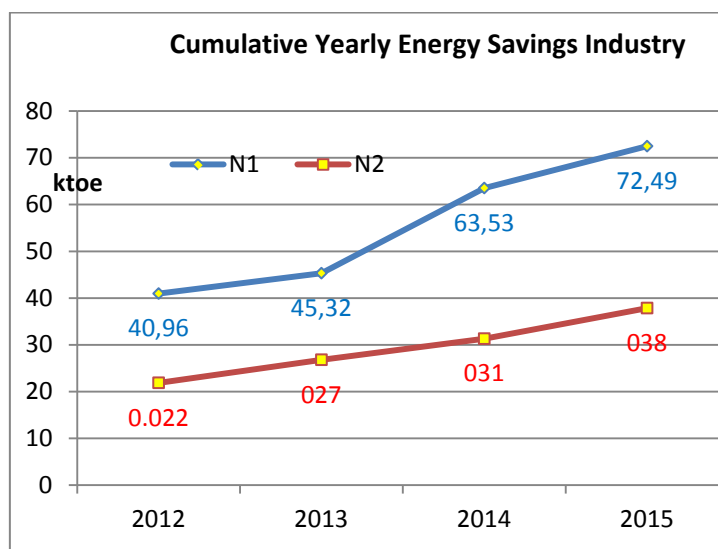


Figure 1.1.3 Cumulative energy savings difference between the first (N1) and second (N2) EEAP in the industry sector

In the transport sector, dwindling energy savings starts of 28.21 ktoe as is provided in the first EEAP, till 14.65 ktoe assumed in the second. The main reason is the lower number of new vehicles that went (were bought) in the transport system than expected, and delayed implementation of other measures. The difference of assumed level of savings with EEAP 1 and EEAP 2 is shown on Figure 1.1.4.

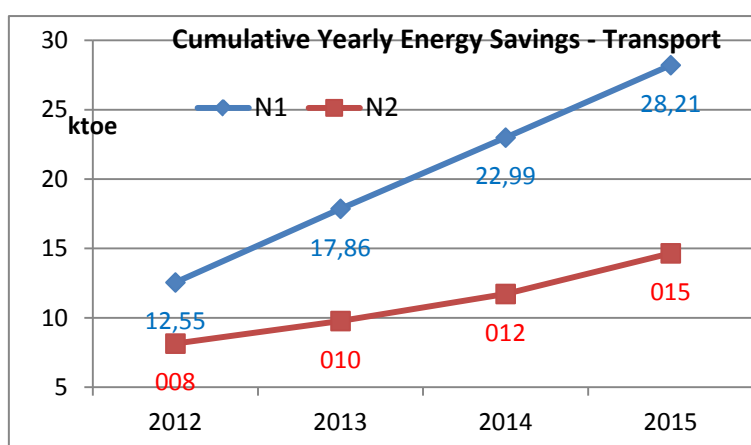


Figure 1.1.4 Cumulative energy savings difference between the first (N1) and second (N2) EEAP in the transport sector

## 1.2. National Context of Energy Savings

The objective of the Strategy for improvement of the energy efficiency<sup>9</sup> of the Republic of Macedonia until 2020 is to develop a framework for accelerating adoption of energy efficiency practices in a sustainable fashion through implementation of a series of programs and initiatives that are linked to creating reduction of import dependence, energy intensity, the non-productive use of electricity, preparing a favorable ground to maximize the

<sup>9</sup> Strategy for improvement of the Energy Efficiency of the Republic of Macedonia until 2020, adopted in 2010.

involvement of and opportunities for the private sector, complemented by advocacy and training activities.

The final result of achieving this objective will be realization of 14.35 % energy savings till 2020, comparing to average consumption in the observed 5 years period (2002-2006), with continued promotion of energy efficiency and monitoring and verification. This is an important task for RM in the way to sustainable development of the country's economy, and to fulfill commitments in the way of EU accession.

According to the Energy Sector Development Strategy, without integration of energy efficiency, the energy consumption in the Republic of Macedonia will reach the level of 2703 ktoe by the year 2020<sup>10</sup>. The two scenarios of energy efficiency penetration can bring to either 3.14 percent (under limited integration of energy efficiency), or 8,8 percent (strong intervention of energy efficiency scenario) less energy consumption compared to business as usual - BAU). As a signatory of the Energy Community Treaty, the Republic of Macedonia aims to achieve this at least 9 percent energy saving target, which is equal to 147 ktoe by 2018, compared to the baseline – measured in average consumption during the five-year period 2002-2006, which is equal to 1636 ktoe.

The various scenarios and their respective estimated energy saving potentials are summarized below (2020 energy consumption as presented in the Energy Sector Development Strategy):

- Under Business as Usual (BAU, no EE): 2703 ktoe;
- Under limited energy efficiency measures: 2618 ktoe; 85 ktoe (3.14%) less than BAU;
- Under strong energy efficiency intervention: 2466 ktoe; 237 ktoe (8.8%) less than BAU; or 14.5% below 2002-2006 average consumption.

Expected energy savings in 2020 are estimated at 237 ktoe (14.5 percent savings of energy compared to the average consumption in the period 2002-2006).

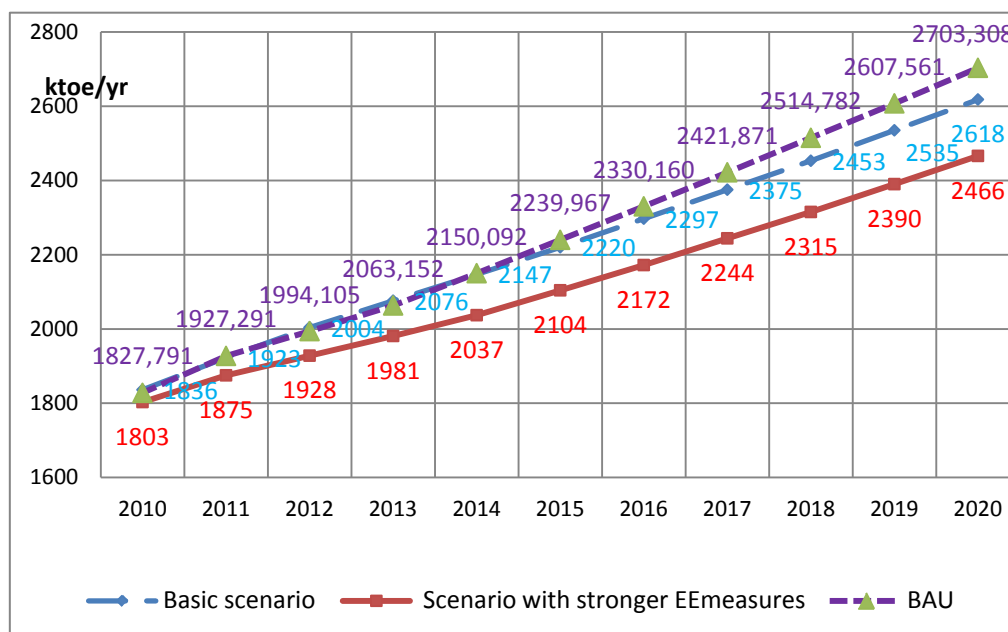


Figure 1.2.1 Final energy needs in accordance with joint energy and EE strategy

<sup>10</sup> Strategy for Energy Development in the Republic of Macedonia till 2030, adopted in 2010.

Based on the analysis of the energy consumption statistics for the period before the financial crisis, four sectors were selected for further in-depth analysis and energy efficiency measures recommendations. The industry sector is the biggest energy consumer, with metallurgy holding the dominant stake. Worldwide financial conditions dramatically influence this sector, which further reflects on this sector's energy consumption.

According to the structure of officially statistical data, the buildings were broken down into two sectors – (i) residential, and (ii) commercial and public services sector. The building energy consumption is most relevant given the huge potential for energy saving.

The Transport Sector may also achieve significant energy savings through of replacement of aged vehicle fleet, encouraging the use of public transportation.

Energy savings potential within the Strategy for improvement of the energy efficiency timeline periods are presented in the Table 1.2.1:

*Table 1.2.1 Assumed energy savings potential in strategically documents*

Sectors	2012	2015	2018	2020
Residential Sector	7,63	20,42	40,51	57,14
Commercial and Public Building Sector	4,96	14,85	24,19	28,60
Industry Sector	40,96	72,49	90,45	91,09
Transport Sector	12,55	28,21	44,63	60,48
Sum	<b>66,10</b>	<b>135,97</b>	<b>199,78</b>	<b>237,31</b>

The timeline of the EEAP implementation is presented on the Figure 1.2.2:



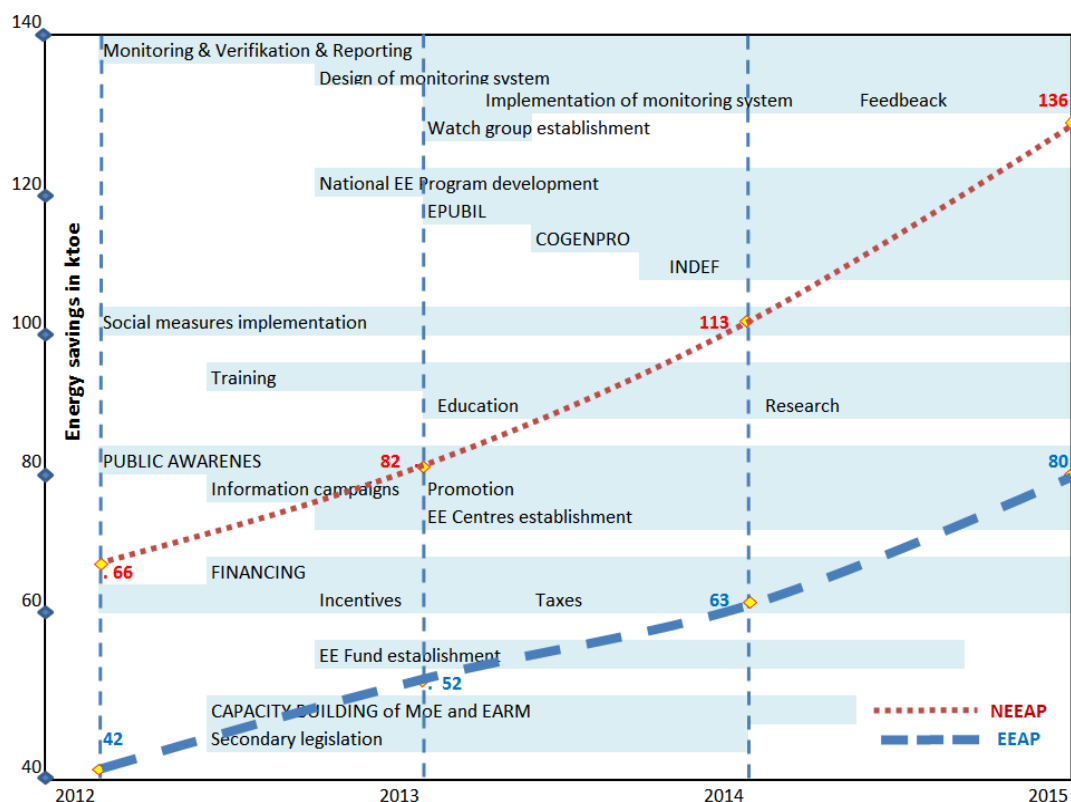


Figure 1.2.2 First and Second EEAP implementation timeline

### 1.3. Review of energy saving targets and achievements

Table 1.3.1 shows the savings calculated using the BU method to the extent that it was possible given the available data. Actual savings achieved in the 2012 are calculated using the top-down indicators as recommended by the European Commission. Estimated savings at the end of 2015 were also performed with TD indicators, but it should be noted that this is done with application of ingeneering calculation based to experiance with particular cases, numerous buildings and industrial processes energy audit, which carried an additional verification of the assessment.

Results obtained using TD indicators and additional modeling are well matched, so it was decided to show savings obtained by calculating the TD indicators in the EEAP as relevant estimated final energy savings for the next period.

Table 1.3.1 National indicative target for final energy savings and its achievement

National indicative target in 2018 (ktoe)			147.2			
National intermediate indicative target in 2012 (ktoe)			66.10			
Sector division of target	Sector target (ktoe)		Achieved final energy savings in 2012 (ktoe)		Estimated final energy savings in 2018 (ktoe)	
	2012	2018	Total (TD)	From measures (BU)	Total (TD)	From measures (BU)
Residential	7.63	29.80	7.14	2.79	27.41	21.07
Services	4.96	17.80	4.78	1.55	33.77	33.11
Industry	40.96	66.55	21.87	10.46	57.59	32.24
Transport	12.55	32.84	8.14	8.15	28.26	24.53
<b>Total:</b>	66.10	147.2	41.94	22.96	147.03	110.95
<i>Percentage (%) (compared to ESD reference consumption)</i>	<b>4%</b>	<b>9%</b>	<b>2.56%</b>	<b>1.40%</b>	<b>8.99%</b>	<b>6.78%</b>

With measures proposed in the EEAP Macedonia has set a goal to reduce final energy demand till the 2015 year to 80.06 ktoe in accordance with the requirements of Directive 2006/32/EC on energy efficiency and energy services (ESD), and in the 2018 the reduction should be 147 ktoe in relation to the baseline projection (table 1.3.2).

Table 1. 3. 2 Overview of targets and achieved/projected energy savings both in respect of primary and final energy

Year	Primary energy		Final energy		
			ESD		EPBD
	Target (in ktoe)	Projection (ktoe)	Final energy savings target as set in the first EEAP (in ktoe)	Attained (for 2012) and projected final energy savings (for 2018, in ktoe)	Target for nearly zero energy houses (All new buildings, percentage (%) or tightening of energy performance requirements)
2012	68.85	104.69	66.10	<b>41.94</b>	0
2015	125.76	213.52	135.96	<b>80.06</b>	0
2018	229.37	310.44	199.78	<b>151.19</b>	N/D

## **2. PRIMARY ENERGY SAVINGS**

### **2.1. Primary energy targets, primary energy consumption projections**

Within the sustainable development policy of the State, energy is one of the basic pillars and driving locomotive of economic development. To achieve the strategic goals adopted documents define strategic objectives for future development.

Achievements of these objectives in the energy sector are defined by laws and regulations and with many development plans (strategic documents) that are set and strategic goals. These documents have been harmonized with EU policies, so that Macedonia supports EU targets for 2020 to reduce energy consumption by 20%, to reduce emission of pollutants by 20% and to increase the share of energy produced by renewable energy sources by 20% in the gross final energy consumption.

### **2.2. Measures for Primary Energy Savings**

All EE measures that are provided by this program are measures for reduction of energy consumption among end users. The same applies and for EE measures which are taken in the power plants that generate electricity and thermal energy.

It is necessary to emphasize that the implementation of measures at the site of energy end users is considerably more conducive to reducing the consumption of primary energy, compared to power plants that generate energy. The reason for this lies in the fact that the generation of energy, except losses during transformation of primary into secondary form of energy, appear and additional losses of transmission and distribution.

Optimal approach is to predict the energy efficiency measures in all steps – at the side of power supply (production, transmission/transport and distribution) and at the side of the energy end users.

Primary energy savings measures are aimed at existing facilities as well as the selection of new energy facilities. Given the market orientation of the energy sector and its integration into the European energy market, it is likely that the decision of investors to build new power plants, and to invest into energy efficiency measures, will be guided by market principles and will be based on the most profitable economic solutions. Energy efficiency and environmental protection at the same time are certainly important factors.

Numerous studies under preparation and projects that apply to the energy sector in the future and will have an EE impact on the efficiency in plants / systems for the production and the distribution of energy. They precede the process of construction. Studies and project designs of natural gas distribution networks for all cities of Macedonia are under preparation. Studies are underway assessing the potential for construction of new hydropower plants (Boškov Most and a large number of small scale hydro power plants). If implemented, these projects will make a substantial benefit to the environment.

In order to achieve proposed EE savings the Republic of Macedonia will focus on the following:

- New energy standards for buildings and promoting low-energy buildings (“nearly-zero energy buildings”);
- Increased efficiency of power generation and distribution;

- New energy performance standards for product groups such as boilers, copiers, TVs and lighting;
- Legislation to limit CO<sub>2</sub> emissions from cars to 120 g/km and strengthened fuel-efficiency labeling;
- Facilitated bank financing for investments in energy efficiency for SMEs and ESCOs;
- Enhanced regional cooperation and EU integration;
- Coherent use of taxation to increase EE implementation;
- Awareness campaigns, systematical education, and scientific research and development and
- Improved energy efficiency in urban areas through participation of Macedonian municipalities in the “Covenant of Mayors” which will exchange best practices in sustainable energy action planning.

### *2.2.1. Energy saving measures on the supply side*

Production of transformed forms of energy is always accompanied by considerable losses. In Macedonia, 80% of electricity generation is accomplished in outdated thermal power plants with an efficiency of 32% fueled by low-quality coal. Therefore, any efficiency upgrade targeting existing thermal power plants, will considerably reduce the consumption of primary energy.

Some of the implemented measures, as well as measures which have to be implemented are:

1. Increasing the efficiency of thermal power blocks in REK Bitola by reconstruction of Low Pressure Turbine. The penultimate turbine stage (“Bauman stage”) was replaced by two new turbine stages. This increased installed capacity by 10% while increasing the effectiveness by cutting fuel consumption with increased production of electricity.
2. Modernization of boilers in thermal power plants “Bitola”. The project worth 88.5 million Euro includes full change coal tract of coal supply, air supply, reducing the level of harmful emissions and many other activities. With the completion of the project, ELEM will become compatible in terms of emissions of nitrogen oxides and meet stringent European directives on environmental protection. The project will allow a certain percentage to increase the usage of coal in the combustion process, and greater flexibility in the production of steam with coal of different quality.
3. By replacing old equipment with new high-efficiency during the process of maintenance, this especially concerns many pumps with variable speed in thermal power plants and boiler rooms, electrical drives-motors in metallurgy, electromotors driving conveyor belts, etc. will reduce its energy consumption.
4. Reconstruction of six existing large hydropower plants owned by ELEM: Spilje, Globochica, Tikves, Vrutok, Raven and Vrben. Increasing their capacity of 18.1 MW, with additional annual production of about 50 GWh and implementing better regulation will improve their efficiency.<sup>11</sup>
5. Revitalization and modernization of supply “Upper Radica” and rehabilitation of supply “Shara waters” with a total value of 3.9 million euros. This will increase the capacity for 4 cubic meters per second and will create an opportunity for additional production of 18 GWh electricity from hydro power system Mavrovo.
6. Installation of new condensing boiler plants that use natural gas in facilities under the jurisdiction of the City of Skopje, as well as administrative and cultural facilities on its territory.

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<sup>11</sup> Investment plan 2012-2017 AD Elektrani na Makedonija, 2012

7. For its first wind project, ELEM has targeted a minimum annual net production of 100 GWh from wind energy or approximately 2% of its current annual electricity generation. Calculating on the basis of widely-used utility turbines with installed capacities between 2 and 2.5 MW, a wind park size of 50 MW has been established to meet this target.

Providing incentive for new investments for use of the available wind energy, as renewable energy source, the Energy Regulatory Commission of the Republic of Macedonia, has enacted the Decision for Determination of a Feed-In-Tariff for the sale of electricity produced and delivered from windmills, determined to be 8,9 €cents/kWh. The privileged generator is obligated to use the privileged tariff in the period of 20 years.

Taking into account available financial resources, it was agreed to install the wind park in two phases: the first phase with 36.8 MW and an annual net production of 100 GWh and a second phase with the remaining 13.8 MW and an additional net production of 37 GWh.<sup>12</sup>

The situation with generation of heat energy in District Heating System in Skopje is similar. The thermal energy is produced by outdated shell boilers with relatively poor performance, fueled by heavy fuel oil or natural gas. The distribution of thermal energy to end users is followed by considerable technical losses. During 2012 the distribution system also connected to new cogeneration production capacity, which improved the supply-side efficiency.

To improve the working process, the company has developed plan for modernization of equipment, which will be mostly directed to realize:

- Gasification of VKSM50 boilers, installation of frequency control to the equipment and automation systems for dictate pumps during 2013.
- Embed frequency regulation of boiler fans and automatic operating mode of the three boilers VKSM 40 during 2014.
- Embed utilizator at the end of gas boiler VKSM 60/1, VKSM20 and VKSM50 during 2015.

#### *2.2.2. Energy saving measures in distribution and transmission*

Energy losses in the transmission network during the period 2009-2012 are within 170-204 GWh/yr. Smallest losses occur during periods when imports of electricity is greatest and when hydropower in the western part of Macedonia least produce electricity, because the transmission of electricity to major consumer centers are implemented through 400 kV network. The entry into operation of the new 400/110 kV TS Stip in August 2012, is reducing electricity losses by 10%.

MEPSO shall reduce transmission loss of electricity using the operational and constructive measures. Constructive measures require additional investment and they include: strengthening and upgrading the transmission network, installing compensatory devices, setting up devices for voltage regulation and reactive power, continuous control of the conductors situation, infrared (thermovision) control etc.

The operational measures do not require additional investment and include: maintenance of all elements of the transmission network, running the plants in most favorable configuration, allocation of power between the transformers (optimal utilization of transformers in operation with the greatest efficiency coefficient), maintenance of operating voltage all voltage levels

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<sup>12</sup> [www.elem.com.mk](http://www.elem.com.mk)

as close to par, cost allocation of active and reactive power in the system, optimal power flow, good organization and running of statistics data for the generation, transmission, transmission and own consumption in power plants and substations, etc.

Lower than nominal voltage occurring in the transmission network in western Macedonia, although there are located hydroelectric plants that are expected to provide voltage support. The optimal reactive power flow between generating units improve voltage and achieves a reduction of losses in the transmission network for more than 3.5 MW or smaller losses of electricity from 12.4 GWh annually.

Loss of power and electricity will be significantly reduced by structural measures to be taken in the period 2013 - 2018 and shown in the Table 2.2.1 below.

Table 2.2.1 Energy savings and investments by MEPSO

Year	Project	Electricity savings (GWh)	Investment (M Denars)
2009-2012	Construction of new 400 /100 kV transformer station in Stip	31.9	690
2014	Grid reconstruction in Polog region	14.2	602
	Optimal managing of reactive power	12.4	0
	Grid reconstruction in Bitola region	2.5	196
	400 kV interconnection line Stip (MK)-Nis (SRB)	0.4	1183
2015	Instalation of compenization device in TS Ohrid 1 (2x25MVA) <sup>13</sup>	0.7	92
2017	Construction of new 400/100 kV transformer stations in Ohrid (connected to TS Bitola 2- TS Elbasan)	4.3	852
	400 kV Interconnection line TS Bitola 2 (MK)- TS Elbasan (Al)	23	1822
<b>Sum</b>		<b>85,1/88,7</b>	<b>4585/5345</b>

MEPSO<sup>14</sup> will pay particular attention to the voltage profile of 110 kV through appropriate management of voltage and production of reactive power by the generating units connected to the transmission network.

It should be invested till 88.424 million Euros in the next period for implementation of the measures, as estimated.

Energy losses in power distribution systems are considerably higher compared to the standard technical losses. This is the case with the transmission and distribution of electricity. Reason is obsolete network equipment, bottlenecks, rapid growth of energy consumption that is not adequately matched by performance of new lines of supply. Some of the measures envisaged to be undertaken in the future period till 2018 and further are:

1. Installation of new 20 kV high efficiency electropower- transformers in electrical distribution network by EVN Macedonia in order to diminish losses in the network. EVN Macedonia master plan envisions investment of 1 billion Euros for the next 20

<sup>13</sup> This investment have to be realized if by 2015 new 400/110 kV TS Ohrid is not constructed.

<sup>14</sup> Impact of investments on the energy losses in the transmission network in the period 2009-2013 and 2013-2018, MEPSO, August 2013



years. The whole sum is not dedicated only to implementation of EE measures. Energy saving is value added to implementation of the new equipment and installations. Expected savings are on the level of 0.1-2.5%/year of the whole amount of distributed electrical energy (0.7 ktOE/year).

## 2. Reduction of barren / reactive energy in electric network.

The state of the heating distribution network in Skopje features a high loss of heat due to insufficient insulation of distribution pipelines, considerable fluid loss due to aging and damaged fixtures and outdated pumps to circulate the water in the network. Some of the measures envisaged to be undertaken by the network operator Balkan Energy Group in the future period till 2018 and further are:

- Installation of new / replacement of old equipment in measuring thermal sub-stations, as well as maintenance and verification of measuring equipment for achieving higher accuracy of thermal energy measurement, amounting to 75 000 euros a year;
- Installation of modern regulation and monitoring equipment at thermal sub-stations, for the control and reduction of consumed thermal energy, which provides lower temperatures of heat carrier in the distribution system, in the amount of 65 000 euros year and
- Reconstruction of 1-2% per year of the distribution network and with cost of 1million euros annually.

Expected reduction of energy consumption in 2013 remained at 0.9% of the total produced heat and electricity used.

In 2014 it is expected to reduce energy consumption by 0.1% compared to the thermal energy supplied and 0.6% of the electricity used.

### 2.2.3. *Other measures on primary energy savings*

The State encourages the construction of highly efficient cogeneration plants as preferential producers of energy.

A 30 million Euro investment is planned for the next period for construction of transmission and distribution network connecting the city Bitola with thermal power plant REK Bitola. The power plant will provide heat supply to the city, the settlements, commercial consumers in the local business zones and businesses (particularly greenhouse complexes).

Two blocks in REK Bitola were reconstructed and converted into a cogeneration plant. A regulated valve for low pressure steam extraction was installed in the segment of the turbine between medium and low pressure sections. This makes it possible to deliver heat energy of 250 MW<sub>th</sub> for the city of Bitola. This improved the efficiency of energy production, while reducing power consumption for heating apartments. The primary energy savings was more than three times in the final terms used.

In a significant number of strategic documents energy efficiency is more or less directly or indirectly represented. Thus through these other measures considerably contributes to realize anticipated developments. These documents belongs to the sectors of industry, commerce, education and science, the social sphere and more. Some of them are:

- Industrial Policy of the Republic of Macedonia 2009-2020, Skopje, June 2009
- Revised National Strategy for Development of Small and Medium Enterprises (2002-2013)
- Strategy for Export Promotion and recommendations about reorganization of the Agency for Foreign Investments and Export Promotion-Invest Macedonia, 2011
- Innovation Strategy of the Republic of Macedonia 2012-2020
- Housing Strategy of the Republic of Macedonia (2007-2012)

- National Transport Strategy of the Republic of Macedonia, 2007-2017,<sup>15</sup>
- Air-Flight National Development Strategy of the Republic of Macedonia, 2007
- Strategy for Integrated Education - Steps towards Integrated Education in the Republic of Macedonia
- National strategy to reduce poverty and social exclusion in the Republic of Macedonia 2010-2020
- Adaptation strategies for the health sector to climate change in the country and Action Plan 2011-2015, 2011 Skopje<sup>16</sup>.

The energy savings planned to be realized by supply side are remarkable (over 380 GWh/yr) and are shown in Table 2.2.2. Expected investments to realize these tasks are over 6000 million Denars.

Table 2.2.2 Energy savings on the supply side

Year	Project	ktoe/an
2012	ELEM: Modernization of REK Bitola I and II	10.32
2013-2014	ELEM: Modernization of 6 HPP	4.30
	ELEM: Revitalization of water supply "Upper Radica" and "Shara waters"	1.55
2015	ELEM: Wind Farm	8.60
2014	BEG: Gasification of VKSM50 boilers	0.37
2014	BEG: Frequency regulation of VKSM 40 boilers	0.29
2015	BEG: Embed utilizer at the end of 3 gas boilers	0.04
2009-2012	MEPSO: Construction of new 400/100 kV transformer plant in Stip	2.74
2014	MEPSO: Grid reconstruction in Polog region	1.22
	MEPSO: Optimal managing of reactive power	1.07
	MEPSO: Grid reconstruction in Bitola region	0.22
	MEPSO: Construction of 400 kV transmission line Stip (MK)-Nis (SRB)	0.03
2015	MEPSO: Instalation of compenization device in TS Ohrid 1 (2x25MVar)	0.06
2017	MEPSO: Construction of new 400/100 kV transformer station in Ohrid (connected to TS Bitola 2- TS Elbasan)	0.37
2017	MEPSO: 400 kV Interconnection line TS Bitola 2 (MK)- TS Elbasan (Al)	1.98
	<b>Sum</b>	<b>33.16</b>

<sup>15</sup> [www.mtc.gov.mk / ... / NTS% 202007% 20 -% 202017.pdf](http://www.mtc.gov.mk/.../NTS%202007%20-%202017.pdf)

<sup>16</sup> <http://zdravstvo.gov.mk/wp-content/uploads/2012/12/strategija-klimatski-promeni.pdf>



### 3. FINAL ENERGY SAVINGS IN THE END-USE SECTORS

#### 3.1. Review of Final Energy Saving Targets and Final Energy Saving Achievements

##### 3.1.1. National overall end-use energy savings targets and progress towards them

Macedonia belongs among the countries with high primary energy consumption per unit of GDP. The energy infrastructure of the Republic of Macedonia is comprised of coal, oil and oil products, natural gas sectors and firewood as primary energy sources, and electricity and heat generation as sectors with transformed energy.

The first EEAP provided a package of measures for the most important final energy demand sectors: residential (households), commercial and public services, industry and transport. The second EEAP follows the same structure of energy consumptions. Buildings (residential and tertiary sector) with share of 39% in final energy consumption are the biggest consumption sector, followed by industry with 34% and transport - at 25% (see Figure 3.1.1.1).

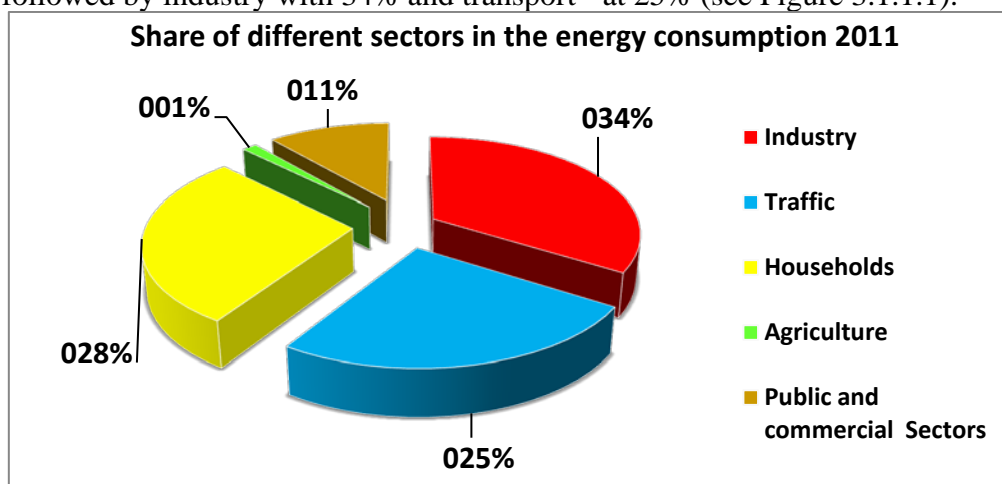


Figure 3.1.1.1 Structure of energy consumption in the Republic of Macedonia (2011)

The structure of the total final energy consumption during the past period was not changed significantly (Figure 3.1.1.2).

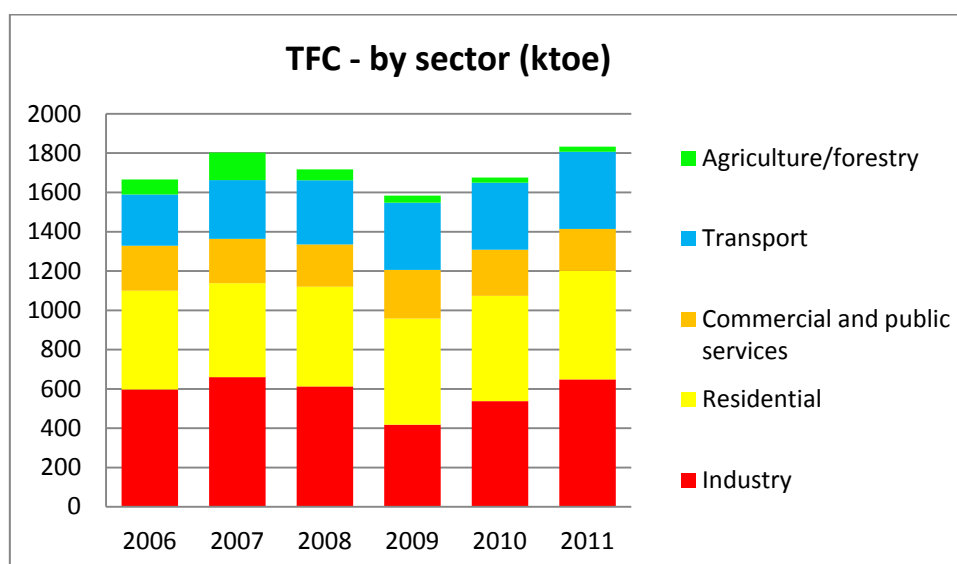


Figure 3.1.1.2 History of structure of total final energy consumption in the Republic of Macedonia

Official statistics additionally identifies the sector of agriculture and non-energy use. However, due to the small percentage of the overall energy consumption, it is not specified as separate sector.

The rate of accomplishment of the set goals has changed, although the indicative basic target remains almost the same, i.e. 9.24% compared to the reference period from the average of 5 consecutive years.<sup>17</sup>

The difference between realization of final energy savings assumed in the first EEAP and projected within second EEAP, are presented in the Table 3.1.1.1.

Table 3.1.1.1 Overview of final energy savings from measures under the ESD.

	Final energy saving target		Final energy savings achieved or projected	
	In absolute terms as from EEAP 1 (ktoe)	Percentage (%) (compared to ESD reference consumption)	In absolute terms assumed by TD method (ktoe)	Percentage (%) (compared to ESD reference consumption)
2012 (interim period)	66.10	4%	41.94	2.56%
2015 (interim period)	135.97	8.3%	80.06	4.9%
2018 (overall period)	147.24	9%	151.19	9.24%

#### 3.1.1.1. Achievement of the 2012 intermediate energy end-use target

Monitoring results for energy savings achieved by 2012, showed that the set goals were not achieved. There is a substantial difference between the indicative target set for 2012 and the accomplished results assessed by e application of BU and TD method (which differ).

In conclusion it can be underlined the implementation of energy efficiency measures till now was unsatisfactory, considering final energy consumption.

<sup>17</sup> See first EEAP

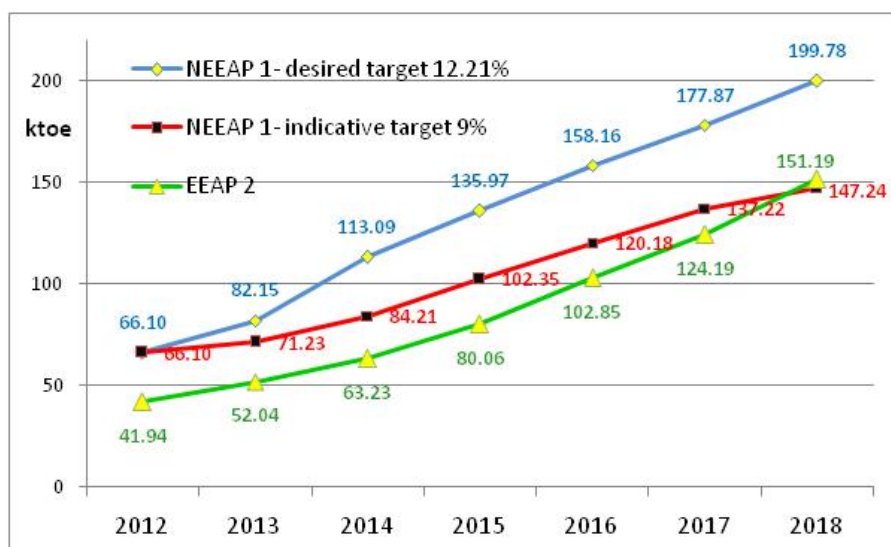


Figure 3.1.1.3 Difference in realization of assumed goals with EEAP 1 and EEAP 2

To determine the energy savings predicted by energy efficiency measures in the period treated in the 2<sup>nd</sup> EEAP, adopted is achieved real result for final consumption, i.e. 41.94 ktoe at the end of 2012 (Figure 3.1.1.3), as a base starting point for the next period. Considering the financial situation in the real sector, which is expected to have largest financial participation in the implementation of the measures, the dynamics of realization of expected achievements of energy savings changes. The 1<sup>st</sup> EEAP envisaged to achieve desired decreased energy consumption amounting to 69.86 ktoe during 2013-2015, while the 2<sup>nd</sup> EEAP – only 38.12 ktoe.

In the next period (2013-2015), the expected improvement of the financial situation in the region, including in Macedonia, accelerates the rate of realization of measures for saving energy in the second EEAP. Assumed dynamics of realization of energy savings in the period 2016-2018 in the Strategy for improvement of the energy efficiency and 1<sup>st</sup> EEAP is slower and envisages a savings of 63.81 ktoe, but of the 2<sup>nd</sup> EEAP forecasts 71.13 ktoe for the same period. It is noteworthy that the Republic of Macedonia will achieve the national indicative target of at least 9% (ESD requirement and stipulated with the Decree for indicative energy savings targets) by 2018, equal to 9.24% (151.19 ktoe) as assumed in this document. This is possible to achieve despite the fact that the estimated indicative intermediate target for 2012 was not fulfilled. While the 1<sup>st</sup> EEAP set an indicative target of at least 9% (147.24 ktoe), but it was identified possibility to achieve considerably higher target of 199.78 ktoe i.e. 12.21%<sup>18</sup>.

This optimistic target of 12.21% final energy savings by 2018 was assumed as desired goal, to serve as an additional incentive for all participants, on the path to approach the EU policy for achieving the target for 20% primary energy savings by the end of 2020.

The difference between national indicative target in 2018 and desired goals is presented in the Table 3.1.1.2.

Table 3.1.1.2 Difference of desired and indicative targets for energy savings

<sup>18</sup> 1<sup>st</sup> EEAP, Table 1.3

Sector division of target	National indicative target in 2018 (ktoe) <sup>19</sup>	Expected (desired) energy savings according to 1 <sup>st</sup> EEAP in 2018 (ktoe)
Residential	29.95	40,51
Services	17.90	24,19
Industry	66.55	90,45
Transport	32.84	44,63
<b>Total (ktoe):</b>	<b>147.24</b>	<b>199,78</b>
<i>Percentage (%) (compared to ESD reference consumption)</i>	<b>9.00%</b>	<b>12.21%</b>

### 3.1.1.2. Expected savings in relation to the 2018 overall energy end-use target

Effects of individual measures defined in the second EEAP cannot be accurately assessed nor it is possible to establish the expected savings of each measure.

The assessment of the dynamics of the efforts for the realization of the measures for energy efficiency in the period from 2013 to 2015 and from 2015 to 2018 is done on the basis of the starting point values achieved by 2012. This means that it starts from the lower starting base compared to the previous EEAP, but sets the similar final target, for 2018 in the amount of 9.24%. The final energy savings in all sectors at the end of 2015 is at a level of 80 ktoe (Table 3.1.1.1).

Depending on the characteristics of the each measure or sector, the second EEAP assesses the trend for realization of the final energy savings. The attained energy savings in 2012 and expected final energy savings are shown graphically for a typical time periods (2015, 2018 and 2020) in the Figure 3.1.1.4.

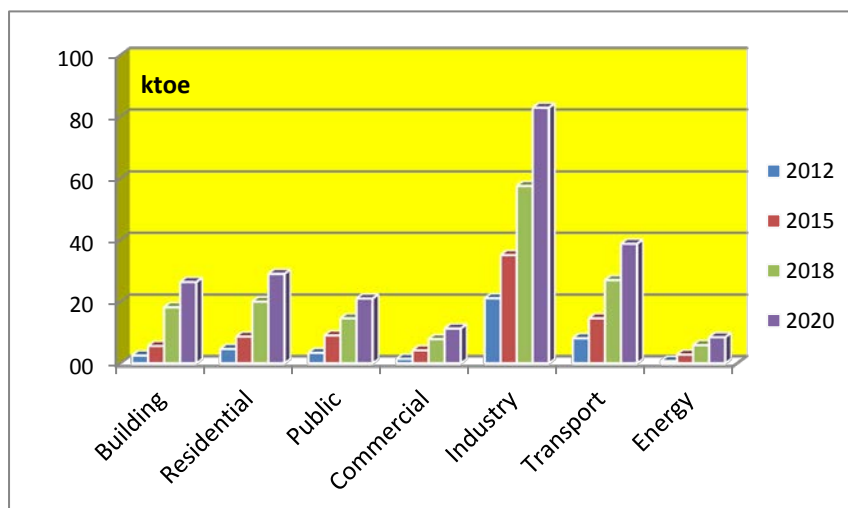


Figure 3.1.1.4 Final indicative savings targets for consumers in different time periods

The efforts should intensify the following periods to implement measures and ensure additional energy savings by implementing a comprehensive and coordinated energy

<sup>19</sup> Decree on indicative energy savings, adopted by Government of the Republic of Macedonia (OG 112/2011) set indicative energy savings target by 2018 of at least 9%.

efficiency policy set forth in this EEAP. Consumption projections and scenario analysis show that without a systematic and timely implementation of the measures set out in this EEAP, the goals set for 2015 will not be accomplished.

### *3.1.2. National targets for nearly zero-energy buildings*

Macedonia has not set its target for the building with almost zero energy consumption.

Anyhow, in line with the requirements of Directive 2010/31/EU, Macedonia will endeavour to support the construction of new nearly zero-energy buildings and the achievement of this level of energy performance in the refurbishment of existing buildings.

Basic tasks in this period is education of designers as well as providing training to contractors. This task will be carried out in parallel with the determination of criteria for priority areas for implementation, construction of pilot plants and the definition of momentum for the implementation of these measures to comply with the financial resources.

### *3.1.3. Other targets and/or final energy saving projections and achievements*

The second EEAP was prepared using following control list of measures and actions necessary for effective realization as follows:

- Building energy codes enforcement;
- Low-income assistance for residential energy efficiency investments;
- Development of secondary legislation;
- Tariff reforms;
- Incentives for wider combined EE-RES application;
- Improvement of energy statistics collection;
- Strengthening the institutional capacity of the state and local institutions;
- Primary Legislation upgrading, further harmonization of secondary legislation with EU Directives and Energy Community roadmap;
- Development of research studies (e.g. on cogeneration, gas application, etc.);
- Administrative issues:
  - o Strengthening the capacities of the Energy Department in the Ministry of Economy and the Energy Agency of the Republic of Macedonia (additional personnel and training);
  - o Streamlining the licensing procedures for power producers (including one-stop-window, conforming of contracts to international standards and guarantee of Preferential Producer status prior to construction)<sup>20</sup> and
  - o Improve confidence in legal system's ability to enforce long-term purchase agreements,
- Financial issues - Establishment of EE Fund;
- Participation in Carbon Market <sup>21</sup>(CDM development);
- Institutional strengthening;
- Analysis, design and implementation of a social safety net;
- Public awareness for all participants and

<sup>20</sup> In Macedonia, the high-efficiency CHPs are granted status of preferential producers of electrical energy (as well as RES electricity producers) ) but there are no established feed-in tariffs.

<sup>21</sup> <http://moepp.gov.mk/WBStorage/Files/Macedonia%20CDM%20projects%20list%2018.02.2013.pdf>

- Monitoring and reporting instruments designed and applied.

### **Sectoral EE Programs development**

In some cases, to better operationalize the Republic of Macedonia's national energy efficiency policy national sectoral energy programs can be developed by specific Programs. The Ministry of Economy should develop, organize and manage these programs while the Energy Agency will support these activities. Different parts of these programs will be realized by different players, governed by steering committees. The main benefit of aggregating various initiatives in such state programs is the wish to avoid duplication of work, facilitating realization, mitigating hurdles during realization, unification of indicators and their collection, unified reporting. These will further improve the effectiveness and quality of communication with donor institutions, and have clearer and more accurate long-term targets.

Some indicative programmes dealing with energy efficiency may be follows:

**EPUBIL:** Program for development and realization of energy efficiency in existing buildings in the public sector. This program will aggregate at one place different aspects of this important issue: training of energy auditors, designers and building companies; accreditation of training institutions, teaching programs; control of materials, designs, working procedures; preparation and acceptance of national standards and indicators. Ministry of economy (through the Energy Efficiency Fund) will be in charge to manage this program in close collaboration with Ministry of Finance and donor community to obtain necessary financial means for realization.

**INDEF:** Establishing a network of industrial companies for promotion and faster implementation of energy efficiency – Program to develop a structure which interconnects large groups of energy consumers from industrial sector, public and commercial service sector and connects them with expert and national organizations for realization of energy efficiency measures. The program will start with implementation of ISO 50001 Energy management in industry. This program has to be facilitated and supported by the Ministry of Economy and Energy Agency, but organization will be in the hands of the Macedonian Chambers of Commerce, branch industry. Programmatic actions in this field started with the support of the USAID 3 year project, directed to ensure implementation of Energy management recommendation in few industry and medium sized organizations.

**COGENPRO:** Program for promotion and support of swift implementation of high efficient small scale cogeneration units and overreaching barriers. Realization of this program mainly depends to faster introduction of natural gas all over the territory of the Republic of Macedonia. Depending to existing Rulebook on high efficiency CHP, the timing of promotional measures will need to be elaborated. Meanwhile the State should establish feed-in tariffs for electricity produced by CHPP and to remove barriers in the administrative sector which disable jeopardize the development of CHP plants.

### **3.2. List of strategies with an impact on final energy demand**

The main objective of the EE policy in the Republic of Macedonia, as well as the whole energy sector is to ensure sustainable development of the state at whole, and particularly in the energy sector by:

- Increased energy efficiency;

- Security of energy supply;
- Diversification of energy sources;
- Utilisation of renewable energy sources;
- Market-based energy prices, energy market and private entrepreneurship development;
- Protection of vulnerable consumers from fast growth of energy prices and
- Environmental protection.

The above national policy, in addition to sectoral programs, also needs horizontal and cross-sectoral energy efficiency improvement measures, including the following:

- Study preparation on financial and fiscal support for energy efficiency projects;
- Allocation of CO<sub>2</sub>-levy (carbon tax) to energy efficiency measures;
- Promotion of innovative financing schemes for energy efficiency;
- Strengthening research, development, education and training activities in energy efficiency;
- Participation in EU programs related to EE (the Intelligent Energy for Europe, Covenant of Mayors etc.);
- Strengthening energy efficiency in education;
- Public awareness and cross-sector information campaigns;
- Developments and implementation of energy auditing programmes;
- Energy efficiency in buildings;
- Appliance and equipment labelling and energy performance standards and education of State Market Inspectorate's representatives for better understanding of the bylaws for labelling and eco design of energy-related products and
- Promotion of energy metering and informative billing.

The list of strategies that defined the strategic objectives, despite the high number of rules is:

- 1) Strategy for sustainable development of the Republic of Macedonia;
- 2) Strategy for Energy Development in the Republic of Macedonia until 2030 (Official Gazzete of the Republic of Macedonia No. 61/2010);
- 3) Strategy for improvement of the energy efficiency in the Republic of Macedonia until 2020 (Official Gazzete of the Republic of Macedonia No. 143/2010);
- 4) Strategy for utilisation of renewable energy sources in the Republic of Macedonia by 2020 (official Gazzete of the Republic of Macedonia No. 125/2010);
- 5) First Energy Efficiency Action Plan of the Republic of Macedonia until 2018;
- 6) Program for implementation of the Strategy for Energy Development in the Republic of Macedonia for the period 2013 – 2017 (Official Gazzete of the Republic of Macedonia No. 50/2013) and
- 7) Draft National program for energy efficiency in public buildings in the Republic of Macedonia until 2020, (Phase I).

The **Strategy for improvement of the energy efficiency** of the Republic of Macedonia is the basic document dealing with energy efficiency and reduction of energy consumption. It describes in detail the measures and instruments necessary to realize the energy policy of Macedonia, and specifies the required investments and commitments to be made by the Government. The Strategy for improvement of the energy efficiency further estimates the energy saving potential, which can be realized under current economic circumstances.

Macedonian EE policy is formulated in Strategy for improvement of the energy efficiency. The Strategy has the following objectives:

- energy efficiency increase;



- security of energy supply;
- diversification of energy sources;
- utilisation of renewable resources;
- realistic energy prices, energy market and private entrepreneurship development and
- environmental protection.

The projections and simulations of the possible measures and instruments are in accordance with the realization requirements of the energy policy principles laid out in Strategy for energy sector development.

The present document is designed to assist the Government of Macedonia, particularly the Ministry of Economy to meet a requirement under Articles 129, 130 and 131 of the Energy Law to prepare Implementation Plans for the energy efficiency programs and measures contained in the Strategy for improvement of the energy efficiency and, by extension, the EEAP.

The final result of achieving this objective will be realization of 14.35% energy savings till 2020, comparing to average consumption of final energy in the observed 5 years period (2002-2006), with continued promotion of energy efficiency, monitoring and verification. This is an important task for the Republic of Macedonia in the way to sustainable development of the country's economy, and to fulfill commitments in the way of EU accession.

According to the Strategy for Energy Development, without integration of energy efficiency, the energy consumption in the Republic of Macedonia will reach the level of 2703 ktoe by the year 2020. The two scenarios of energy efficiency penetration can bring to either 3.14% (under limited integration of energy efficiency), or 8.8% (strong intervention of energy efficiency scenario) less energy consumption compared to business as usual - BAU).

As the Strategy for improvement of the energy efficiency indicates, in order to achieve proposed EE savings Macedonia will focus on the following:

- *New energy standards for **buildings** and promoting low-energy buildings ("passive buildings")*;
- *Making **power generation** and distribution more efficient*;
- *Legislation to limit CO<sub>2</sub> emissions from **cars** to 120g/km and strengthened fuel-efficiency labeling*;
- *Facilitate bank **financing** for investments in energy efficiency by SMEs and ESCOs*;
- *Enhance regional cooperation and EU*;
- *Coherent use of **taxation** to increase EE consumption*;
- *Awareness **campaigns**, systematical **education**, and **science** development and*
- *Improve energy efficiency in **urban areas** through participation of Macedonian municipalities at the "Covenant of Mayors" which will exchange best practices.*

The implementation of these key measures will be implemented in the strategic sectors: households, commercial sector, industry and transport.

The objectives proclaimed by the Republic of Macedonia in the Strategy for Energy Development until 2030 are based on the EU objectives, taking into account the specificities of the country. Considering the high energy intensity, the Republic of Macedonia plans for a greater improvement of energy efficiency in the generation, transmission, and utilization of energy. The strategy sets an objective to reduce energy intensity by 30% until 2020 in comparison to the energy intensity in 2006. The share of renewable energy sources in 2020 in the moment is planned to be 21% of the total final energy consumption. At the same time, the



share of bio-fuels in the total consumption of diesel and petrol fuels is planned to reach 10% by 2020.

Overall, the strategy provides detailed diagnostics of key problems burdening the energy sector in the Republic of Macedonia (highlighted energy deficiency, depressed energy prices and lack of stimuli to save and invest, high energy intensity, irrational fuel utilization mix from economic and environmental point of view, high technical and commercial losses, existence of monopolized structures in certain segments of the sector, incomplete harmonization of the regulations with the European standards regarding price policies, environment etc.). Alternative approaches have been proposed to overcome all of the previously mentioned problems by focusing of their strengths and weaknesses. This will provide the Government with an opportunity to make smart choices and take informed decisions based on scientific and competent analyses.

The **Program for Implementation of the Strategy for Energy Development in the Republic of Macedonia** is prepared for a period of five years (Article 11 from the Energy Law<sup>22</sup>). Pursuant to this article of the Law on Energy, the Program specifies the measures, conditions, methods and time schedules for the realization of the Strategy, as well as the obligations of the state authorities, the authorities of the units of local self-government and the providers of energy services that are obligated to provide public services.

Main goals are determination of specific measures that have to be taken in order to decrease the consumption of the primary energy in Republic of Macedonia. The Strategy defines the most appropriate long-term development of the energy sector in the country in order to provide reliable and quality power supply to consumers.

The following annual indicators and targets have been defined:

- Energy savings targeted at achieving 9% energy savings by 2018, in accordance with the time schedule envisioned in the first Energy Efficiency Action plan (EEAP 1);
- Improve the energy utilization efficiency, especially in electricity, on the part to approach the EU policy for achieving 20% energy savings in the primary energy consumption by 2020;
- The share of renewable energy sources in the total final energy consumption as well as the share of renewables in each of the subsectors (electricity, heat generation, transport) with a view of achieving a 21% share of the renewable energy sources in the total final energy consumption by 2020 and at least a 18.2% share by 2016, according to the following dynamics: 17% by 2012, 17% by 2013, 17.5% by 2014 and 17.7% by 2015;
- GHG emissions from combustion engines (including the GHG emissions in each subsector) with a view to reduce such emissions;
- Import dependence, with a view of increasing the independence and thereby improve the strategic reliability of supply;
- The supply structure, with a view of diversifying the sources of primary energy, thus improving the strategic reliability of supply;
- The energy supply intensity, in order to improve the energy efficiency and the overall competitiveness of the economy; and
- The natural gas and electricity price differences between the Republic of Macedonia and EU 27 for industrial and household consumers, with a view of providing for a transparent market;

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<sup>22</sup> Official Gazette of the Republic of Macedonia, No.16 /2011, 136/2011 and 79/2013.

**National Strategy for Sustainable Development of the Republic of Macedonia** stipulate that in the field of energy structural changes are needed in terms of energy sources and pricing.

The consolidated conclusions for energy sector can be summarised as follows:

- A long term National Energy Sector Development Strategy should be adopted.
- A Study for Utilization of the Potential Renewable Energy Sources should be prepared
- The concept of market price for energy should be introduced.
- The energy sources should be changed so as to incorporate greater use of natural gas and renewable energy for generating heat and electricity.
- Structural changes in the industry should be encouraged to favour less energy intensive industries.
- The energy efficiency on both supply side and demand side should be improved through targeted programs, education, training and raising awareness.
- As many as possible Clean Development Mechanism (CDM) projects should be hosted and a national pipeline of sustainable energy projects that are eligible for Programmatic CDM should be developed.

Strategic Measures of the National Strategy for Sustainable Development of the Republic of Macedonia - Key Challenge Climate Change and Clean Energy are:

- Progressively change the energy mix (utilization of natural gas and renewable energysources for energy production);
- Stimulate structural changes in the industry, favouring less energy intensive industries and SMEs;
- Improve the EE at the demand side through targeted programs, education, training and raising awareness;
- Introduce a market price for energy (rationalization of energy prices) which will improve the operational condition of the energy producers and will provide significant motivation for energy savings;
- Enhance the existing and introduce more incentives for EE and RES projects;
- Promote a sustainable energy financing facility and encourage RES and EE projects to make use of it;
- Host as many as possible CDM projects and identify and promote as many as possible Programmatic CDM projects and
- Monitor and assess the climate change vulnerability (particularly health impacts) and undertake appropriate adaptation measures.

Strategic Measures of the National Strategy for Sustainable Development of the Republic of Macedonia - Key Challenge Sustainable Transport are:

- Use policy, programs and innovative approaches to support the productivity and efficiency of the transport sector and its contribution to the national economy and allocate resources, and apply tools to create an integrated sustainable transport system;
- Support partnerships between public and private sectors to promote investment in the transport sector that will facilitate the introduction of appropriate technologies and infrastructure consistent with sustainable development goals based on national priorities;

- Improve urban traffic flow operations and circulation and providing facilities and urban transport infrastructure, which will reduce emission of green house gasses;
- Enforce the application of sound environmental protection and conservation practices and support transportation systems that make efficient use of land and natural resources preserve vital habitats and maintain biodiversity;
- Take measures to improve the economic and environmental performance of all modes of transport and, where appropriate, measures to establish a shift from road to rail, public passenger transport including lower transport intensity through production and logistic process reengineering and behavioural change combined with a better connection of the different transport modes;
- Promote the use of Public Transport and support the Public Transport System to offer efficient, affordable services and consider price regulation measures and subsidies in the case of public interest;
- Place a high priority on investing in multi-modal freight transportation, Intelligent Transportation Systems, and planning and feasibility studies in support of these investments and
- Implement transport safety standards covering each mode of transportation.

The objective of the **draft National Program for Energy Efficiency in Public Buildings in the Republic of Macedonia<sup>23</sup> until 2020 (Phase I)**, is to achieve energy efficiency improvements in the public buildings sector and to meet the strategic targets as outlined in the national strategic documents. Major objective of the Program is to provide input to reaching the established indicative target of at least 9% reduction of energy consumption in Macedonia until 2018. Specifically, the Program aims to provide input to the adopted target for reduction of energy consumption of the Public buildings, as set by the Strategy for improvement of the energy efficiency and the EEAP. Further Program objectives include:

- To provide support and incentives to public entities for implementation of their obligations under the Energy Law;
- To improve the conditions in public buildings in the country;
- To support the introduction of energy efficiency practices in the management of public buildings;
- To provide examples of energy efficiency practices to other sectors and
- To encourage the development of the market for energy efficiency services and products in the country.

This Program is envisaged to engage 107.4 million EUROs for reconstruction of 2235 public buildings (95.2 millions for reconstruction and 12.2 millions for energy audit of buildings). The sum has to be ensured by soft loans, donation from international financial institutions and State budget.

The change of the final energy consumption in 2011 is on the level of 1909 ktoe. Table 3.2.1 and Figure 3.2.1 shows the change in GDP, population, specific energy consumption per capita, the ratio of primary to final energy consumption and intensity of energy consumption.

*Table 3.2.1 GDP, Population, Intensity, Final and Consumption per capita*

	2003	2004	2005	2006	2007	2008	2009	2010	2011
GDP at current prices (in billion denars)	258	272	295	320	365	411	411	434	461
Population size (in millions)	2.026	2.032	2.036	2.040	2.043	2.046	2.050	2.055	2.058

<sup>23</sup> Draft version, 2013

Final Energy Consumption [ktoe]	1593	1600	1678	1702	1793	1771	1671	1789	1909
Energy Consumption per citizen [KWh/cap]	1.35	1.35	1.41	1.43	1.48	1.48	1.37	1.40	1.52
PE/FEC	1.64	1.66	1.62	1.62	1.69	1.71	1.68	1.61	1.58
Energy Intensity [GWh/1000eur]	710.9	681.6	680.3	661.9	646.5	613.9	575.7	573.3	607.1

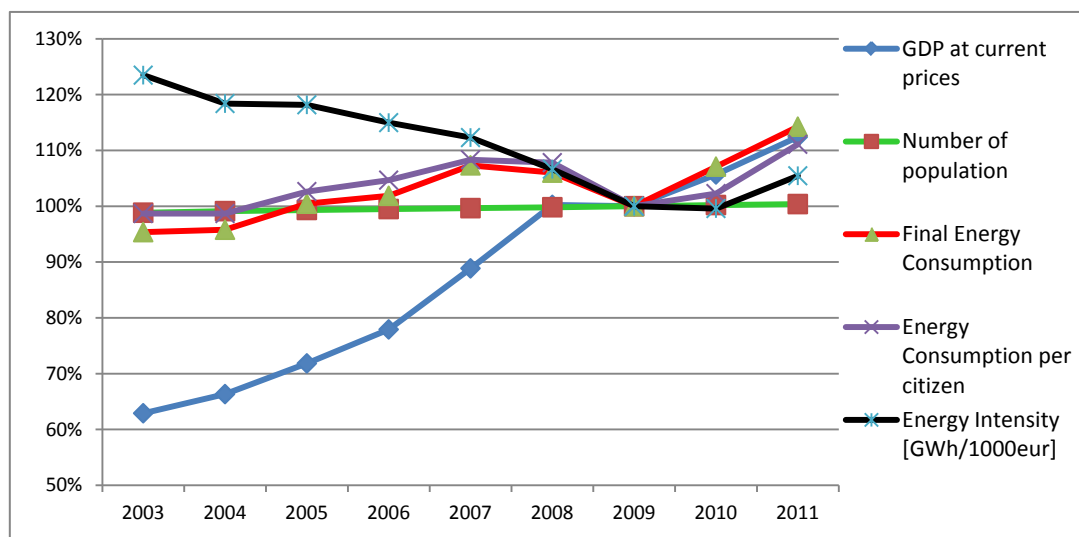


Figure 3.2.1 Index of GDP, Population, Intensity, Final and Consumption per capita

From these characteristic indicators which are needed to assess the energy consumption in the future, it should be underlined that the population is slightly increased, the final energy consumption increases by an average of 100 ktoe annually, too, but reducing energy intensity. Macedonia is expected to stabilize and slowly repair the consequences of the financial and economic crisis. The expected growth of GDP in 2013 remained at 2.2% while in 2014 growth will accelerate to 3.4%. These indicators suggest that it will affect the achievement of set goals.

### 3.3. End-Use Measures and Final Energy Savings

#### 3.3.1. Calculation methodology

For the purpose of calculating the energy savings achieved by 2012 the 2<sup>nd</sup> EEAP uses the Methodology for measuring and verification of energy saving in the final energy consumption, which is consisting part of the Rulebook on energy audit<sup>24</sup>. This Methodology consists of two parts, i.e. top-down and bottom-up methodology, which are based on EC document "Recommendations on Measurement and Verification Methods in the framework of the Directive 2006/32/EC on Energy End-Use Efficiency and Energy Services."

For the purpose of calculation of top-down indicators the following data sources was used data from the State Statistical Office, the State Hydrometeorological Institute, data from the Energy balance of the Republic of Macedonia adopted by the Government of the Republic of

<sup>24</sup> Official Gazette of the Republic of Macedonia No. 94/2013.

Macedonia, the Ministry of the Interior and modeled data. The used similar model for projecting energy savings was similar to the one used for the preparation of the 1<sup>st</sup> EEAP.

In accordance with the recommended TD methodology, 2009 was used as the reference year, and last year with a known energy balance was the 2011. The used input data in energy balance for year 2012 was extrapolated based on current trends in energy consumption and the data collected to produce the energy balance. In residential sector, industry and transport the parameters of consumption and savings are calculated using the minimum (M) and preferred (P) indicators. The commercial and service sector is an exception where, due to lack of data, the calculation of the preferred indicator was not possible.

It is recommended to consider that energy savings were determined by calculating the (P) indicator, except in the service sector. Also, in the residential sector, due to lack of data, it was not possible to calculate the indicator (P4) for appliances. An overview of TD indicators is given in Table 3.3.1 and Table 3.3.2.

To estimate energy savings in years 2018 and 2020, in paralel with the calculation of TD indicators as recommended by the European Commission, national methodology was used based on data taken from the Strategy for Energy Development until 2030 and Energy Balance<sup>25</sup>, in the model of planning the future of final energy consumption taking into account all energy efficiency measures that are planned for the period in accordance with the Energy Strategy.

Adopted Rulebook on energy audit includes Methodology for monitoring, measurement and verification of energy savings in the final energy consumption.

Table 3.3.1 Overview of TD indicators used for calculation and reporting of achieved energy savings

TD Indicator	Sector	Possibility of calculation	No. of energy saving measure evaluated using TD indicator
P1 HH	Residential	✓	P1, P2, P3, P5
P2 HH		✓	
P3 HH		✓	
P4 HH		-	
P5 HH		✓	
M1 HH		✓	
M2 HH		✓	
P6 SS	Services	-	M3, M4
P7 SS		-	
M3 SS		✓	
M4 SS		✓	
P8 TS	Transport	✓	P8, P9, P10, P11, P12, P13
A1 P8 TS		✓	
P9 TS		✓	
A2 P9 TS		✓	
P10 TS		✓	
P11 TS		✓	
P12 TS		✓	

<sup>25</sup> Energy balance of the Republic of Macedonia for the period 2013-2017 (Official Gazette of the Republic of Macedonia No. 170/2012).

P13 TS		✓	
M5 TS		✓	
M6 TS		✓	
M7 TS		0	
P14 IS	Industry	✓	P14
M8 IS		-	

National BU methodology is fully compliant with EC recommendations and national indicators related to climatic characteristics are taken into account.

Table 3.3.2 Overview of BU methods used for calculation and reporting of achieved energy savings

BU method	EC recommended method / national method	No. of energy saving measure evaluated using BU method
New residential buildings	NBU	B1
Improvement of the building	NBU	R1; P1
Domestic Hot Water - Solar water heaters	NBU	R3, P4
Improvement of lighting systems	NBU	P3
Vehicle energy efficiency	NBU	T1

### 3.3.2. All individual measures

#### 3.3.2.1. Measures in the buildings sector

The Buildings sector is divided into several groups. This is due to the impact of individual measures on the sector (EPB), or individual measures can be implemented mandatory (public buildings) and some voluntary, depending on market conditions (commercial and residential). Investments also depend on whether they are investing in the construction of new facilities, which have considerably less impact to implementation of EE measures to reach thresholds for minimal performances of buildings, and considerably higher when it is necessary to implement restoration, modernization (refurbishment, veatherization) of existing facilities. The residential sector is considerably greater than that of tertiary (public and commercial) and the relationship is shown on the Figure 3.3.1.

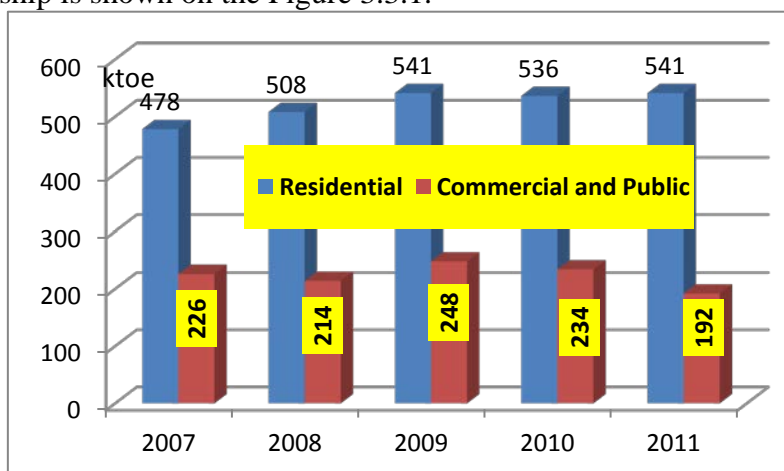


Figure 3.3.1 The history of energy consumption in buildings in the period 2007-2011

The approach for calculation of energy savings in the newly built buildings is the same as

previous - based on the methodology for determining the potential for energy saving in 1<sup>st</sup> EEAP, based on real-derived housing (State Statistical Office), calibrated to the average dwelling size, obtained are the values of the magnitude of savings. Expected values are not achieved, because the Rulebook on Energy Performances of Buildings, escorted with methodology for calculation of energy performance of buildings and the Rulebook on energy audit (including manner for carrying out energy audits, BU and TD methodologies for monitoring and verification of energy savings) have been adopted in 2013.

Delayed adoption and starting with implementation of both Rulebooks have caused a reduction in investment in these EE measures, especially at the level of getting feedback on the quality of realization of the new facilities.

The estimations are based on the number of new buildings built, assuming that on these facilities are used (in main part) EE measures, and partly justified by national BU method. The climatic conditions, level of occupation, as well as indicator of the dynamic of introduction of the measures are observed and implemented, too.

The realization of end use energy savings by the end of 1<sup>st</sup> EEAP in 2012, related to regulations in the buildings sector is shown in Table 3.3.3. Expected savings that would be caused by the application of these measures is shown at the same table.



Table 3.3.3 Overview of individual measures in the building sector

No.	Title of the energy saving measure	End-use targeted	Duration	Achieved energy savings in 2012 (ktoe)	Energy savings expected in 2018 (ktoe)	Status in relation to 1 <sup>st</sup> EEAP	Additional comments
B.1.	<i>Implementation of Rulebook on EPB</i>	New buildings, existing building renovation (appliances, lightning, heating)	2013 – 2015 (2020)	2.44	16.70	Not implemented	Foreseen in the Energy Law
B.2.	<i>Inspections of boilers/air conditioning systems</i>	Heating and air conditioning systems in existing buildings	2014 - 2015	0,06	1,54	Not implemented	Foreseen in the Energy Law
<b>Sum of savings:</b>				<b>2.50</b>	<b>18.24</b>		

Measures B1 and B2 deserve further elaboration. As noted above official publication and adoption of the Rulebook on Energy Performance of Buildings (EPB Rulebook) was delayed for several years. In the meantime have been realized many activities that promote the implementation of EE measures and the need for better isolation of newly constructed buildings. In the Official Gazette of the Republic of Macedonia No. 134/2008 was announced Rulebook on energy efficiency of buildings with a table showing a recommended minimum of U values for heat transmittance coefficients of different parts of building.

Implementation of this Rulebook was delayed and, after adoption of the new Energy Law in 2011, the Rulebook was withdrawn. But applications of the minimum values of heat transmittance coefficients revive in the construction sector set in this Rulebook started to be applied. Buildings began to be built with increased insulation, windows to be replaced with modern two or three panes glazing windows, with or without argon, and implementing extra insulation at ceilings. The continuous increase of the electricity price, following the market logic, urged citizens and the commercial sector to implement EE measures.

In addition it should be emphasized that there is an expertise in the Republic of Macedonia where one municipality provides incentives for applying of minimal values of the energy performances of buildings. In that example, obtaining a building permit was conditioned on compliance with minimal energy performance of buildings. Investors which provided project designs for buildings with considerably better energy performances, were rewarded with lowered municipal construction excise. The decision of the municipality to ask to comply with minimal energy performance of buildings, have contributed over 100 buildings to be constructed with good energy performances.



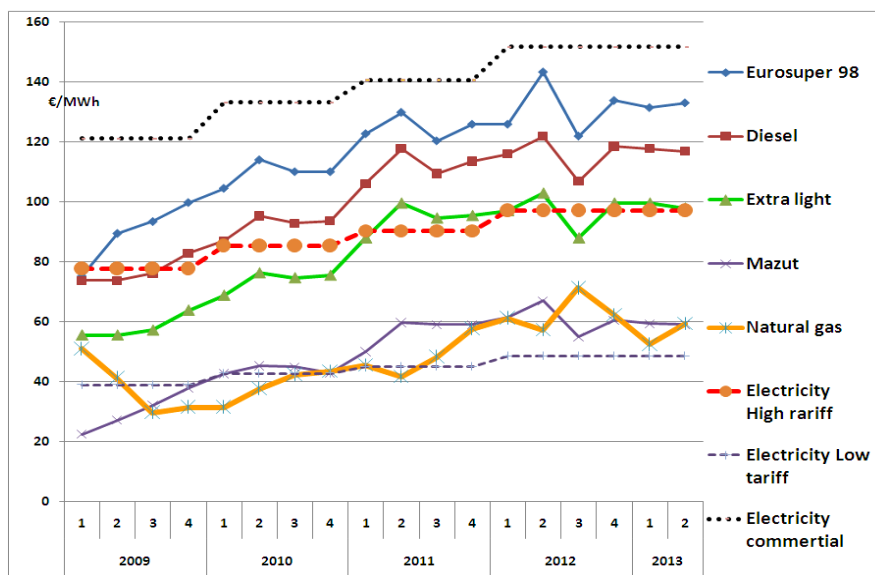


Figure 3.3.2 Energy price history

The application of these measures was realized through the project HABITAT (USAID) too, although it was not caused by order of the Rulebook for energy performances of buildings. The same is true for the reconstruction of a significant number of schools and kindergartens using the donation and partial co-financing funds from GEF Sustainable Energy Project of the World Bank (total investment in EE refurbishments of around 4 million U.S. dollars). For this reason we can conclude that energy savings were made by voluntary implementation of improved energy performances, that starting this year have to be applied as an obligation. Therefore these measures are de jure "new" (now they must be applied according to the law), but in reality previously de facto have been achieved measurable results.

The size of assumed energy savings for every year of the implementation of the 2<sup>nd</sup> EEAP are shown graphically in Figure 3.3.3. Cumulative value of the final energy savings, from starting value reached in 2012 is presented, too.

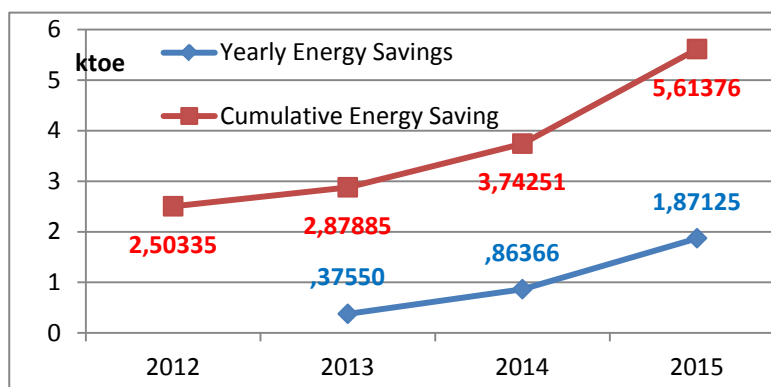


Figure 3.3.3 Energy savings in building sector

Title of the energy saving measure		Implementation of EPB Rulebook
Index of the measure		B.1
Description	Category	Regulation; Information and mandatory information measures
	Timeframe	Start: 2013
		End: 2015 (2020)
		The measure was edited, improved and supplemented with additional similar activities. Partial activities were already realized during EEAP 1 realization.
	Aim/brief description	This measure seeks to increase the awareness of users of buildings and transform the market towards more efficient buildings. Control mechanisms will be provided for implementation and quality control of authorized energy performance certificates. Energy performance certificate for the new buildings shall be issued under the project documentation, while the existing building will be needed to carry out energy audit. This measure also includes implementing building codes for new multi-apartment buildings, reduced energy consumption and in the future ensured lower energy bills for low income families in future. Building codes and their enforcement is an effective measure to ensure compliance with best practice energy efficiency of buildings.
	Target end-use	New buildings, significant reconstruction of existing buildings (including appliances and systems for lightning, heating, cooling)
	Target group	New buildings, significant reconstruction of existing buildings
Information on implementation	Regional application	National
	List and description of energy saving actions substantiating the measure	<p>Development of regulations for energy efficiency of buildings is closely related to satisfying the requirements of the EPBD. Enforcement mechanisms include inspections, control obligations certification of new buildings and building which are subject to significant reconstruction, building which are sold or rented and control of issued energy certificates correctness.</p> <p>There are laws, regulations and activities which are adopted/implemented, as are:</p> <ul style="list-style-type: none"> <li>• Law for construction (Official Gazzete of the Republic of Macedonia. No. 39/2012, 144/2012, 25/2013 и 79/2013);</li> <li>• Law for housing (Official Gazzete of the Republic of Macedonia. No. 99/2009, 57/2010, 36/2011, 54/2011, 13/2012 и 55/2013);</li> <li>• Energy Law (Official Gazzete of the Republic of Macedonia. No. 16/2011, 136/2011, 79/2013, 164/2013 and 41/2014);</li> <li>• Rulebook on energy audit (Official Gazzete of the Republic of Macedonia No. 94/2013);</li> <li>• Rulebook on Energy Performance of Buildings (Official Gazzete of the Republic of Macedonia No. 94/2013);</li> <li>• Program for training and examination of energy auditors (Official Gazzete of the Republic of Macedonia No. 161/2013);</li> <li>• Tariff system for maximal charge for trainings and examination of energy auditors as well as for maximal charge for advanced training of energy auditors (Official Gazzete of the Republic of Macedonia No. 153/2013) and</li> <li>• Tariff system for maximal charge of for carrying out of energy audits (Official Gazzete of the Republic of Macedonia No. 153/2013).</li> </ul> <p>Energy auditing will define the technology connected to building materials, windows, doors, insulation materials, lighting and HVAC systems.</p> <p>In order to realize the measure, EARM selected legal entities for carrying</p>

		<p>out of training and examination of energy auditors. Also, the following steps will be undertaken:</p> <ul style="list-style-type: none"> <li>• EARM will prepare and adopt Program for advanced training of energy auditors;</li> <li>• Manuals for training of energy auditors could be prepared and</li> <li>• Financial support mechanisms for energy auditing in SMEs through EEF to be established.</li> </ul> <p>First trainings for energy auditors started in first quarter of 2014, after that latest by the end of second quarter will be carried out first examinations, issuing of first authorisations of energy auditors and first licenses for carrying out of energy audits.</p> <p>Public sector entities are obliged to carry out regular energy audits of their building stock every 3 years and to provide energy performance certificate. Performing energy audits and selection of energy efficiency measures for implementation will be enabled also in residential buildings.</p>
	<b>Budget and financial source</b>	302 MD, provided by EEF and MULS.
	<b>Implementing body</b>	MoE, EARM, PS
	<b>Monitoring authority</b>	EARM
<b>Energy savings</b>	<b>Method for monitoring/measuring the resulting savings</b>	According to NBU methodology
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	5.10 ktoe
	<b>Savings achieved in 2012*</b>	2.44 ktoe
	<b>Expected energy savings in 2018*</b>	16.70 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	7.6%
	<b>Assumptions</b>	<p>Considering that this measure is with a mandatory character it will be implemented by the power of the law. To overcome barriers, more attention should be paid to continuous training and education of involved structures.</p> <p>We can conclude that energy savings of 2.44 ktoe were made by voluntary implementation of improved energy performances of buildings, following the open market conditions. There were no stipulated preconditions for this measure, and for this reason it is inserted as “new measure”, starting in 2013 after entering in force of the Rulebook on EPB.</p>
	<b>Overlaps, multiplication effect, synergy</b>	This is horizontal measure

Title of the energy saving measure		Inspections of boilers/air conditioning systems
Index of the measure		B2
Description	Category	Regulation, Mandatory information
	Timeframe	Start: 2014
		End: 2015
		This measure will continue beyond 2015
	Aim/brief description	Increased efficiency of boilers with effective rated output bigger than 20 kW and air conditioning systems in buildings with effective rated output bigger than 12 kW.
	Target end-use	Heating and air conditioning systems in existing buildings
	Target group	Building users, building owners
Information on implementation	Regional application	National
	List and description of energy saving actions substantiating the measure	<p>It is estimated that a large share of boiler and air conditioning systems are old, not functioning properly and thus wasting significant amounts of energy. Regular inspections is prescribed by the Rulebook on Energy Performance of Buildings pursuant to the requirements of the Energy Performance of Buildings Directive (Article 14 and 15) as well as Regulation (EC) No 842/2006. Implementation of this bylaw is aiming to improve the efficiency of the existing boilers and air conditioners, through their refurbishment or replacing with new ones with higher energy efficiency.</p> <p>Ministry of Economy and/or EARM should prepare guidelines for the order of control that should realize energy auditor during the inspection of boilers for hot water systems and air conditioners. Before to be implemented this measure, the following preconditions have to be meet:</p> <ul style="list-style-type: none"> <li>• Training and authorization of energy auditors and</li> <li>• Maintain evidence of completed inspections.</li> </ul> <p>The measure is mandatory for new and existing heating systems. The auditing will be escorted by advising.</p>
	Budget and financial source	18 MD from MULS and PS.
	Implementing body	MoE, AERM
	Monitoring authority	EARM
Energy savings*	Method for monitoring/measuring the resulting savings	NBU
	Expected savings in 2012 as per 1 <sup>st</sup> EEAP	0.30 ktoe
	Savings achieved in 2012*	0.06 ktoe
	Expected energy savings in 2018*	1.54 ktoe
	Expected impact on energy savings in 2020 (if available)	0.7%
	Assumptions	Some European recommendations give significantly higher assumptions (20% for electricity and 15% for other forms of energy), but they are not used.

		It can be concluded that energy savings of 0.1 ktoe were made by voluntary reconstruction of boilers and heating systems in public and commercial buildings. The reason to invest in heating and cooling modernization was continual increasing of fuel price, and good information campaign on possible benefits i.e. respecting market conditions. There were no stipulated preconditions for this measure, and for this reason it is inserted as “new measure”, starting in 2013 after entering in force of the EPB Rulebook.
	<b>Overlaps, multiplication effect, synergy</b>	This measure may overlap with a series of measures which include the implementation of energy audits. If the audit is made for certification of buildings, its effects are displayed on the measure, and if they are implemented as part of the energy audit for the purpose of energy, then it is displayed in the appropriate measures. Only in case if the energy audit is implemented separately, without the implementation of the general energy audit of the building, the effect is assigned to this measure.

### 3.3.2.2. *Measures in the residential sector*

Households are the second largest energy end-use consumers in Macedonia with 27.4% of total final energy consumption according to data from 2011 (Figure 3.1.1.1). The history of residential final energy consumption during the 6 year period is presented on the Figure 3.3.5. Households have the largest consumption of electricity among all sectors (exceeding even industry). The dominant forms of household energy consumption are electricity (largely for heating purposes) with 53% share (Figure 3.3.4) and biomass (firewood) with 31.4%. Liquid fuels and thermal energy (district heating) contribute with similar shares (8.4% and 6.8%). There is no use of natural gas in the residential sector, yet. However, the Government of the Republic of Macedonia in July 2013 signed agreement with the Government of the Russian Federation for connection of the Republic of Macedonia to the South Stream Pipeline. Also, there are initial activities in the Municipalities of Kumanovo and Strumica to enable connection of the households to the local gas distribution grid and first households are expected to use the gas in these municipalities in the heating season 2013/2014.

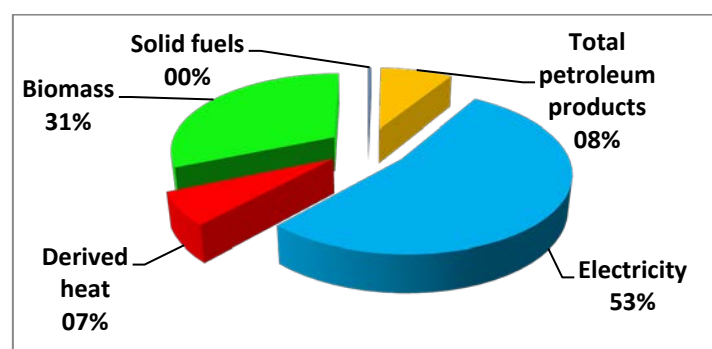


Figure 3.3.4 Households final energy consumption in 2011<sup>26</sup>

<sup>26</sup> State Statistical Office

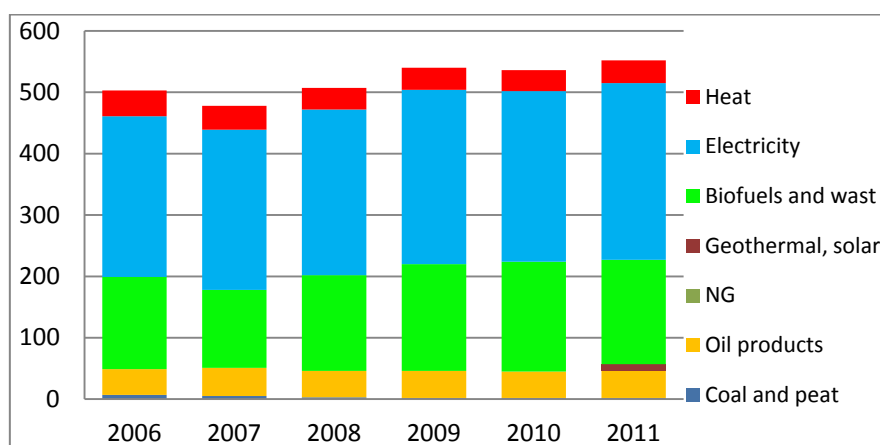


Figure 3.3.5 History of residential final energy consumption (in ktoe)

The specific energy consumption per capita predominantly depends on two factors - climatic characteristics and economic situation in an observed year. The maximum difference in the ten-year period is within 12% (see Figure 3.2.1).

The household energy consumption in Macedonia, expressed per capita, is very low, compared to EU. The developed European countries have 2.6 times greater household energy consumption per capita than Macedonia, and the less developed European countries have a 50% higher consumption than Macedonia. The actual energy consumption in Macedonia is 10-15% higher than the official estimates, if the unregistered consumption of firewood, estimated at 25-35% of the registered consumption, and the unregistered electricity consumption, estimated at 8% of the registered electricity consumption, is introduced into the calculation.

The household DH energy consumption participates with 6.8% in the household energy consumption. This ratio depends to the limited DH use only in the capital Skopje. Concerning expected development of DH for the city Bitola from existing thermal power plant in vicinity, which will be reconstructed into CHP, the share of DH will increase.

Residential sector still do not use natural gas, however this is expected to change during 2014.

Policy measures in the residential sector will include the following steps:

- Implementation of the recast Energy Performance Building Directive;
- Changing the threshold for minimum performance requirements for major renovations;
- Aiming for the performance of new buildings to approach the level of “nearly zero-energy buildings”;
- Considering binding requirements to install passive heating and cooling technologies;
- Introducing energy efficiency where relevant under the construction products directive and
- Implementation of Rulebook on labeling the energy consumption and other resources of the energy-related products and Ordinance for eco-design of products.

The realization of end use energy savings by 2012, dependent to the elaborated EE measures for residential sector are shown in Table 3.3.4. Expected savings that would be caused by the application of these measures are shown at the same table.

Table 3.3.4 Overview of individual measures in the residential sector

No	Title of the energy	end-use	Duration	Achieved	Energy	Status in	Additional
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	saving measure	targeted		energy savings in 2012 (ktoe)	savings expected in 2018 (ktoe)	relation to 1 <sup>st</sup> EEAP	comments
R.1	Retrofits in existing residential buildings	Existing residential buildings	2010 - 2015 (2018)	1.94	11.95	Implemented as planned	Targeted to multi apartment buildings
R.2	Electrical appliance and equipment labeling	Electrical appliances	2010 – 2015	0.26	0.66	Partially implemented	Horizontal measure
R.3	Promotional Program for wider application of thermal solar collectors and heating pumps	Residential sector (solar thermal, heat pumps, biomass)	2013 – 2015	1.46	2.37	Implemented as planned	Targeted to Association of building owners
R.4	Information campaigns and network of EE infocenters	Residential owners and tenants	2010 – 2015	0.99	5.12	Implemented as planned	Horizontal measure
<b>Sum of savings:</b>				4.64	20.09		

The size of assumed energy savings for every year of the implementation of 2<sup>nd</sup> EEAP in the residential sector are shown graphically in Figure 3.3.6. Cumulative values of the final energy savings, from starting value reached in 2012 are presented, too.

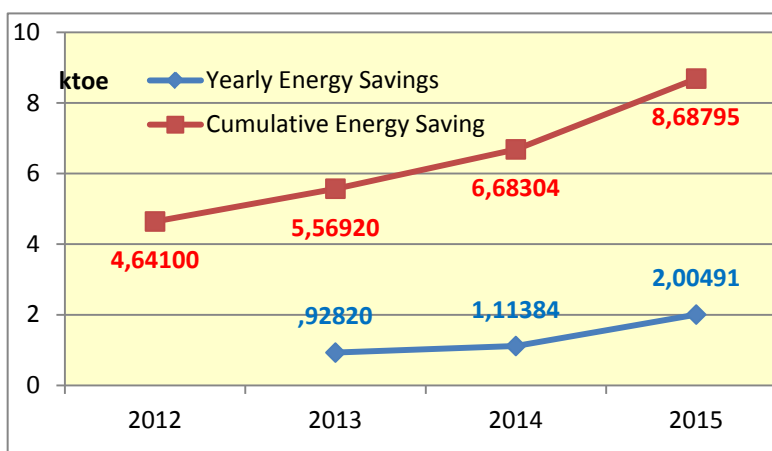


Figure 3.3.6 Residential sector energy savings

Title of the energy saving measure		Retrofits in existing residential buildings
Index of the measure		R.1
Description	Category	Financial instruments, Information
	Timeframe	Start: 2010 End: 2015 Realization of the measure continues with anticipated certain changes, additions and improvements.
	Aim/brief description	The measure provides a comprehensive action plan for the rehabilitation of existing residential buildings by the end of 2015 (2020) and the implementation of that plan. The plan attention focuses primarily on multi apartment residential buildings and weatherization of building envelope. This measure provides issuing certificates for energy performance of buildings after the energy renovation.
	Target end-use	Existing residential buildings
	Target group	Association of property owners; companies that manages apartment buildings.
	Regional application	National
Information on implementation	List and description of energy saving actions substantiating the measure	Preparation of multi-year Action Plan for the renovation of residential buildings till 2015.
	Budget and financial source	2048 MD from FI, PS and ESCO.
	Implementing body	PS, Donors
	Monitoring authority	EARM
Energy savings*	Method for monitoring/measuring the resulting savings	NBU
	Expected savings in 2012 as per 1 <sup>st</sup> EEAP	1.63 ktoe
	Savings achieved in 2012*	1.94 ktoe
	Expected energy savings in 2018*	11.95 ktoe
	Expected impact on energy savings in 2020 (if available)	5.43%
	Assumptions	In the Republic of Macedonia as of 2011 there were 54,09 million m <sup>2</sup> area of residential buildings, according to National statistical bureau, Population Census of 2002, and several publications for Construction in the Republic of Macedonia between 2003 and 2011. It is assumed that only 40% of total space is heated. Also, it is assumed that energy renovation will be firstly performed in the buildings that are built before 1990, with average consumption of energy over 150 kWh/m <sup>2</sup> year. According to the Rulebook on energy performance of buildings, building and building units subject to major renovation, in addition to the other minimal requirements, have to be classified in the energy class D.
	Overlaps, multiplication effect, synergy	To achieve multiplier the effect and to increase the interest of the apartment owners in the restoration of its buildings and apartments, it is in the common interest to effectively showcase the completed projects and the benefits they bring to the households. Activities under this measure that are related to building refurbishment overlap with the measure R.3. These are complex thermal modernization measures that are subject to a comprehensive program.



Title of the energy saving measure		Electrical appliance and equipment labeling
Index of the measure		R.2
Description	Category	Information and mandatory information measures
	Timeframe	Start: 2010. End: end of 2015. The measure continues with anticipated certain changes, additions and improvements.
	Aim/brief description	Aim of the labeling is to provide substantial information of the energy consumption of the energy-related products. Since 2007 in Republic of Macedonia there is regulation for labeling of electrical household appliances, which started to be implemented by January 1, 2010. In addition, in 2011 and 2012 the new Rulebook on indication by labeling of energy consumption and other resources by energy-related products (Official Gazzete of the Republic of Macedonia No. 154/2011 and 146/2012) and Ordinance for eco design of products (Official Gazzete of the Republic of Macedonia No. 100/2011) have been adopted and started to be implemented. The application of labeling and eco-design of products is necessary to ensure that Macedonian market will place products that meet EU regulations.
	Target end-use	Existing residential buildings
	Target group	Property owners, tenants
	Regional application	National
Information on implementation	List and description of energy saving actions substantiating the measure	Increased awareness and consequently modified end-user behaviour.
	Budget and financial source	228 MD from PS and FIs.
	Implementing body	MoE, producers and distributors/suppliers of energy related products, and households
	Monitoring authority	EARM
Energy savings*	Method for monitoring/measuring the resulting savings	In order to monitor the effects of this measure it is necessary to ensure the use of TD method recommended by the European Commission.
	Expected savings in 2012 as per 1 <sup>st</sup> EEAP	0.28 ktoe
	Savings achieved in 2012*	0.26 ktoe
	Expected energy savings in 2018*	0.66 ktoe
	Expected impact on energy savings in 2020 (if available)	0.3%
	Assumptions	The tracking the realization of this measure, and with that, the estimate even with the TD methods have become difficult earnings to the lack of information concerning the number of the electrical appliances which are placed on the market, how much following equipment was purchased and in which classes on energy efficiency belongs.
	Overlaps, multiplication effect, synergy	This is a horizontal measure.

Title of the energy saving measure	Promotional Program for wider application of solar thermal collectors and heat pumps
Index of the measure	R.3

<b>Description</b>	<b>Category</b>	Financial instruments, Information, subsidies
	<b>Timeframe</b>	Start: 2013 End: 2015 Extensive national campaigns will continue, escorted with targeted campaigns combined with financial incentives to a certain extent.
	<b>Aim/brief description</b>	The objective of this measure is to provide information on existing financial means as well as assistance to individuals for investment in renewable energy. In addition, the measure provides establishment of a scheme of financial incentives for the use of renewable energy for heat generation.
	<b>Target end-use</b>	The use of renewable energy (solar thermal systems, heat pumps, biomass)
	<b>Target group</b>	Flat owners
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	Increased awareness and consequently modified end-user behavior; Total number of subsidized households is 2415 per following years: <ul style="list-style-type: none"> <li>- In 2007, 500 households have been subsidized with the amount of subsidies of 7,890,184 MKD;</li> <li>- In 2009, 500 households have been subsidized with the amount of subsidies of 7,947,059 MKD;</li> <li>- In 2011, 420 households have been subsidized with the amount of subsidies of 6,032,429 MKD;</li> <li>- In 2012, 481 households have been subsidized with the amount of subsidies of 5,985,329 MKD and</li> <li>- In 2013, 514 households been subsidized with the amount of subsidies of 5,956,569 MKD.</li> </ul> It is expected that installation of average solar water heater in one household will contribute to energy production, i.e. energy savings in amount of around 2,400 kWh/year or 13,344 MKD/year.
	<b>Budget and financial source</b>	504 MD, from MoE and PS.
	<b>Implementing body</b>	MoE
	<b>Monitoring authority</b>	MoE, AERM
<b>Energy savings</b>	<b>Method for monitoring/measuring the resulting savings</b>	NBU
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	0.42 ktoe
	<b>Savings achieved in 2012*</b>	1.46 ktoe
	<b>Expected energy savings in 2018*</b>	2.37 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	1.08%
	<b>Assumptions</b>	Using NBU method successfully was monitored co-financing scheme for citizens, as recommended by the European Commission. It is developed NBU method for heat pumps, too.
	<b>Overlaps, multiplication effect, synergy</b>	This measure partially coincides with the measure R.4 . It must be ensured that the effects of the measures will be separated. Activities under this measure related to building thermal modernization should be integrated into a measure R.1

Title of the energy saving measure		Information campaigns and network of EE infocenters
Index of the measure		R.4
4. Description	Category	Information and mandatory information measures
	Timeframe	Start: 2010 End: 2015 Anticipated major changes, additions, improvements.
	Aim/brief description	Information campaigns are aimed for raising awareness of the target groups of the benefits and opportunities to improve energy efficiency. The most effective campaigns are for a limited period and focused on specific activities, such as thermal insulation, more efficient lighting, etc. This measure provides the establishment of EE info centers in the local self-governments, in which energy advisors will operate, will share free advice to the interested citizens the possibilities of saving energy and saving money in their homes. With those targeted educational activities will have to include participants who participate in achieving the goal of increasing energy efficiency.
	Target end-use	Household appliances, all devices in any mode that consume energy; measures for building weatherization
	Target group	Household owners; decision makers who purchase the devices in other sectors.
	Regional application	National
Information on implementation	List and description of energy saving actions substantiating the measure	<p>A nation-wide information campaign will have to be organized to achieve envisaged targets.</p> <p>EVN Macedonia has developed a few campaigns and projects for rising of awareness for saving of electricity which are linked to the measures of the first Energy Efficiency Action Plan of the Republic of Macedonia until 2018.</p> <p>Media that are to be used are TV spots, print and radio announcements, online campaign, traditional and alternative outdoor creative executions, web site saving tips. Also, prize game for regular users is implemented, with emphasis on energy efficiency, but of special importance is the Platform for energy efficiency, for education of the population and experience exchange of the private sector for successfully implemented EE measures.</p> <p><b>Preparation and broadcasting of a documentary film under the GEF Sustainable Energy Project:</b></p> <p>The Ministry of economy, in the frame of GEF Sustainable Energy Project has engaged company for the purpose of conceptualizing, shooting and producing of a documentary film and short video in order to promote the global importance of energy efficiency, as well as the World Bank's and the Ministry of Economy's activities in the field of energy efficiency and, in particular, to demonstrate the importance and benefits of implementing energy efficiency measures in buildings under GEF Sustainable Energy Project.</p> <p><b>Info Center for Energy of the City of Skopje:</b></p> <p>In the frame of the GIZ Project for Capacity Building for energy management in cities, the Info Center for Energy</p>

		<p>of the City of Skopje was established. The Info center is continuing its work and provides education to the citizens in the field of energy efficiency and renewable energy sources.</p> <p><b>EVN's Customer relations centre:</b> EVN Macedonia operates "Customer relations centre" under which there is separate customers' office. This centre provides advices to the customers for reasonable consumption of electricity with no charge.</p> <p><b>Info Center for Energy:</b> In 2010 the Energy Agency of the Republic of Macedonia, supported by the Ministry of Environment, Land and Sea of Italy opened the Info Centre for energy of the Republic of Macedonia. The purpose of the Info Centre for energy is providing free of charge and instant access to information about energy efficiency and renewable sources of energy for all citizens.</p>
	<b>Budget and financial source</b>	141 MD, from MoE and ESP (EVN, ELEM, MEPSO, BEG).
	<b>Implementing body</b>	MoE, ESP
	<b>Monitoring authority</b>	EARM
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	TD
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	1.08 ktoe
	<b>Savings achieved in 2012*</b>	0.99 ktoe
	<b>Expected energy savings in 2018*</b>	5.12 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	2.33%
	<b>Assumptions*</b>	
	<b>Overlaps, multiplication effect, synergy</b>	It is horizontal measure.

### 3.3.2.3. Measures in the public sector

The statistics of the Republic of Macedonia did not processed information related to energy consumption separately for the commercial and public sector. For this reason Figure 3.3.7 shows the total consumption of different types of energy for these two subsectors. Figure 3.3.8 shows history of total final energy consumption in commercial and public sectors. The main feature of the sector is the dominant consumption of electricity and liquid fuels. The expansion of the natural gas distribution network will considerably increase the share of this fuel to meet the energy needs of these two sectors. This energy resource will take over part of share of the liquid fuel with less impact to the the part of share of electricity.

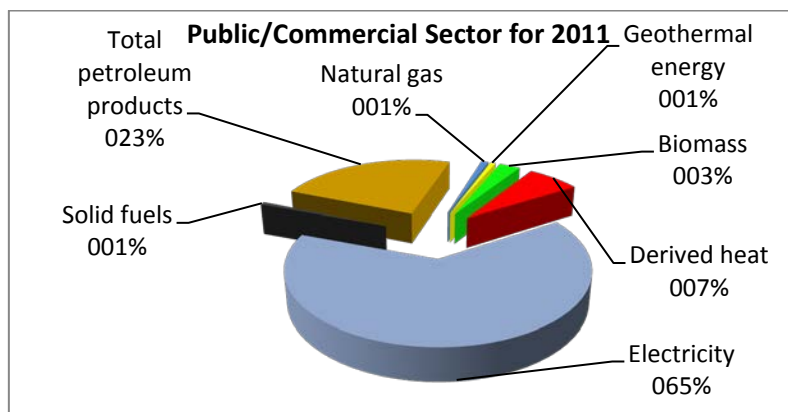


Figure 3.3.7 Joint final energy consumption in the Public and Commercial sector 2011<sup>27</sup>

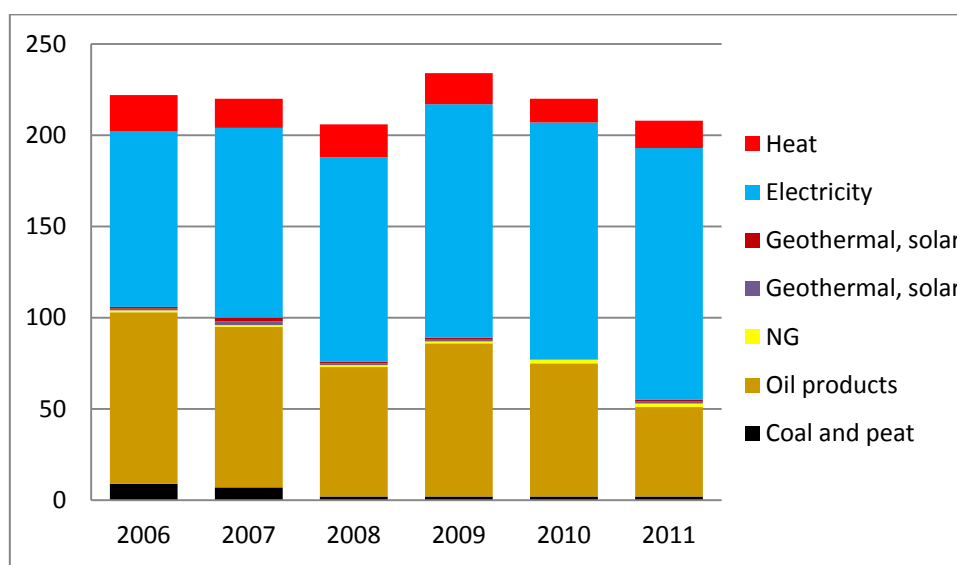


Figure 3.3.8 History of final energy consumption in the Public and Commercial sector (in ktoe)

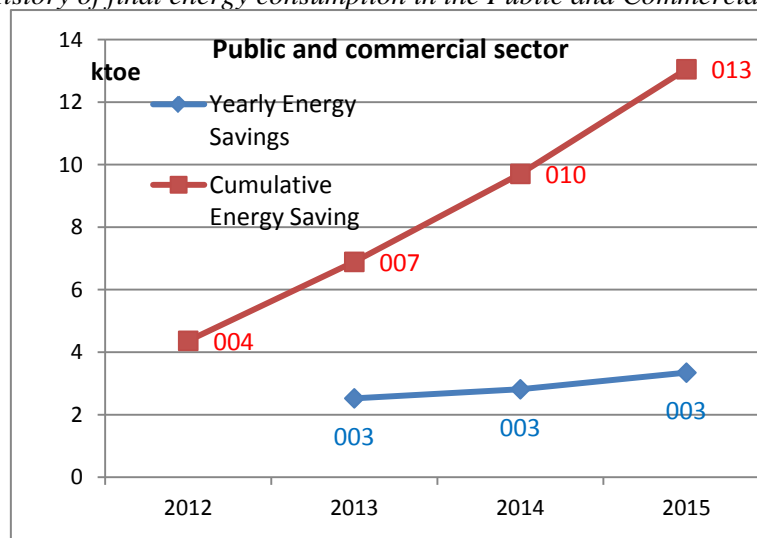


Figure 3.3.9 Public and commercial sector energy savings

<sup>27</sup> State Statistical Office

To allow easier connection to the results of 1<sup>st</sup> EEAP in which these subsectors were not separated, projected energy savings jointly are shown on Figure 3.3.9.

Public buildings are probably the only category of existing buildings where energy efficiency measures can and need to be "imposed" by policy, particularly in all new construction in all sectors through building codes. The following compulsory measures apply:

- Compulsory establishment of an energy management scheme and appointment of an energy manager among the existing personnel of the building.
- Specifications of the energy managers' duties.
- Strong role of the public sector to lead by example – demonstrate new technologies and methods.
- Training programmes and technical support to energy managers.
- Compulsory energy audit execution within a specified time period and elaboration of a concrete action plans for the improvement of the energy performance of the building.
- Implementation of the action plan and of the energy efficiency investments within a specified period of time.
- Regular reporting.

Priority actions:

- When needed, periodically, to update energy efficiency public procurement guidelines already developed and adopted by EARM.
- Promote energy management schemes, and training toolkits for industry, SMEs, and the public sector.
- Propose a vocational educational initiative on energy efficiency.
- Establish Municipal Network on Energy Efficiency.
- Involve and charge the EARM with duties related to the implementation of the EEAP and the Strategy for improvement of the energy efficiency.
- Strengthen energy efficiency in external relations cooperation frameworks.
- Increase international cooperation.
- Promote, support and strengthening allocation of realization of some duties from Governmental to private sector (academic, consulting organization, NGOs).

The implementation of energy efficiency measures in public buildings will be accomplished by developing and launching the EPUBIL project (Energy Efficiency in Public Buildings). The establishment of this project and its implementation will be in accordance to the Draft National Program for EE in Public Buildings<sup>28</sup>, EED Directive and the provisions of the Energy Law. This project will ensure systematic and intensive implementation of energy efficiency in public sector but also quality monitoring of the implementation of the measures, their valorization and preparing the required Report (legal obligation and commitment to Energy Community). The funding of this project will be accomplished through EEF (Energy Efficiency Fund).

The realization of end use energy savings by 2012, dependent to the elaborated EE measures in the 2<sup>nd</sup> EEAP, for the public sector, are shown in Table 3.3.5. Expected savings that would

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<sup>28</sup> Draft National program for energy efficiency in public buildings in the Republic of Macedonia until 2020 (Phase I) is developed under the GEF Sustainable Energy Project and with technical assistance of, the World Bank Institute.

be caused by implementation of these measures and status of each measure in relation to 1<sup>st</sup> EEAP are shown at the same table.

Table 3.3.5 Overview of individual measures in the public sector

No .	Title of the energy saving measure	End-use targeted	Duration	Achieved energy savings in 2012 (ktoe)	Energy savings expected in 2018 (ktoe)	Status in relation to 1 <sup>st</sup> EEAP	Additional comments
P. 1	<b>PROJECT EPUBIL:</b> Retrofits in existing public buildings	Existing public buildings	2013 - 2015 (2018)	2.08	8.17	Restructured measure	Connected to National Program for EE in Public Buildings
P. 2	Energy Management	Existing and new public buildings	2013 - 2015 (2018)	0.36	2.57	Restructured measure	Horizontal measure
P. 3	Municipal Street lighting	Municipalities	2010 - 2015 (2018)	0.66	1.29	Implemented as planned	Continue implementation as planned
P. 4	Wider application of renewable energy (solar, bio mass)	PSE	2012 - 2015 (2018)	0.18	1.57	Reviewed measure;	Horizontal measure
P. 5	Green procurement	MULS, GA, OPP	2012- 2015 (2018)	0.08	1.05	New measure	Connected with Energy Law
<b>Sum of savings:</b>				<b>3.37</b>	<b>14.64</b>		

The size of assumed energy savings for every year of the implementation of 2<sup>nd</sup> EEAP in the public sector are shown graphically in Figure 3.3.10. Cumulative values of the final energy savings, from starting value reached in 2012 are presented, too.

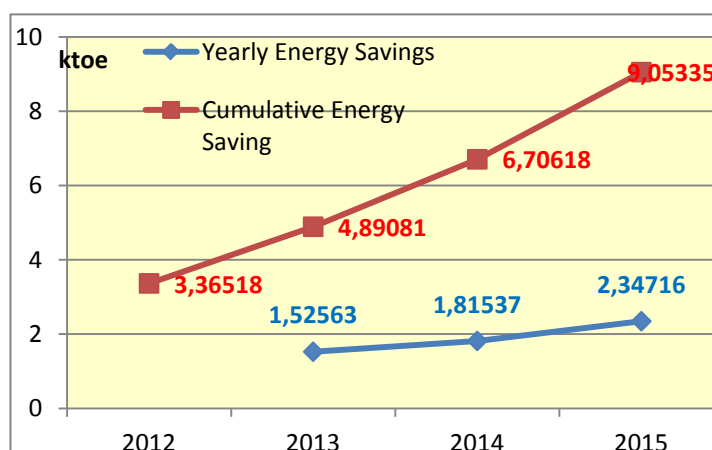


Figure 3.3.10 Public sector energy savings



Title of the energy saving measure		PROJECT EPUBIL Retrofits in existing public buildings	
Index of the measure		P.1.	
	Category	Financial instruments, Regulation	
	Timeframe	Start: 2013	
		End: 2015 (2018)	
		New measure	
	Aim/brief description	<p>Aim of this measure to establish a Project for realization of EE measures in the sector of Public Buildings - EPUBIL. It will ensure permanent control and monitoring of realization and valorization of achieved energy savings. The basis of the project is the National Program for EE in public buildings until 2020 (Phase I).</p> <p>Public building interventions have proven to be fairly cost-effective whether they have targeted a single technology improvement (lighting, building envelope) or an integrated facility approach.</p> <p>Activities should be directed towards potentials for large no/low cost energy savings, such as encouraging changes of behaviour through education, training and information campaigns. Additionally, energy management systems (EMS) will be introduced supported by monitoring and targeting tools. This will take place within the local administration.</p> <p>Public buildings are probably the only category of existing buildings where energy efficiency measures can and have to be "imposed" by policy, particularly in building and major reconstruction of buildings and building units, all new construction in all sectors through building codes.</p> <p>Typical EE measures aimed at thermal energy savings are:</p> <ul style="list-style-type: none"> <li>• Thermal insulation on the outside walls.</li> <li>• Replacement of the existing windows and outside doors with new, energy efficient ones.</li> <li>• Thermal insulation of the roof (attic).</li> <li>• Thermal insulation on the floor.</li> <li>• Installation of Automatic Control (AC) systems in existing heating substations in the public buildings that are connected to the district heating system.</li> <li>• Reconstruction of boiler stations in existing hot water radiator heating systems.</li> <li>• Installation of AC systems in boiler stations in existing hot water radiator heating systems.</li> <li>• Replacement of existing room stoves operating on firewood with new, highly efficient ones.</li> <li>• Replacement of existing radiator masks in kindergartens with new ones, to enable better emission of the heat produced from the radiator units.</li> </ul> <p>Typical EE measures aimed at electricity savings are:</p> <ul style="list-style-type: none"> <li>• Improvement of lighting arrangement.</li> <li>• Replacement of existing pumps in hot water supply systems with new EE pumps.</li> </ul> <p>The measure envisage adoption of the prepared draft National Program for EE in public buildings and the implementation of that Program. The buildings of the public sector will be subject to reconstruction as are the buildings owned by the state budget users (ministries, departments, institutes, academies, offices) and extra-budgetary users and buildings owned by public companies. Attention is primarily focused to the buildings of the public sector built as older buildings, and their restoration to the low-energy standard and achieving at least energy class D, according to the Rulebook on energy performance of</p>	



		buildings.
	<b>Target end-use</b>	All buildings under jurisdiction of public sector
	<b>Target group</b>	<ul style="list-style-type: none"> <li>• Buildings under jurisdiction by MULS</li> <li>• Buildings under jurisdiction by GA</li> <li>• Buildings under jurisdiction by public enterprises</li> </ul>
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	<p>Draft National Program for EE in public buildings (Phase I) is prepared under the GEF Sustainable Energy Project and with technical assistance of the World Bank Institute. After establishment of the EEf and providing funding for its operation, this Program will be adopted. National Program, also, need to be publicly presented and encourage ESCOs and other private companies to participate in the implementation of activities.</p> <p>EEf shall provide necessary resources for financing the National Program by the end of 2014.</p> <p>Implementation of the National Program should begin no later than the end of 2014 year and the first phase of its implementation to finalize by 2020.</p> <p>The execution of the National Program should be monitored on an annual basis in terms of money spent and actual energy and CO<sub>2</sub> emissions savings.</p>
	<b>Budget and financial source</b>	2171 MD from EEf, FI and EUF.
	<b>Implementing body</b>	MoE, EEf
	<b>Monitoring authority</b>	EARM, EEf
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	NBU
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	1.50 ktoe
	<b>Savings achieved in 2012*</b>	2.08 ktoe
	<b>Expected energy savings in 2018*</b>	8.17 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	3.71%
	<b>Assumptions</b>	<p>It is assumed that the energy renovation of buildings will primarily focus on buildings built before the 1990th years, with an average fuel consumption of thermal energy for heating over 150 kWh/m<sup>2</sup>year.</p> <p>Priority will be given to hospitals, kindergartens and schools.</p> <p>The National Program also assumes elimination of a number of administrative barriers, capacity building and successful construction of the financing scheme.</p>
	<b>Overlaps, multiplication effect, synergy</b>	This measure has synergy with measures P4, P5, R4

<b>Title of the energy saving measure</b>	<b>Energy Management</b>
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Index of the measure		P. 2
Description	Category	Information and mandatory information measure, Regulation
	Timeframe	Start: 2013 end: 2015 (2018) Anticipated major changes, additions and improvements.
	Aim/brief description	The aim of the measure is to apply the model of continuous and systematic energy management, strategic energy planning and sustainable management of energy resources at the local level, which contributes to the reduction of energy consumption and thereby the reduction of emissions into the atmosphere. The measure is based on the establishment of an organizational structure for energy management, employee education and the application of IT tools for continuously monitoring and analyzing energy and water consumption in buildings owned by the public sector. The amendment to the Energy Law (Official Gazzete of the Republic of Macedonia No. 79/2013) envisages establishment of information system for monitoring and management of energy consumption of the public sector entities. On the base of this Law a separate Rulebook on information system for monitoring and management of energy consumption of the public sector entities will be adopted, after which the system will be established. EARM will establish the information system and the main beneficiaries will be MoE, EARM and all other public sector entities.
	Target end-use	Existing buildings owned by public sector or where the public sector entities carry out its activities
	Target group	Public-sector employees responsible for energy management
	Regional application	National
Information on implementation	List and description of energy saving actions substantiating the measure	Activities implemented and the results achieved: 1. Creating the political will to implement energy efficiency activities; 2. Establishing organizational structures (EE teams and offices); 3. The introduction of software tools for continuous monitoring and analysis of energy consumption in the public sector buildings. For that reason, will be provided use of ExCITE29 software to all public buildings; 4. Education/training of EE teams to use software; 5. Activities to increase awareness of other employees through the workshop "EE/Green Office" and 6. Promotion of activities as public events with press conferences, television, radio broadcasts and articles in the print and electronic media.
	Budget and financial source	394 MD from MoE, EARM, PSE and donors.
	Implementing body	MoE, PSE
	Monitoring authority	MoE, EARM
Energy savings*	Method for monitoring/measuring the resulting savings	TD
	Expected savings in	0.26 ktoe

<sup>29</sup> External Climate and Inventory Tool for Energy Efficiency (www.eeportal.mk)

	<b>2012 as per 1<sup>st</sup> EEAP</b>	
	<b>Savings achieved in 2012*</b>	0.36 ktoe
	<b>Expected energy savings in 2018*</b>	2.57 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	1.17%
	<b>Assumptions</b>	According to the recommendations of the European Commission, the lifespan of organizational measures is 5 years, which means that savings of 2013 will not be "live" after 2018. For the 2020 the program is assumed to still produce savings realized 2015 be "live", which will in part be true, especially with regard to the established energy management structure that will continuously pursue improvement.
	<b>Overlaps, multiplication effect, synergy</b>	This measure also includes activities that are aimed at the citizens because the activities of the public sector to promote the general public. In this way, achieving effects in other sectors of final consumption, especially in households. These effects are recorded by TD indicators of energy efficiency.

<i>title of the energy saving measure</i>		<b>Municipal Street lighting</b>
<i>Index of the measure</i>		<b>P. 3</b>
<b>Description</b>	<b>Category</b>	Energy services for energy savings, Information
	<b>Timeframe</b>	Start: 2010 End: 2015 (2018) The measure is designed on the basis of best practices and experiences on financing reconstruction projects of public lighting.
	<b>Aim/brief description</b>	Projects to improve energy efficiency in street lighting are cost effective, the savings are visible immediately and are easily demonstrable and verifiable. Therefore, these projects can be an excellent use for the promotion of PPP and ESCO. The main objective of this measure is to stimulate the market for energy services in Macedonia. The main activity will be to replace the mercury lamps with sodium lamps. At the same time will be implemented LED lights, depending on the economic justification.
	<b>Target end-use</b>	Electricity consumption in street lighting
	<b>Target group</b>	MULS
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	<ol style="list-style-type: none"> <li>1. Promotional activity MULS to meet all decision makers that this measure is one of the fastest worthwhile;</li> <li>2. Promotional activities for the implementation of PPP;</li> <li>3. Inventory of lamps and technical analysis of potential savings;</li> <li>4. Preparation of tender documents and</li> <li>5. Access to an agreement for Energy Performance Contract.</li> </ol>
	<b>Budget and financial source</b>	449 MD from MULS, ESCO and EEF.
	<b>Implementing body</b>	MULS

	<b>Monitoring authority</b>	EARM
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	The savings realized by the end of 2012 of projects were determined using the NBU-based methods based on determination of difference on energy consumption - installed capacity and number of fixtures before and after the implementation of the measure with respect to the number of hours of public lighting system and the existence of the control strategy (as recommended by the European Commission). A detailed description of the method is given in the Appendix 4 of the Rulebook on Energy Audit "Bottom-up Methodology for Measurement and verification of energy savings for achieving the preconditions of the EU Directive 2006/32/EC for energy savings". The savings for the majority of the projects are based on actual measured data before and after the implementation of the measure. For future activities of this project will be used the same set of methodological options.
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	0.11 ktoe
	<b>Savings achieved in 2012*</b>	0.66 ktoe
	<b>Expected energy savings in 2018*</b>	1.3 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	0.59%
	<b>Assumptions*</b>	Savings from all measures already implemented, assuming equipment life in public lighting systems, will be "live" by 2016, according to the life span of the new lamps.
	<b>Overlaps, multiplication effect, synergy</b>	N/A

<i>Title of the energy saving measure</i>		<b>Wider Application of Renewable Energy</b>
<i>Index of the measure</i>		<b>P. 4</b>
<b>Description</b>		Financial instruments, Regulation, Information
	<b>Timeframe</b>	Start: 2012 End: 2015 (2018) The measure is designed on the basis of realized best practices and experiences.
	<b>Aim/brief description</b>	The objective of this measure is to encourage the wider application of solar thermal systems for hot water preparation and the use of heat pumps in heating systems and wider application of solar thermal systems for hot water preparation. Installation of solar thermal systems for hot water preparation is mandatory for public buildings during their rehabilitation, if there is economical justification. The Energy law (Article 134, paragraph 5) and Rulebook on energy performance of buildings (Article 26) requires new buildings and building units subject to major renovation owned by the state or the municipalities to incorporate solar thermal systems for the preparation of hot water where it is economically justified.

		Solar collectors should be installed in buildings in health institutions, secondary school and university students' residence halls, kindergartens, social care facilities, sports halls, penitentiaries and barracks. Economic viability and relatively acceptable payback period of the investment can be provided with large hot water needs during the day and during the year. As an alternative, but also complement to the solar systems are geothermal heat pumps, which provide efficient heating and cooling of buildings with an efficiency of over 400% lodged in terms of energy (1 kWh electrical energy provides up to 4 kWh heat).
	<b>Target end-use</b>	The use of renewable energy (solar thermal systems, heat pumps, biomass)
	<b>Target group</b>	MULS, GA
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	<ol style="list-style-type: none"> <li>1. Energy Law and Rulebook on energy performance of buildings: Mandatory application of solar systems for hot water preparation for new public buildings and building units and public buildings and building unit subject to major renovation, if economically justified;</li> <li>2. Control over the work of the energy auditors - proper implementation of the legislation for EPB;</li> <li>3. Government Financial incentives;</li> <li>4. NGO, Private sector awareness, information, promotion;</li> <li>5. Academic institutions, Private sector Development of domestic technologies and Transfer of know-how.</li> </ol>
	<b>Budget and financial source</b>	240 MD from MULS, ESCO and EEf.
	<b>Implementing body</b>	MoE, MULS, GA, PSE
	<b>Monitoring authority</b>	EARM
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	Monitoring the effects of these measures is realized using the NBU method where are set up a national benchmarks. Details are given in the Appendix 4 of the Rulebook on energy audit, "Bottom-up Methodology for Measurement and verification of energy savings for achieving the preconditions of the EU Directive 2006/32/EC for energy savings", which is based on EC recommendation. Beneficiaries of funds required by local governments provide information about the surface and the type of installed collectors (plate or tube), as well as the efficiency of the hot water that was used prior to the installation of solar panels.
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	0.34 ktoe
	<b>Savings achieved in 2012*</b>	0.18 ktoe
	<b>Expected energy savings in 2018*</b>	1.57 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	0.71%
	<b>Assumptions</b>	Although 1 <sup>st</sup> Energy Efficiency Action Plan gives approximate

		estimates for achieving energy savings that are associated with this measure, due to the lack of detailed plans for the implementation and the uncertainty related to the response of MULS and GA, for the next period is not possible to give precise estimates of potential savings. However, it is assumed that all consumers will establish cooperation with the EEF to co-finance the installation of solar thermal systems.
	<b>Overlaps, multiplication effect, synergy</b>	

<i>Title of the energy saving measure</i>		<b>Green procurement</b>
<i>Index of the measure</i>		<b>P. 5</b>
<b>Description</b>	<b>Category</b>	Voluntary agreements and cooperative instruments, Regulation
	<b>Timeframe</b>	Start: 2012; End: 2015 (2018); New measure; It is necessary to intensify activities to ensure legal and technical knowledge and skills of public purchasers for inclusion and evaluation requirements for energy efficiency in public procurement procedures by applying the criteria most economically advantageous tender.
	<b>Aim/ brief description</b>	The intention of this measure is to facilitate the application of "green procurement" i.e. implementation of EE criteria in practice not only as asset but as obligation. Common knowledge on energy efficiency is not sufficient, which can lead to the retention of old habits and obliviousness to the legal possibilities to promote energy efficiency in the public sector.
	<b>Target end-use</b>	All forms of energy consumption in the public sector, including the consumption of liquid fuels in vehicles used by the public sector
	<b>Target group</b>	Person in charge of procurement , OPP
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	A procurement department at PSE - performs procurement for government bodies. One of the tasks of departments is sustainable procurement whose implementation is difficult in practice because of the lack of knowledge and experience in the integration of energy-efficiency and environmental protection in public procurement procedures. These requirements can be incorporated into the technical specifications in the preparation of procurement procedures according to the criteria most economically advantageous tender in individual lots. Should provide technical assistance to the departments when creating technical specifications and the development reasoning applying certain criteria in terms of energy-efficient and environmentally sustainable procurement for several purchasing categories. EARM should provide training for PSE for appropriate implementation of the Guidelines for EE criteria, i.e. for more successful integration of requirements for energy efficiency into the public procurement procedures.
	<b>Budget and financial</b>	31 MD from MULS and GA.

	<b>source</b>	
	<b>Implementing body</b>	EARM and OPP
	<b>Monitoring authority</b>	OPP and EARM
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	TD
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	New measure
	<b>Savings achieved in 2012*</b>	0.08 ktoe
	<b>Expected energy savings in 2018*</b>	1.05 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	0.48%
	<b>Assumptions</b>	Due to lack of activity (public procurement), which could be assign to energy savings in the previous period, this measure is not possible to assign the savings in the 2012 year. Also due to the current lack of plans for the institutions responsible for public procurement in terms of the amount of equipment purchases, it is not possible to predict either the effects of these measures by 2015 and 2018.
	<b>Overlaps, multiplication effect, synergy</b>	/

3.3.2.4. *Measures in the commercial sector*

The energy consumption in the commercial and service sector is very variable. This sector consists of small and medium sized enterprises (SMEs).

Macedonian energy statistics, similar to EU statistics data, do not distinguish final energy consumption between the public (belonging to state administration and services on central and municipal level) and private commercial services at whole.

Table 3.3.6 Final energy consumption by sectors for 2011 (ktoe)<sup>30</sup>

Final energy consumption			1909,97	
Industry	Transport	Households	Agriculture	Public and Commercial
648,49	479,40	542,31	25,67	214,09
34%	25%	28%	1%	11%

However, the rough estimations are that from 74424 commercial subjects that exists in Macedonia, 82% of them are commercial, and 18% are public ones. Statistical numbers in the sector shows over 82% of commercial entities have under 10 employees which situates them into the commercial sector.

Table 3.3.7 Number of active business entities by sectors of activity according to the National Classification of Activities NKD Rev. 2 and by number of persons employed, 2012

Total	%	Number of business entities by number of persons employed						Sectors of activity
		0 <sup>1)</sup>	1-9	10-19	20-49	50-249	250 +	
<b>74 424</b>	<b>100,0</b>	<b>7 158</b>	<b>61 053</b>	<b>2 937</b>	<b>1 795</b>	<b>1 280</b>	<b>201</b>	<b>Total</b>
3 072	4,1	290	2 678	38	31	33	2	Agriculture, forestry and fishing
182	0,2	24	103	27	15	9	4	Mining and quarrying
8 251	11,1	607	6 059	658	518	352	57	Manufacturing
134	0,2	58	61	3	4	5	3	Electricity, gas, steam and air conditioning supply
321	0,4	39	200	25	23	27	7	Water supply, sewerage, waste management and remediation activities
4 541	6,1	465	3 564	277	161	67	7	Construction
27 307	36,7	1 879	24 140	826	342	107	13	Wholesale and retail trade; repair of motor vehicles and motorcycles
6 445	8,7	299	5 795	208	99	37	7	Transportation and storage
4 611	6,2	278	3 922	311	78	20	2	Accommodation and food service activities
1 515	2,0	338	1 037	73	35	25	7	Information and communication
413	0,6	69	287	13	15	18	11	Financial and insurance activities
493	0,7	119	331	21	16	5	1	Real estate activities
5 707	7,7	531	4 956	152	48	18	2	Professional, scientific and technical activities
1 438	1,9	428	872	55	47	22	14	Administrative and support service activities
268	0,4	10	31	41	74	80	32	Public administration and defense; compulsory social security
1 020	1,4	67	453	41	158	296	5	Education
3 298	4,4	49	2 965	70	73	120	21	Human health and social work activities
1 176	1,6	416	629	47	45	33	6	Arts, entertainment and recreation

<sup>30</sup> Energy balance, State statistical office, Skopje



4 232	5,7	1 192	2 970	51	13	6	0	Other service activities
-	-	-	-	-	-	-	-	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
-	-	-	-	-	-	-	-	Activities of extraterritorial organizations and bodies

The registered energy consumption in this sector in 2006 was 229,63 ktoe. The energy consumption in this sector was mainly comprised of electricity with a 43% share in the consumption, and oil products (heating oil, the so-called D2 fuel and LPG) with almost 42% of the total energy consumption in the sector in 2006.

Analyses of the statistical data shows that commercial and public services have electricity consumption of about 52% in 2011 (increase of use due to increased oil prices in 2008) while the consumption of oil products (heating oil, the so-called D2 fuel and LPG), in the same period has dropped from 42% in 2006 to 26% in 2011<sup>31</sup>. The energy for heating in the 2006-2011 period was constant at the level of 9%.

Table 3.3.8 Energy consumption in commercial and public sector in the period 2005 - 2011 (in ktoe)

TOTAL	Lignite	Total Oil Products	LPG	Diesel fuel (Light oil)	Heavy oil	Natural gas	Geothermal energy	Biomass	Heating energy	Electricity
<b>2005</b>										
243,58	7,366	118,189	4,120	90,567	23,501	0,528	1,373	4,852	21,236	90,031
<b>2006</b>										
229,63	8,566	94,599	4,956	86,724	2,919	0,583	1,446	8,290	19,849	96,293
<b>2007</b>										
227,13	7,715	88,733	6,822	79,447	2,464	0,726	1,610	7,909	16,197	104,238
<b>2008</b>										
214,59	1,788	70,503	7,293	62,537	0,673	0,613	1,456	10,291	17,837	112,102
<b>2009</b>										
249,49	1,703	85,171	7,042	77,785	0,344	0,792	1,576	15,060	17,276	127,908
<b>2010</b>										
234,86	1,650	73,751	6,642	52,591	14,519	1,905	1,452	13,635	13,009	129,462
<b>2011</b>										
214,09	1,474	50,244	5,258	43,899	1,087	2,004	1,481	5,923	14,857	138,110

The commercial service sector in Macedonia consume less than 6% of total final energy consumption, according to the statistics and estimations.

In the previous 3 year period the focus of state EE Policy was on the public sector since it is easier to address through policy measures. It is expected that the public sector's leading-by-example will trigger actions in the commercial sector as well. Activities should be directed towards potentials for large no/low cost energy savings, such as encouraging changes of behavior through education, training and information campaigns.

<sup>31</sup> Source: State Statistical Office – Energy Statistics 2011

In the next three years, a measure of "Energy Management" will continue to be implemented. The commercial sector is driven by economic principles and it finds interest in energy efficiency, while promoting energy management by the public sector, and financial support for the introduction of a system for monitoring energy consumption and energy audits and especially energy performance certification is a welcome stimulus for the implementation of complex technical energy efficiency projects.

Intensive construction of structures in the commercial buildings sector is not to be expected, neither on central, nor on local (municipal) level. Higher growth can be expected in the hotels, wholesale and retail trade, and financial sector (55% of the subjects in the sector), but in this group, only the hotels and restaurants are significant consumers of energy (total of 383 subjects).

Table 3.3.9 Tourist facilities in the Republic of Macedonia

	2009	2010	2011	
	По видови деловни единици By type of establishment			
Хотели - вкупно	110	124	135	Hotels-total
Хотели *****	9	9	10	Hotels*****
Хотели ****	17	19	21	Hotels****
Хотели ***	24	25	34	Hotels***
Хотели **	33	41	41	Hotels**
Хотели *	27	30	29	Hotels*
Пансиони	2	2	3	Boarding houses
Мотели	7	9	8	Motels
Преноќишта	16	10	10	Overnight lodging houses
Бањски и климатски лекувалишта	5	5	5	Spas and sanatoriums
Работнички одморалишта	25	24	20	Workers' vacation facilities
Детски и младински одморалишта	14	15	15	Children and youth vacation facilities
Кампови некатегоризирани	8	8	8	Camps, uncategorized

\* Stars – quality sign

That is why the 2<sup>nd</sup> EEAP provides encouragement of the use of solar energy in tourist facilities. The hotels and restaurants are mostly used throughout the entire length of the year, and the camping facilities are preferably used in periods with the availability of intensive solar radiation. Therefore, the introduction of solar thermal systems in accommodation facilities is one of the goals in the future period. This does not rule out promoting the use of solar energy and other tourist facilities, especially small hotels and resorts.

The indicative final energy savings in the commercial and public building sector within the scope of the Energy Services Directive in the Republic of Macedonia in 2018 is considered to be equal to 24,19 ktoe. The investments necessary to achieve the targeted savings was estimated at 5850 million Denars.

It is noteworthy that this investment amount is merely the difference between the reconstruction cost of existing buildings as opposed to new buildings, to be built in compliance with the Rulebook for energy performance of buildings.

Realized energy savings in the commercial sector by 2012, dependent to the elaborated EE measures in the 2<sup>nd</sup> EEAP are presented in Table 3.3.10. Expected savings that would be realized by the application of these measures are shown at the same table. Status of each measure for commercial sector, in relation to 1<sup>st</sup> EEAP, is determined.

Table 3.3.10 Overview of individual measures in the commercial sector

No	Title of the energy saving measure	End-use targeted	Duration	Achieved energy savings in 2012 (ktoe)	Energy savings expected in 2018 (ktoe)	Status in relation to 1 <sup>st</sup> EEAP	Additional comments
C.1.	Retrofits in existing commercial buildings	Existing building with commercial purposes	2013 - 2015	0,79	4,25	New Measure	Financial instruments
C.2.	Energy Management	Commercial buildings (privately owned)	2010 - 2015 (2020)	0,34	1,69	Partially implemented	Financial instruments, Regulation, Information and mandatory information measures
C.3.	Wider application of Renewable Energy	Preparation of DHW in hotels and camps	2010 - 2015 (2020)	0,28	1,92	Partially implemented	Financial instrument
<b>TOTAL</b>				<b>1,41</b>	<b>7,85</b>		

The level of expected energy savings for 3 years during 2<sup>nd</sup> EEAP implementation in the commercial sector are shown graphically in Figure 3.3.11. Cumulative values of the final energy savings, from starting value reached in 2012 are presented, too.

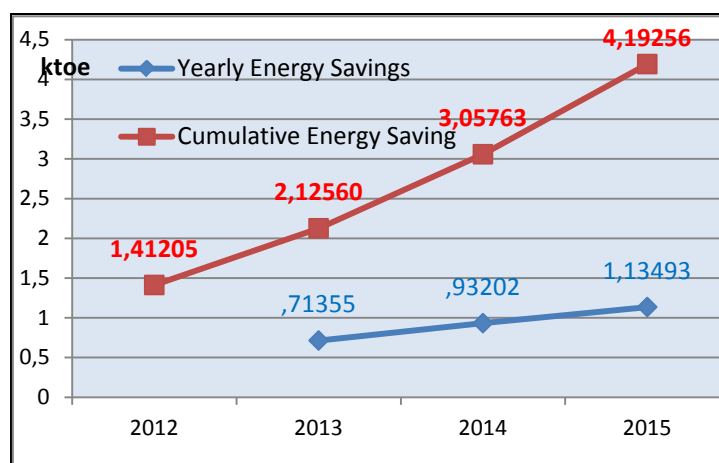


Figure 3.3.11 Commercial sector energy savings

Title of the energy saving measure		Retrofits in existing commercial buildings
Index of the measure		C. 1
Description	Category	Financial instruments, Regulation, Information
	Timeframe	Start: 2013
		End: 2015
		New Measure
	Aim/brief description	This measure includes development of a plan for the retrofitting of existing commercial buildings by 2018 and the its implementation. The plan focuses on the 40 year old commercial sector buildings and their restoration to the low-energy standards. The measure provides the introduction of energy performance certification for the commercial buildings.
	Target end-use	Existing buildings for commercial purposes
	Target group	Owners of commercial buildings
Information on implementation	Regional application	National
	List and description of energy saving actions substantiating the measure	Future activities: 1. Making multi-year action plan for restoration non-residential buildings by 2018: MoE, EARM and MTC is required to start and develop such a plan. During the development of the plan should include building management in order to identify the primary objects for reconstruction. It is also necessary to conduct information and education of users to obtain their consent to the proposed procedure. 2. Encouragement of commercial banks to open new credit lines.
	Budget and financial source	718 MD from PS, FI and ESCO.
	Implementing body	PS
	Monitoring authority	EARM; Execution Plan should be monitored on an annual basis in terms of actual energy savings, money spent and CO <sub>2</sub> emissions.
Energy savings*	Method for monitoring/measuring the resulting savings	TD
	Expected savings in 2012 as per 1 <sup>st</sup> EEAP	N/D
	Savings achieved in 2012*	0.79 ktoe
	Expected energy savings in 2018*	4.25 ktoe
	Expected impact on energy savings in 2020 (if available)	1.93%
	Assumptions	

	<b>Overlaps, multiplication effect, synergy</b>	Successful projects, from energy and financial perspective should be promoted through the media, so the general public and especially the owners of commercial buildings realize the benefits of incorporating the EE measures.
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Title of the energy saving measure		Energy Management
Index of the measure		C. 2
Description	Category	Financial instruments, Regulation, Information and mandatory information measures
	Timeframe	Start: 2010
		End: 2015 (2020)
	Aim/brief description	<p>There are 74,424 commercial entities in Republic of Macedonia. The commercial (privately owned) entities represent 82%, while the other 10% are entitled to the public entities. It is roughly estimated that commercial buildings cover cca 8 Mm<sup>2</sup> of area, while the public buildings which take part of the draft-National Program for EE in public buildings (Phase 1) cover area of 2.56 million m<sup>2</sup>.</p> <p>Building codes and enforcement represent an efficient method to secure the compliance of building contractors and construction companies with best practice solutions through official building codes.</p> <p>Rulebook on energy performance of buildings is adopted in June 2013. MoE and EARM, in cooperation with Economic Chamber of Macedonia, Association of Economic Chambers of Macedonia and Economic Chamber of Nord-Western Macedonia will establish the promotional/ educational program on the building codes oriented towards the following target groups: owners, construction companies and energy managers. In addition, the continuous growth of the energy prices will remain strong impetus for the private commercial sector to improve energy management and accept the building codes instantly.</p> <p>On the national scale the enforcement of the Energy Performance of Building requirements through building codes and certification will cumulatively promote efficiency improvements in this sector. The commercial banks will continue to provide loans for energy efficient projects designed for the commercial sector.</p>
	Target end-use	Commercial buildings
	Target group	Owners of commercial buildings, construction companies and energy managers.
	Regional application	National
Information on implementation	List and description of energy saving actions substantiating the measure	<p><b>1. EARM activities:</b> Preparation and adoption of Program for advanced training of energy auditors as well as monitoring and reporting over the trainings and examination of energy auditors.</p> <p><b>2. Academic institutions, Economic chambers, Private sector, NGO activities:</b> Trainings of energy auditors, information campaigns for commercial building owners, energy managers and users.</p> <p><b>3. Private sector, certified persons activities:</b> Implementation of EE measures into project documentation to fulfil minimal energy requirements 2014-2020; Control of</p>

		documentation by certified reviewers 2013-2020; Regular inspection during building by certified inspectors 2014-2020; Control the compliance of the building with proposed minimal energy requirements; issuing certificate on BEP 2014-2020; <b>4. Financial institutions activities:</b> Continuation/extension of soft loan programs concerning EE measures for commercial entities.
	<b>Budget and financial source</b>	249 MD from PS, FI and ESCO.
	<b>Implementing body</b>	PS
	<b>Monitoring authority</b>	EARM
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	TD, NBU (Method No. 18. Energy audit savings calculation)
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	/
	<b>Savings achieved in 2012*</b>	0.34 ktoe
	<b>Expected energy savings in 2018*</b>	1.69 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	0.77%
	<b>Assumptions</b>	The savings associated with this measure till 2012 are small. There are reasons for this situation which includes primarily the bad economic period from 2008 to this day. Another reason is the high investment for EE measures because great portion of the commercial buildings are old enough.
	<b>Overlaps, multiplication effect, synergy</b>	This measure coincides with the horizontal measure "Energy audits in buildings".

<i>Title of the energy saving measure</i>		<b>Wider application of Renewable Energy</b>
<i>Index of the measure</i>		<b>C. 3</b>
<b>Description</b>	<b>Category</b>	Financial, Information, Voluntary measure
	<b>Timeframe</b>	<i>Start: 2010</i>
		<i>End: 2015 (2020)</i>

	<b>Aim/brief description</b>	<p>In designing and building of new buildings the Rulebook on energy performance of buildings envisage some combination of the following highly efficient alternative systems to be used, if available and if their use is technically, environmentally and economically justified:</p> <ol style="list-style-type: none"> <li>1) Decentralized systems for energy supply based on utilization of renewable energy sources;</li> <li>2) Combined systems (i.e. cogeneration systems) for simultaneous single process generation of heating and electrical and/or mechanical energy;</li> <li>3) Central heating or cooling systems by parts of the building, especially those which are completely or partly based on utilization of renewable energy sources and</li> <li>4) Heat pumps.</li> </ol> <p>Also, when building or building unit is subject to major reconstruction, highly efficient systems has to be installed, if their use is technically, environmentally and economically justified. The Rulebook for energy performance of buildings stipulates the issuance of energy performance certificates for buildings where the use of renewable energy sources in the energy consumption of the building has to be presented as a separate item.</p> <p>Geothermal heat pumps provide efficient heating and cooling of buildings with an efficiency of over 400% lodged in terms of energy (1 kWh electrical energy provides up to 4 kWh heat).</p> <p>For commercial sector it is voluntarily measure, determined only by economical justification.</p> <p>The aim of the measure is to achieve mass use of solar thermal systems for hot water and heat pump installation in hotels, private hospitals and similar buildings in the service sector which operate with huge quantities of hot water. The idea is to reduce the use of electricity and fossil fuels for preparation of DHW and heating and utilize solar energy wherever its use meaningful.</p>
	<b>Target end-use</b>	Preparation of HW in hotels, camps, private schools and kindergartens and in private hospitals.
	<b>Target group</b>	Hotels and camps owners, owners of private educational institutions and owners of private health institutions.
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	<ol style="list-style-type: none"> <li>1. Rulebook on energy performance of buildings: Required installation of central heating or cooling systems, centralized systems based on renewable energy sources, cogeneration systems and heat pumps, if available and if their use is technically, environmentally and economically justified.</li> <li>2. Control over the work of the energy auditors - proper realization of the legislation for EPB;</li> <li>3. Government Financial incentives;</li> <li>4. NGO, Private sector Awareness, information, promotion and</li> <li>5. Development of domestic technologies and transfer of know-how by the academic institutions and through the private sector.</li> </ol>
	<b>Budget and financial source</b>	243 MD from PS, FI and ESCO.
	<b>Implementing body</b>	PS, FI
	<b>Monitoring authority</b>	EARM
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	TD

	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	/
	<b>Savings achieved in 2012*</b>	0.28 ktoe
	<b>Expected energy savings in 2018*</b>	1.92 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	0.87%
	<b>Assumptions*</b>	
	<b>Overlaps, multiplication effect, synergy</b>	This measure is horizontal.



### 3.3.2.5. Measures in industry and SMEs

The industry sector is the largest energy consumer in the country, thus having the biggest share 33.95% from the available final energy in Macedonia. This shows the significance of the implementation of measures in this sector.

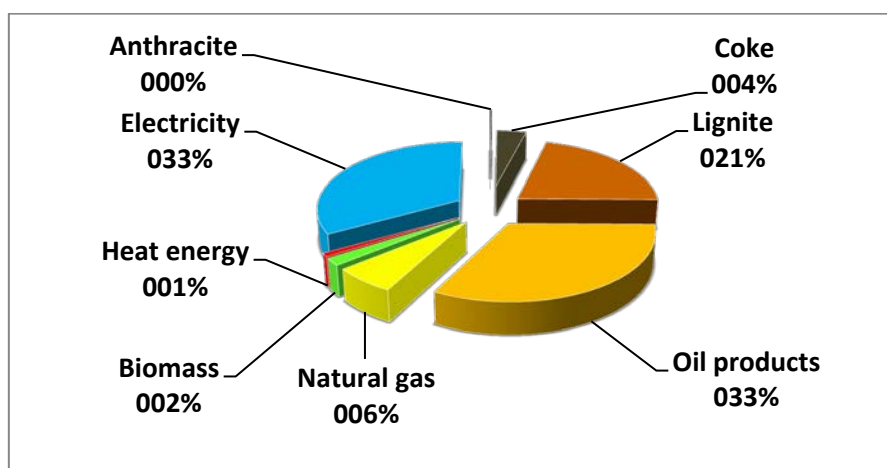


Figure 3.3.12 The share of energy carrier in the industry sector in 2011

Basic energy carriers in the industrial sector are electricity and oil products (Figure 3.3.12). It is remarkable still very low share of natural gas in this sector. The share of this fuel in the industry will increase by developing a distribution network for natural gas, providing his characteristic advantages. The history of the total final energy consumption in the industry sector, as well as the participation of energy carriers for the period of 2006-2011 is shown on Figure 3.3.13.

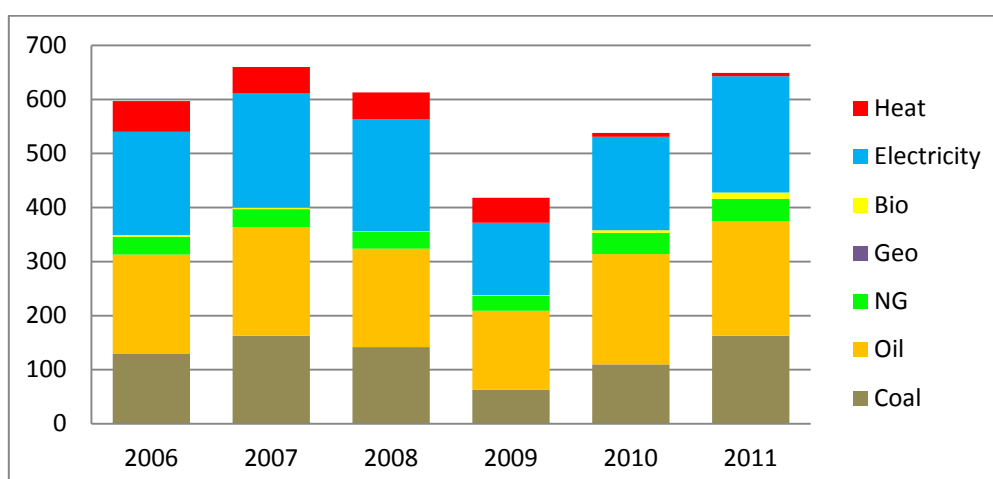


Figure 3.3.13 The history of the total final energy consumption in the industry sector- ktoe

Industrial sector accounts for more than 28% of GDP and engages over 30 percent of total occupied labour force. Textiles, iron and steel, power generation, cement, food and tobacco

are the important manufacturing industries of Macedonia. The industry sector used mostly electricity and petroleum products with 33% and 33% respectively in 2011, followed by solid fuels with 25%, thermal energy with 1%, natural gas with almost 6% and biomass with 2% (Table 3.3.11). The efficiency at which energy is used in Macedonian industry differs from one sector to another as it does from one company to another in the same industry sector.

Table 3.3.11 Industry energy balance for 2011 (ktoe)

	Electricity	Petroleum products	Solid fuels	Thermal energy	Natural gas	Biomass	Σ
Iron & steel industry	153.59	70.55	159.37	3.20	27.99	8.65	423.34
Non-ferrous metal industry	0.79	0.89	-	-	-	-	1.68
Chemical industry	5.56	2.44	-	0.21	0.93	-	9.14
Glass, pottery & building mat. industry	12.03	79.58		-	2.21	0.11	93.94
Ore-extraction industry	13.70	19.05		-	-	0.32	33.07
Food, drink & tobacco industry	12.24	20.15	0.15	2.00	5.61	0.14	40.29
Textile, leather & clothing industry	4.06	3.67	3.34	-	-	1.37	12.44
Paper and printing	0.72	0.67	0.01	-	0.81	0.01	2.22
Engineering & other metal industry	7.78	3.36	0.31	0.25	3.55	0.17	15.43
Other industries	4.96	10.97	0.03	-	-	1.00	16.95
<b>Summ</b>	<b>215.44</b>	<b>211.325</b>	<b>163.21</b>	<b>5.656</b>	<b>41.099</b>	<b>11.77</b>	<b>648.50</b>

Table 3.3.12 shows that Industry is a sector in which there is mostly a decrease in energy consumption on a long-term basis, which is a result of technological advances (improved energy efficiency) as well as reduced production volumes, particularly 2009 and 2010 due to the economic crisis.

Table 3.3.12 Final energy consumption in industry sector for 2003- 2011 (ktoe)

2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>459.86</b>	<b>462.50</b>	<b>561.96</b>	<b>588.55</b>	<b>663.70</b>	<b>613.26</b>	<b>421.59</b>	<b>525.09</b>	<b>648.50</b>

The first EEAP monitored the Strategy for improvement of the Energy Efficiency, in which three types of actions that will help in achieving high levels of energy efficiency are considered essential.

The Iron & steel industry, with its specific characteristics is very important from the standpoint of energy consumption. It involves a relatively small number of companies, which are energy intensive and heavily dependent on the movement of global markets for steel and alloys. The Iron & steel industry is the most intensive user of virtually every type of energy.

The main objective of the measures in industry is to systematically promote energy efficiency, establish a system for energy management, monitoring and analysis of energy consumption and use the potential of measures of organizational character to reduce energy consumption.

The policy measures in the Industry sector will focus on improvement of technologies, equipment and process control systems.

Priority will be given to low energy intensive technologies. In addition, measures will be undertaken to ensure that new industrial installations are designed and constructed for efficient use of energy. The following measures are envisioned for early intervention:

- Companies will be required to apply best available technologies (BAT) through specific licensing processes (IPPC and energy audits of the processes) in performing their activities;
- As energy saving reduces greenhouse gas emission, legislative framework will be developed to require CDM applicable (additional);
- Co-generation should be given priority when searching for local energy supply and
- Auxiliary systems and activities such as HVAC, compressed air supply, electric motors control, lighting etc. should be gradually improved to use energy more efficiently.

Final energy savings in industry by 2012, dependent to the elaborated EE measures in the 2<sup>nd</sup> EEAP are shown in Table 3.3.13. Expected savings that would be realized by the application of these measures are shown at the same table, too. Status of each measure in relation to 1<sup>st</sup> EEAP is determined.

Table 3.3.13 Overview of individual measures in the industry sector

No	Title of the energy saving measure	End-use targeted	Duration	Achieved energy savings in 2012 (ktoe)	Energy savings expected in 2018 (ktoe)	Status in relation to 1 <sup>st</sup> EEAP	Additional comments
I.1.	Improvement of process performances	Production processes	2012 – 2015	3.46	4.01	Reviewed measure	Enveloped few measures from EEAP 1
I.2.	<b>PROJECT INDEF:</b> Energy Management	Energy managers, Owners of industry capacities, Energy auditors	2013 - 2015 (2020)	1.48	4.87	Reviewed measure	The measure provides to develop program for effective implementation of many individual measures that cannot be elaborated separately. In correlation with ISO 50001
I.3.	Introduction of efficient electrical motors	Industrial plants	2012 - 2015	0.52	2.48	Continue implementation as planned	Voluntary, connected with ISO 50001
I.4.	Waste heat utilization/ CDM	Industrial plants and equipment	2013 - 2015 (2018)	2.74	21.65	Reviewed measure	Connected with obtaining working license ( IPPC permission)
I.5	<b>PROJECT COGEN :</b> Co-generation	SMS producers/ consumers of energy	2013 - 2015 (2018)	12.98	24.58	Reviewed measure	The project should ensure effective implementation and monitoring of savings.
<b>TOTAL</b>				<b>21.17</b>	<b>57.59</b>		

On the Figure 3.3.14 are presented graphically yearly energy savings in the industry sector and cumulative values of the final energy savings, from starting value reached in 2012.

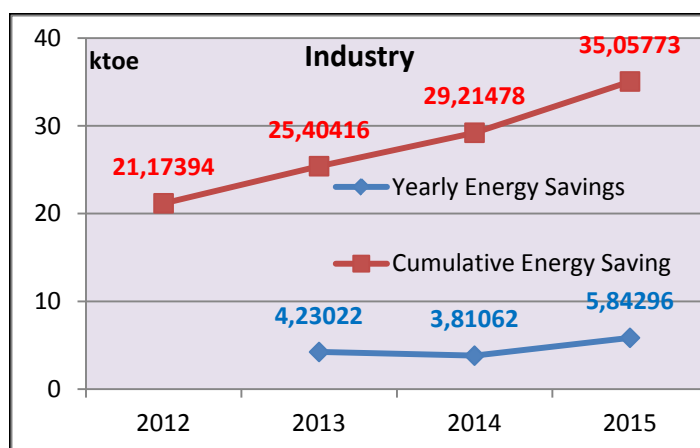


Figure 3.3.14 Industry sector energy savings

Title of the energy saving measure		Improvement of process performances
Index of the measure		I. 1
Description	Category	Financial, Voluntary, Regulation law comparison
	Timeframe	Start: 2012
		End: 2015
		This is a reviewed measure. With this measure are partly covered other energy efficiency measures from the industrial sector of the First EEAP which because the implementation of complex interventions in the processes can not be accurately split and separated.
	Aim/brief description	The aim of this measure includes improving processes in terms of reducing energy consumption in different sectors. Improving performance means greater productivity and increased product quality. This measure includes possible improvements to the processes that are set aside as special measures (eg. Compressed air, condensate distribution, steam traps etc..). It is preferable in this measure to incorporate other listed measures that can be not easily monitored as individual measures.
	Target end-use	<ol style="list-style-type: none"> <li>1. Industrial processes;</li> <li>2. Compressed air devices and installation;</li> <li>3. Fuel type changing and</li> <li>4. Energy performance of industrial buildings.</li> </ol>
	Target group	Industrial facilities
Information on implementation	Regional application	National
	List and description of energy saving actions substantiating the measure	<p>More efficient energy carrier should be used whenever possible. Natural gas is the most effective among fossil fuels, because it generates the smallest volume of gas burnt per unit of energy carrier.</p> <p>It have to be implemented advanced regulation and control whenever is possible. Heating and ventilation systems in industry should be improved by:</p> <ul style="list-style-type: none"> <li>• improvement of energy carrier combustion equipment;</li> <li>• improvement thermostatic controls;</li> <li>• installation of recuperators that retrieve heat and exchange at least 50% of the fresh air and the released air.</li> </ul> <p>The cost of compressed air can be reduced by 30%, through appropriate design capacity of compressed air, improved working installation of the pipeline, implementation of a maintenance program and, ultimately, through a purchase of compression units with high energy efficiency.</p>
	Budget and financial source	318 MD from PS, FI and ESCO.
	Implementing body	Ministry of Environment and Physical Planning and MoE
	Monitoring authority	EARM, National Cleaner Production Centre- NCPC

<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	<p>For the needs of monitoring/measuring the resulting savings , TD method adapted to local conditions using data from particular cases will be used.</p> <p>Appropriate verification of the effects can be achieved only through regular monitoring/measurement of the consumption of fuel, steam, water, compressed air, electricity, etc. A tool to achieve proper monitoring and verification of the effectiveness of the measure is introduction of mandatory reporting on indicators of energy efficiency.</p> <p>In this respect, specific role has the State Statistical Office, which is responsible for collecting, processing and disseminating statistical data about the economic, social and demographic situation of the society.</p> <p>Provision of benchmark information has shown to be environmentally effective and appropriate to stimulate energy efficiency measures. Benchmarking of specific energy consumption figures (e.g. kWh/ton product fabricated) is a powerful instrument to raise the interest of companies in energy matters. Mandatory periodic reporting of emissions of harmful substances, the mandatory reporting on indicators of energy efficiency: fuel consumption per unit of product, fuel consumption per unit time, power consumption etc.</p>
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	6.72 ktoe
	<b>Savings achieved in 2012*</b>	3.46 ktoe
	<b>Expected energy savings in 2018*</b>	4.01 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	1.82%
	<b>Assumptions</b>	<p>The size of savings is determined based on the technical controls of the reality of the envisaged EE measures.</p> <p>Due to the large investment costs, the energy recovery is projected to begin after 2013, while in the meantime other activities that are generally associated with establishment of management systems for energy efficiency control will be conducted.</p>
	<b>Overlaps, multiplication effect, synergy</b>	This measure has cross-sector impact with I.2 and I.3.

<i>Title of the energy saving measure</i>		<b>PROJECT INDEF: Energy Management</b>
<i>Index of the measure</i>		<b>I. 2</b>
<b>Description</b>	<b>Category</b>	Information and mandatory information measures, Voluntary measure
	<b>Timeframe</b>	Start: 2013
		End: 2015 (2020)
		The measure is linked to the implementation of ISO 50001.

	<b>Aim/brief description</b>	<p>The main objective of the INDEF project is to provide fast and quality cooperation between industry and exchange of good practice during the implementation of organizational recommendations contained in ISO 50001.</p> <p>As an added value of this project is the direct "on-line" monitoring the implementation of measures and their valuation using the national BU method.</p> <p>This measure provide support for assessment of potential energy savings in industrial plants through an implementation of energy audit. The audit scheme for the industry should include:</p> <ul style="list-style-type: none"> <li>- mandatory energy audits for companies with an annual energy consumption of more than than prescribed with the law;</li> <li>- voluntary scheme for other companies, especially for SMEs and</li> <li>- Introduction and implementation of ISO 50001 scheme for Energy Management in Industry.</li> </ul>
	<b>Target end-use</b>	Consumption of all types of energy and energy carriers in industrial processes.
	<b>Target group</b>	All industrial plants
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	<ul style="list-style-type: none"> <li>- To promote, establish the INDEF Project and to determine participants;</li> <li>- To promote ISO 50001. The purpose of this International Standard is to enable organizations to establish the systems and processes necessary to improve energy performance, including energy efficiency and intensity. The standard should lead to reductions in cost, greenhouse gas emissions and other environmental impacts, through systematic management of energy. Application of the standard can be tailored to fit the requirements of the organization, including complexity of the system, degree of documentation, and resources and applies to the activities under the control of an organization;</li> <li>- To organize trainings on implementation of Energy Management in Industry;</li> <li>- To organize trainings for obtaining authorization for energy auditors and licenses for energy audit performing;</li> <li>- To prepare manuals for training programmes for experts entitled to perform energy auditing;</li> <li>- To realize energy audits of industrial processes;</li> <li>- Good housekeeping includes no-cost or low-cost measures and activities such as tracking steam and compressed air leaks, tuning boiler and furnace burners, piping insulation, replacing leaking steam traps, shutting-off equipment when it is not required, as well as preventing maintenance on heat transfer equipment (i.e., heat exchangers), and on pumps, fans, compressors, measuring devices, and control systems. Most of the savings are related to steam generation, distribution and condensate return;</li> <li>- Promotion of good practices in the use of energy in appliances and equipment, use of raw materials, production, waste materials handling, maintenance, etc;</li> <li>- Dissemination of the results and achievements and</li> <li>- One of the most important issue for direct practicing of good house-keeping is motivation of employees directly dealing with the facilities and equipment and that should be a task of the management of the companies.</li> </ul>
	<b>Budget and financial source</b>	Assumed to 85 MD to be provided by PS, FI and ESCOs.

	<b>Implementing body</b>	<ol style="list-style-type: none"> <li>1. MoE, EARM,</li> <li>2. Academic institutions: for preparation of training programmes for experts entitled to perform energy auditing and inspection;</li> <li>3. Consulting organizations: for performing energy audits;</li> <li>4. Academic institutions, Private sector, NGO: for providing consultancy services, trainings of auditors etc.;</li> <li>5. Financial institutions: for providing soft loans for EE projects and</li> <li>6. State Statistical Office of RM: for collection, processing and dissemination of statistical data.</li> </ol>
	<b>Monitoring authority</b>	EARM and Chambers of Commerce
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	NBU
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	2.86 ktoe
	<b>Savings achieved in 2012*</b>	1.48 ktoe
	<b>Expected energy savings in 2018*</b>	Assumed to 4.87 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	2.21%
	<b>Assumptions*</b>	The starting value for the duration of the energy savings with the implementation of measures derived from energy audit is 8 years.
	<b>Overlaps, multiplication effect, synergy</b>	This measure has cross-sector impact with all measures in the industry sector.

<i>Title of the energy saving measure</i>		<b>Introduction of efficient electrical motors</b>
<i>Index of the measure</i>		<b>I. 3</b>
<b>Description</b>	<b>Category</b>	Financial, Voluntary
	<b>Timeframe</b>	Start: 2012 End: 2015 Continue implementation
	<b>Aim/brief description</b>	<p>Broader introduction of smart drives is applicable to the whole industry on national level due to the wide use of electric drives in the industry and other sectors. That includes:</p> <ol style="list-style-type: none"> <li>1. Installing of new high-efficiency electric motors and</li> <li>2. Installing of devices for frequency/number of revolution control of existing electric motors.</li> </ol> <p>There is a great energy saving potential in intelligent controllers, but their application will slowly increase due to a substantial investment required.</p>
	<b>Target end-use</b>	<p>Electricity consumption in industrial plants:</p> <ul style="list-style-type: none"> <li>- Promotion of opportunities for savings offered by frequency inverters and other electronic systems designed to optimize the operation of the electric motor and</li> <li>- Providing soft loans for efficient use of electricity.</li> </ul>
	<b>Target group</b>	Industrial installations, SMEs



	Regional application	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	<ol style="list-style-type: none"> <li>1. To prepare manual for achieving fast control of rational energy consumption of existing electrical power engines.</li> <li>2. Determination of economic viability of investing in the improvement of energy efficiency of the equipment and</li> <li>3. Providing access to soft loans for the purchase of EE equipment of this type (using funds from EEF).</li> </ol>
	<b>Budget and financial source</b>	38 MD from PS, FI and ESCO.
	<b>Implementing body</b>	PS, MoE, EARM
	<b>Monitoring authority</b>	EARM
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	NBU
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	1.00 ktoe
	<b>Savings achieved in 2012*</b>	0.52 ktoe
	<b>Expected energy savings in 2018*</b>	2.48 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	1.13%
	<b>Assumptions*</b>	<p>It is assumed that 90% of the electricity in the waste industry is consumed by pumps, fans, conveyor and other motors on which it is possible to implement these measures. Economic savings are less than the technical savings, but are high enough for the measure to be economically feasible.</p> <p>A good portion of the older electric motors that are in operation is overdimensioned. Implementation EE measures would reduce the installed capacity, the cost of it, and avoid excess loading of the network.</p>
	<b>Overlaps, multiplication effect, synergy</b>	This measure has cross-sector impact with the Project INDEF.

Title of the energy saving measure		Waste heat utilization/ CDM
Index of the measure		<b>I. 4</b>
<b>Description</b>	<b>Category</b>	Financial, Voluntary, Regulation
	<b>Timeframe</b>	<i>Start: 2013</i>
		<i>End: 2015 (2018)</i>
	<b>Aim/brief description</b>	<p>The Aim of this measure is the utilisation of "waste" heat, for example water recirculation in tanner facilities, usage of hot air in installations for baking bricks, the sensible heat in the gaseous combustion products from the chamber furnaces for heat treatment of refractory products emitted in large amount and at relatively high temperature etc. A number of small and medium size companies have been considering the utilization of their waste heat. Usually these are small projects that do not fit requirements for CDM investment. Most CDM projects that are in preparation, as well as those that will be implemented are related to energy savings. A typical CDM project</p>

		is the SILMAK project which aims to use waste hot gases for electricity production. The potential for savings depends on the duration of its use. The potential for this type of projects is also big in other industrial plants in Macedonia, such as Feni and Skopski Leguri.
	<b>Target end-use</b>	1. Efficient use of rejected (waste) energy and 2. Promotion of benefits from CDM investments.
	<b>Target group</b>	1. All industrial installations producing waste heat and 2. Installations that are big enough to be treated as CDM
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	<ul style="list-style-type: none"> <li>- MoE/EARM to launch a programme for waste heat utilization for small scale projects (not qualifying for CDM) and creates mechanism for control of projects implementation;</li> <li>- Ministry of Finance and Macedonian Bank for Development Promotion (MBDP) in cooperation with MoE and EARM to support by provision of financial incentives/(fiscal measures/ soft loans for efficient use of waste heat;</li> <li>- Given that in Macedonia there is a fully fledged institutional framework to support projects in the Clean Development Mechanism, including Designated National Authority and Technical Advisory Group, the most important steps in the following period should be realization of any of addressed case studies in the National Strategy for CDM.</li> </ul>
	<b>Budget and financial source</b>	Assumed to 303 MD, to be provided by PS, FI and ESCOs.
	<b>Implementing body</b>	<ol style="list-style-type: none"> <li>1. MoE, EARM, PS;</li> <li>2. Designated National Authority, Ministry of Environment and Physical Planning and</li> <li>3. Academic institutions, NGO- Research and development consultancy services.</li> </ol>
	<b>Monitoring authority</b>	EARM
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	TD accomplished according to the NBU 18. Energy Audits
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	4.5 ktoe
	<b>Savings achieved in 2012*</b>	2.74 ktoe
	<b>Expected energy savings in 2018*</b>	21.65 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	9.84%
	<b>Assumptions*</b>	<p>The total energy savings potential of waste heat utilization is significant, and expectations are that a good part of that potential is going to be utilized until 2020. Since the measure is voluntary, its wider implementation must be supported by introduction of soft loans for improvement of energy efficiency.</p> <p>The barriers, obstacles and limiting factors to the broader application of CDM measure can be summarized as follows:</p> <ul style="list-style-type: none"> <li>- Lack of or incomplete information regarding the opportunities that arise from the CDM application and</li> <li>- Indifference and incomprehension of top management.</li> </ul>

	<b>Overlaps, multiplication effect, synergy</b>	
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<i>Title of the energy saving measure</i>		<b>PROJECT COGEN: Co-generation</b>
<i>Index of the measure</i>		<b>I. 5</b>
<b>Description</b>	<b>Category</b>	Financial instrument; regulations, voluntary
	<b>Timeframe</b>	Start: 2013 End: 2015 (2018) Continue implementation - Reviewed
	<b>Aim/brief description</b>	The main objective of this project is to provide necessary preconditions for distributed production of heat and electricity for small and micro energy consumers in the industrial sector, but also in public buildings if appropriate (such as hospitals, hotels etc.). This measure is in a strong correlation with EED.
	<b>Target end-use</b>	Simultaneous production of heat and electricity in industrial plants
	<b>Target group</b>	Industrial plants
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	<ul style="list-style-type: none"> <li>- To provide a promotion of application of micro and small - scale CHP in the industry and other sectors;</li> <li>- To promote implementation of COGEN, a Project for removal of barriers (administrative, technical, financial) and for support of faster implementation of CHP;</li> <li>- To ensure faster transfer of know-how, good practice between industrial organizations, as well as to support inter collaboration and</li> <li>- To provide the companies with information and to prepare preconditions to obtain soft loans.</li> </ul>
	<b>Budget and financial source</b>	Assumed to 425 MD, to be provided by PS, FI and ESCOs.
	<b>Implementing body</b>	PS, MoE and EARM
	<b>Monitoring authority</b>	EARM
<b>Energy savings*</b>	<b>Method for monitoring/measuring the resulting savings</b>	<p>The methodology is described in the Rulebook for high efficiency combined plant (Official Gazzete of the Republic of Macedonia No.128/2011), and is based on Directive 2004/8/EC and EC's decision to calculate primary energy savings which is a requirement to be a high-efficiency cogeneration.</p> <p>The monitoring and measuring of the resulting savings will be accomplished according to the "TD Methodology for monitoring and verification of energy savings for the needs of achievement of preconditions of the EU Directive 2006/32/EC for energy savings" and according to the EC recommendations for industry. Results will be edited using improved method for engineering calculations of the level of savings of electrical part of energy and part of heat energy.</p>
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	25,1 ktoe
	<b>Savings achieved in 2012*</b>	12.98 ktoe
	<b>Expected energy savings in 2018*</b>	24,58 ktoe

	<b>Expected impact on energy savings in 2020 (if available)</b>	11.17%
	<b>Assumptions*</b>	Lower values of energy savings till 2012 are caused by the delay in the entry into operation of existing CHP and unfavorable terms of cost of electricity compared to the price of natural gas.
	<b>Overlaps, multiplication effect, synergy</b>	

### 3.3.2.6. Measures in the energy sector

Obligations of the distribution system operator and the supplier in accordance with the requirements prescribed in the ESD are transposed in the Energy Law and refer to offers on energy services and informative billing issue to its customers. Distributors / suppliers in Macedonia are not obliged to achieve energy savings with its customers. But without their significant involvement, especially in households, achieving the goals of energy savings will be difficult to accomplish.

The energy supply companies in Macedonia have modernized their network for better management of energy and reduction of energy losses through the networks and production process (Figure 3.3.15).

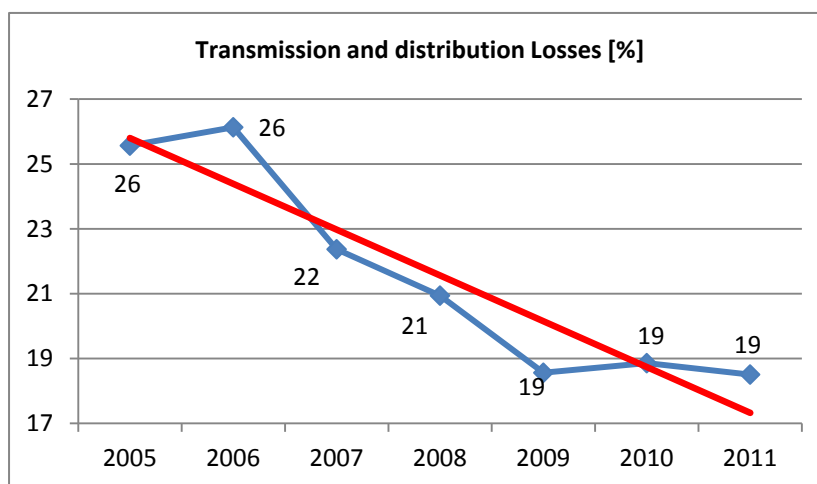


Figure 3.3.15 History of transmission and distribution losses

The supplier of electricity EVN Group, since its entry on the Macedonian market in April 2006 until 31<sup>st</sup> of December 2011, has invested more than 150 million Euros, which have constructed and modernized more than 2000 km of the electricity grid and 1000 transformer stations. Installed 570000 new digital meters for precise measurement of electricity bills. EVN Macedonia Power Plants DOOEL Skopje is power generation company wholly-owned by EVN Macedonia AD. The company operates 11 small hydroelectric power plants which have been refurbished and fully automated. Their total installed power amounts to 47 MW and in 2010<sup>th</sup> they generated record-breaking 218 GWh.

The total sales of electricity in 2011 amounted to 5358 GWh. The investments and measures taken to improve the organizational structure of the Company have yielded good results and contributed to a more reliable supply, reduction of energy losses.

EVN Macedonia operates in compliance with the applicable laws and bylaws of the Republic of Macedonia: Energy Law, Grid Code (Official Gazzete of the Republic of Macedonia No. 87/2012), Supply Rules for Tariff Customers (Official Gazzete of the Republic of Macedonia No. 88/2011), Electricity Market Rules (Official Gazzete of the Republic of Macedonia No. 57/2012).

The core MEPSO company activity is a smooth electricity transmission via the high voltage network, electric power system control and constantly and duly electricity flow to its clients such as the large industrial consumers (Bucim, OKTA, Maksteel, Mitalsteel, USJE, Silmak, and FENI Industry), and to the low voltage grid of EVN Macedonia. Two keys AD MEPSO functions are the electricity transmission and power control. AD MEPSO is responsible for

electricity transmission regular basis from the Macedonian border to the EVN ESM distribution grid, or to the listed big industrial consumers. AD MEPSO arranges and dispatches the electricity transport throughout Macedonia, as well as takes care of balancing the power system.

Toplifikacija AD Skopje is a company whose basic activity was the production and distribution of heat energy, was founded in 1965. Starting from January 2013<sup>th</sup> these activities were taken by new energy provider BEG (Balkan Energy Group).

Today, the district heating system of Skopje is a system with a high degree of automation of the technological processes and a complete computer monitoring of the heat production. Since the year 2000 all of the delivered heat is measured. District heating system of the City Skopje has over 50000 customers. In accordance with the legislation every connection to DH network have to be accomplished by measuring the heat delivered. Problem occurs in buildings with more apartments, and measuring the energy consumed is accomplished in the sub-station with common measurement of energy consumed. On the building level, the costs distribution is based on the level of heated surface, not based on the level of consumed energy.

Pipes for hot water distribution, with diameters up to 700 mm are set into canals, insulated with glass wool, foreseen mainly with U-compensators. The total length of the grid is approximately 170 km.

Natural gas is used in the largest percentage by the industrial customers directly connected on to the transmission system, for district heat generation and power generation in cogeneration plants, starting from 2012. Development of the distribution network of natural gas is on the very beginning phase, with high acceleration starting in 2012.

Regulatory body in the Republic of Macedonia is the Energy Regulatory Commission. Responsibilities of this entity are prescribed into Energy Law. The ERC regulates electricity, natural gas, district heating, oil and oil derivatives and geothermal energy sector. ERC determines: the price for generation of electricity from regulated producer; price for transmission of electricity; price for market operation; price for distribution of electricity; average price for retail supply of tariff customers connected to distribution grid; and tariff rates for customers.

The 1<sup>st</sup> EEAP did not elaborate the state of the energy sector. The measures described below are listed in the 1<sup>st</sup> EEAP in the residential sector as measure heat allocators. The 2<sup>nd</sup> EEAP starts processing measures in the energy sector. The table 3.3.14 shows the measures for improvement the energy efficiency in the energy sector, while the details of each measure are described in the separate tables below.

This measure was not implemented due to the regulation of the Energy Regulatory Commission, based at the proposal of the heat provider. According to this regulation, in order to start installation of the allocators in the apartment of any user, it has to be accepted by 80% of the tenants in a building with several apartments, which is hardly feasible. The effect of the savings is starting down because of price formation at end user has a fixed part which does not depend on the level of consumed energy as is the case with electricity. This means that the user can spend in the heating season only 1 kWh, and still have to pay a fixed cost that is proportional to the dwelling installed heating capacity (and it is determined based on the project for heating, which usually is largely overdimensioned).

The measure should be continued but with the changing requirements/conditions set of by the Energy Regulatory Commission.

The realization of end use energy savings by 2012 in the energy sector, was dependent to the action which were not directly monitored by 1<sup>st</sup> EEAP. Expected savings that would be caused by the application of new EE measures in this sector elaborated in the 2<sup>nd</sup> EEAP are shown in the Table 3.3.14.

Table 3.3.14 Overview of individual measures in the energy sector

No	Title of the energy saving measure	End-use targeted	Duration	Achieved energy savings in 2012 ktoe	Energy savings expected in 2018 ktoe	Status in relation to 1 <sup>st</sup> EEAP	Additional comments
E.1.	Heat allocators	Information and mandatory information measure. Consumption of heat in households	2013 – 2015	0	0.39	Reviewed measure; Not implemented	Not realized during EEAP 1; Information; Financial instruments
E.2.	Intelligent networks	Mechanism for consumption of electricity, heat energy saving realization, natural gas	2014 – 2015 (2018)	0.70	5.50	New measure	Mechanism for energy saving realization
<b>TOTAL</b>				<b>0.70</b>	<b>5.89</b>		

The figure 3.3.16 graphically presents end-use energy savings during the realization of 2<sup>nd</sup> EEAP in the energy sector, yearly and cumulative values, from starting point reached in 2012.

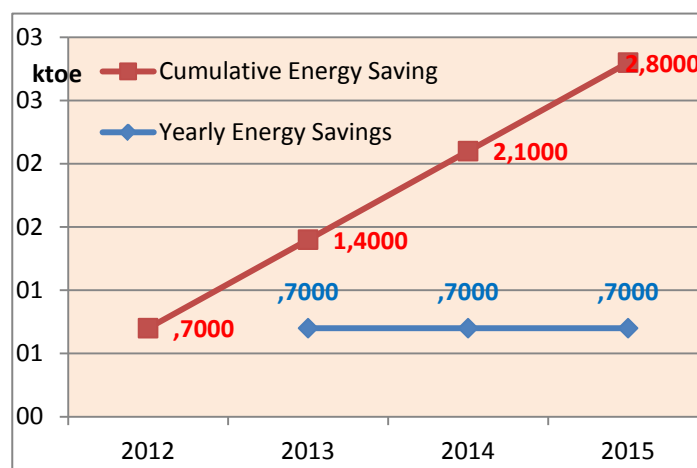


Figure 3.3.16 Energy sector energy savings

Title of the energy saving measure		Heat allocators
Index of the measure		E. 1
Description	Category	Information and mandatory information measure; Financial Instruments
	Timeframe	Start: 2013
		End: 2015
	Aim/brief description	Clear and understandable energy bills (electricity, heat and natural gas) and individual metering are the obligations of distribution system operators and the suppliers set by the Energy Law. This will increase consumer awareness of the way in which they themselves consume energy. Invoices should contain a graphical comparison of consumption in period accounts for this year and for the corresponding period last year. Accounts should be based on actual consumption. Accounts should also contain information on where to obtain advice on the efficient consumption of energy, and the telephone line should be toll-free line.
	Target end-use	Consumption of heat in households
	Target group	<ul style="list-style-type: none"> <li>- District heating system operators;</li> <li>- Building managers and</li> <li>- Dwellings in multi-apartment buildings connected to the DH.</li> </ul>
	Regional application	National
Information on implementation	List and description of energy saving actions substantiating the measure	<ul style="list-style-type: none"> <li>- Energy Regulatory Commission to amend the Rules for delivery of thermal energy to attract the installation of heat allocators;</li> <li>- To perform a public promotion to raise awareness and inform users;</li> <li>- Provide technical assistance and advice to users и</li> <li>- To ensure proper maintenance services of equipment.</li> </ul>
	Budget and financial source	31 MD, to be provided by HEP, ESCO and PS.
	Implementing body	HEP, ERC
	Monitoring authority	ERC, EARM
Energy savings*	Method for monitoring/measuring the resulting savings	Monitoring the effects of these measures will be realized based on the collected data by energy supplier and determined difference on realized energy consumption of users before and after the implementation of allocators. The bottom-up method No. 17 "Intelligent meters in households" will be used.
	Expected savings in 2012 as per 1 <sup>st</sup> EEAP	0.37 ktoe
	Savings achieved in 2012*	0
	Expected energy savings in 2018*	0.39 ktoe
	Expected impact on energy savings in 2020 (if available)	0.18%
	Assumptions*	District heating system of the City Skopje has over 50 000 customers. In accordance with the legislation every connection to DH network have to be accomplished by measuring the heat delivered. It is assumed that about 40000 of them are in multi-apartment buildings. Each apartment at average will enquire 5 allocators.



	<b>Overlaps, multiplication effect, synergy</b>	This measure has an effect primarily in the residential sector.
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Title of the energy saving measure		Intelligent networks
Index of the measure		E. 2
Description	Category	Mechanism for energy saving realization; Financial; Regulation
	Timeframe	Start: 2014 End: 2015 (2018) New measure
	Aim/brief description	The aim of this measure is to save energy based on the obligation of distributors and / or energy suppliers to annually achieve some energy savings at their end users (customers). The target of this measure is intention to create a detailed framework for implementation of the scheme for energy saving in energy networks. Through separate by-laws (grid codes, conditions for supply etc.) distributors and / or energy suppliers should prescribe how these obligations should be, what are the likely participants in the scheme, which are penalties for failure to meet targets that are acceptable measures for achieving the goals, how to measure and verify the savings, which the body will be responsible for control and define all the necessary preconditions (legal-regulatory, institutional) for the future establishment of the scheme.
	Target end-use	Consumption of electricity, heat energy and natural gas
	Target group	Operators with distribution and transportation networks
	Regional application	National
Information on implementation	List and description of energy saving actions substantiating the measure	<ul style="list-style-type: none"> <li>- Preparation of Terms of reference for a feasibility study for this project;</li> <li>- Realizing the feasibility study;</li> <li>- Law Amendments and preparation of secondary legislation;</li> <li>- Conclusions of the study to be transposed into scheme of issuing "white certificates" for realized savings and</li> <li>- Improvement of distribution system control (automation).</li> </ul>
	Budget and financial source	2221 MD, to be provided by ESP and HEP.
	Implementing body	ESP, HEP
	Monitoring authority	EARM, MoE
Energy savings*	Method for monitoring/measuring the resulting savings	TD
	Expected savings in 2012 as per 1 <sup>st</sup> EEAP	/
	Savings achieved in 2012*	0.70 ktoe
	Expected energy savings in 2018*	5.50 ktoe
	Expected impact on energy savings in 2020 (if available)	2.5%
	Assumptions	EVN Macedonia already has prepared Master plan for investment in the next 20 years. The main aim is the replacement of the old transformers

		with new on the voltage level of 20 kV, to decrease the losses of energy in distribution network. Anticipated achievements at an annual rate are within the framework 0.25 to 0.33%, and by the end of 2020 anticipated losses reduction at a level of 1.75 to 2.3%. Based on the data of this Master Plan is derived the predictions for this measure.
	<b>Overlaps, multiplication effect, synergy</b>	

3.3.2.7. *Measures in mobility*

The transport sector is one of the most significant energy consumers in the country. The transport sector has big role in the available final energy in Macedonia, with share of 24.23% which shows the significance of the implementation of measures in this sector.

While the transport sector policy measures will demand implementation among all major stakeholder groups as are the state, municipalities and the private sector, measures to be taken are universal for all projected programs / measures and for all participants in this.

According to statistical data, the most common way of transport is the road transport with share of 98% from the overall transport energy consumption. The railroad and air transport has each of 1% shares and their role is not that significant in relation to the energy consumption. The measures in the 2<sup>nd</sup> EEAP are considering the road transport mainly, but also the railroad transport as chance to improve the situation and gain energy savings with change of the habits of transport on the citizens. The Table 3.3.15 shows the transport energy balance for 2011 for different transport means.

Table 3.3.15 Transport energy balance for 2011 (ktoe)

	LPG	Gasoline	Kerosene, jet fuels	Gas / diesel fuel	Electricity	TOTAL
Railroad	-	-	-	3.5	1.6	5
Road	38.9	136.9	-	294.2		470
Air	-	0.07	3.8	-		4
TOTAL	38.9	137.0	3.8	297.7	1.6	479

The most used fuel type in the road transport in Macedonia is gas/diesel fuel with 63% share in 2011th, than gasoline with 29% and LPG with 8%. The Table 3.3.16 shows the shares of different types of fuel used in the road transport from 2005 to 2011. From this table, it can be seen that the diesel fuel/gas has increasing trend in the last 7 years, the gasoline is decreasing, while the LPG first increased, then decreased.

Table 3.3.16 Fuels used in road transport (ktoe)

	2005	2006	2007	2008	2009	2010	2011
Gasoline	122.2	112.0	119.1	123.4	129.8	129.6	137.0
Gas/diesel fuel	189.1	193.7	223.9	229.1	254.8	274.9	297.7
LPG	30.3	36.0	48.3	51.0	49.6	46.7	38.9

Republic of Macedonia has quite old road vehicle fleet. According to the data from the State Statistical Office, the average age of a road vehicle in Macedonia was more 10 years (biggest share in all types of vehicles). A significant portion of road vehicles have engines that do not comply even with EURO 1 standard. Therefore, an average road vehicle in Macedonia has blown fuel efficiency and pollutes a lot, which is shown in the following Table 3.3.17.

Table 3.3.17 Average age of road vehicles in 2011<sup>32</sup>

<sup>32</sup> "Transport and other services, 2011" – State Statistical office, Skopje, 2012

<= 2 years		<= 5 years		<= 10 years		>10 years	
No. (thousands)	%	No. (thousands)	%	No. (thousands)	%	No. (thousands)	%
<b>Passenger cars</b>							
10	3.3	35	11.2	42	13.4	226	72.1
<b>Buses</b>							
0,2	6,6	0,1	4,2	0,4	14,2	1,9	75
<b>Trucks</b>							
1	3.7	4.2	15.1	5.4	19.2	17.3	62
<b>Road tractors</b>							
0.1	2.9	0.8	18	1.6	34.8	2.1	44.3

The 1<sup>st</sup> EEAP defined several measures aimed at reducing energy consumption growth in transport sector, with a special emphasis on road transport. The measures provided in the 1<sup>st</sup> EEAP were partially implemented, and the greatest success achieved with the measure “Renewal of Public Transport Bus Fleet” and “Renewal of the National Road Vehicle Fleet”. With regulation measures and financial instruments, the bus fleet of the public and private bus companies renewed their fleet, as well as the national road vehicles.

The previous EEAP has initiated and implemented a number of measures to increase energy efficiency in the transport sector, in road traffic. Part of the implemented measures falls into the technical category, while the second part refers to the extent of information/educational and financial types.

Actions assumed to implement EE measures in the Transport sector are:

- Create an integrated transportation system;
- Promote conditions to discourage the use of private cars and to encourage the use of public transport and alternative transport modes, including cycling and walking;
- Establish measures to control the availability of parking in congested areas;
- Improve traffic management and control;
- Develop and implement city logistics systems;
- Encourage financing for market introduction of efficient vehicles;
- Transposition of the car fuel efficiency labeling directive;
- Work towards minimum efficiency requirements for automobile air conditioning systems and
- Propose a labeling scheme for tires.

The 2<sup>nd</sup> EEAP mainly continues the started activities in the 1<sup>st</sup> EEAP. The following table 3.3.18 shows the measures for improvement the energy efficiency in the transport sector, while the details of each measure are shown in the separate tables below.

Table 3.3.18 Overview of individual measures in the mobility sector

No	Title of the energy saving measure	End-use targeted	Duration	Achieved energy savings in 2012 ktoe	Energy savings expected in 2018 ktoe	Status in relation to 1 <sup>st</sup> EEAP	Additional comments
T.1.	Renewal of the national road vehicle fleet	Road vehicle fleet	2010 – 2015 (2018)	3.73	10.66	Implemented as planned	Financial Instruments
T.2.	Promotion of sustainable urban transport systems	Urban transport system, tramway	2013- 2015 (2020)	3.76	12.51	Partially implemented	Information and mandatory information measures; Transport specific measures;
T.3.	Car free days	Road vehicles	2011 – 2015 (2020)	0.40	3.06	Partially implemented	Information and mandatory information measures;

							Transport specific measures
T.4.	Promotion of greater use of railway for intercity travel and transport	Macedonian Railway Company	2013 – 2015 (2018)	0.25	0.66	Partially implemented	Information and mandatory information measures; Transport specific measures
<b>TOTAL</b>				<b>8.14</b>	<b>26.90</b>		

The size of assumed energy savings for every year of the implementation of 2<sup>nd</sup> EEAP in the mobility sector are shown graphically in Figure 3.3.17. Cumulative values of the final energy savings, from starting value reached in 2012 are presented on the same diagram.

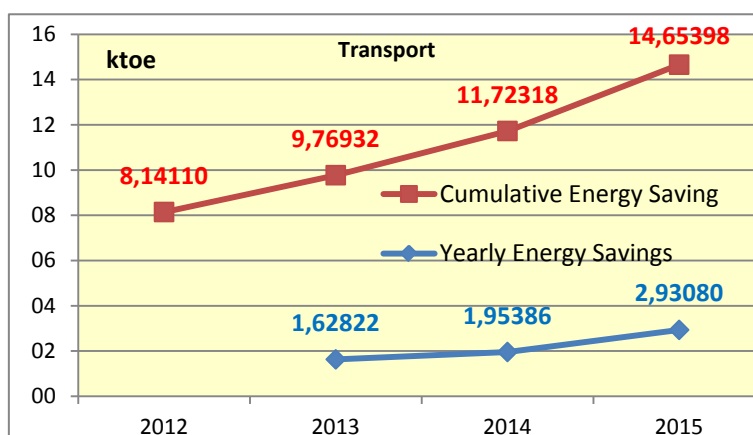


Figure 3.3.17 Transport sector energy savings

Title of the energy saving measure		Renewal of the national road vehicle fleet
Index of the measure		T. 1
Description	Category	Financial Instruments
	Timeframe	Start: 2010 End: 2015 (2018)
	Aim/brief description	Consequently, an organized and well-developed effort by the Government of Republic of Macedonia to promote and to assist with fiscal measures the faster renewal of the road vehicle fleet would have significant impact on the energy savings and reduction of the pollution.
	Target end-use	Road vehicle fleet
	Target group	PS
	Regional application	National
Information on implementation	List and description of energy saving actions substantiating the measure	<p><i>Phases of implementation:</i></p> <ol style="list-style-type: none"> <li>1. Information and campaign up to 2013;</li> <li>2. Regulations and taxes changes up to 2016 and</li> <li>3. Successive realization up to 2020.</li> </ol> <p><i>a) The MoE scope activities:</i></p> <ul style="list-style-type: none"> <li>- Amendment of the following legislation: Rulebook for identification and/or identification and appreciation of vehicles technical condition (Official Gazzete of the Republic of Macedonia No. 131/2009 and 16/2010), Rulebook for individual authorization of vehicles (Official</li> </ul>

		<p>Gazzete of the Republic of Macedonia No. 16/2010, 62/2010 and 185/2011) and Law for registration and technical inspection - part of Law for vehicles ( Official Gazzete of the Republic of Macedonia 140/2008);</p> <ul style="list-style-type: none"> <li>- Successive implementation of EURO standards (EU new standard is a EURO 5, while in Macedonia is EURO 2) for import of new EE vehicles in long terms, up to 2020;</li> <li>- Lower costs for EE vehicle registration;</li> <li>- Registration period for EE vehicles (e.g., each 3 years for vehicle up to 8 year old);</li> <li>- Increasing of registrations cost for old vehicles with EURO 2, with incompatible eco-test.</li> </ul> <p>b) <i>Private sector, selling companies and registration companies</i> will follows all fiscal measures given from MoE and MoF in final import and registration price for EE vehicles. They could participate in promotional activates for this measure.</p>
	<b>Budget and financial source</b>	Budget is not possible to be estimated; Financial source: PS, GA, MULS
	<b>Implementing body</b>	State Statistical Office, Private sector, State sector, Ministry of Economy, Ministry of Finance, Ministry of internal affairs, Municipalities, NGO sector
	<b>Monitoring authority</b>	EARM, Committee – Watch group
<b>Energy savings</b>	<b>Method for monitoring/measuring the resulting savings</b>	The monitoring and measuring of the resulting savings will be accomplished according to the NBU methodology and according to the EC recommendations for mobility. The calculation will be performed by the formula provided in the national BU method No. 14, Energy Efficiency of vehicles.
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	2.18 ktoe
	<b>Savings achieved in 2012*</b>	3.73 ktoe
	<b>Expected energy savings in 2018*</b>	10.66 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	4.85%
	<b>Assumptions*</b>	This measure will give the 2018 estimations of energy savings and will be successful if the rate of new bought vehicle is risen over 15000 per year.
	<b>Overlaps, multiplication effect, synergy</b>	

<i>Title of the energy saving measure</i>		<b>Promotion of sustainable urban transport systems</b>
<i>Index of the measure</i>		<b>T. 2</b>
<b>Description</b>	<b>Category</b>	Information and mandatory information measures; Transport specific measures;
	<b>Timeframe</b>	Start: 2013 End: 2015 (2020)

	<b>Aim/brief description</b>	This measure includes a number of actions aimed at promotion of more sustainable modes of transport and travel behavior. The fact that in the capital of Macedonia, Skopje, live more than a quarter of total country's population, leads to a conclusion that energy savings in urban transport can significantly contribute to the goal of energy saving in transport sector and reduction of the pollution.
	<b>Target end-use</b>	Urban transport system; tramway
	<b>Target group</b>	Citizens
	<b>Regional application</b>	National; local - Skopje
	<b>List and description of energy saving actions substantiating the measure</b>	<p>This measure through its activities will secure more efficient transport in urban environment, promotion of efficient means for transport (public, bicycle) and de-stimulation of car usage.</p> <p>In the previous period renewal of the public bus transport fleet in Macedonia and, especially, of the buses for city transport in Skopje has been made.</p> <p>Following activities to be accomplished:</p> <p>a) Introduction of tramway in Skopje: Provision of attractive rail service - Light Rail Transit (LRT) that will offer higher quality of service (travel time, reliability, capacity) and will attract more passengers, hopefully some previous car users. The main activities are to be carried by the City of Skopje who intends to introduce the tramway through a private-public partnership. NGO and academic institutions should provide a technical support and education of personnel, perform information/promotion campaign.</p> <p>b) Introduction of integrated traffic management center: Investment in integrated traffic management (ITM) center to regulate "on line" City center of Skopje; implementation of first phase of the ITM center of Skopje; establish the organizational structure; provide IT software package for traffic management center; training for management center personnel;</p> <p>c) Promotion of greater use of bicycle: Investments in the bicycle network infrastructure (preparation of safety bicycle lines); organize "Rent a bicycle" service for intercity using (e.g. in Skopje center); realization of permanent campaign for frequent use of bicycle; information and public campaign for greater use for bicycle.</p> <p>d) Parking Policy: - Investments in parking infrastructure (not included in this measure) as are new parking places and new garages. - Enforcing realization of sub-measures in city centers with height citizen density: parking zones (areas); change in parking pricing; parking time limitation; control the availability of parking in congested areas; preparation monthly reports for parking and garages.</p> <p>e) Training for eco driving: The activities will include campaign for eco driving with short termed trainings (60 minutes per candidate).</p> <p>f) Fuel quality and fuel economy standards: Implementation of EU fuel quality standard and standards for higher fuel efficiency; establishing regional and international cooperation for methods and experience to implement EU fuel quality standards and standards for higher fuel efficiency; establish accredited laboratories for fuel quality control; production/import companies to submit monthly and annual fuel quality and economy reports to State statistical office.</p>
<b>Information on implementation</b>	<b>Budget and financial source</b>	Cannot be estimated.
	<b>Implementing body</b>	MULS, Transport agencies, NGO, media.
	<b>Monitoring</b>	EARM

	authority	
Energy savings	Method for monitoring/measuring the resulting savings	The monitoring and measuring of the resulting savings will be accomplished according to the BU national methodology and according to the EC recommendations for mobility. The calculation will be performed by the formula provided in the national BU methodology No. 14. Energy Efficiency of vehicles, No. 15. Change of passenger mobility habits and No. 16. Eco driving.
	Expected savings in 2012 as per 1 <sup>st</sup> EEAP	5.02 ktoe
	Savings achieved in 2012*	3.76 ktoe
	Expected energy savings in 2018*	12.51 ktoe
	Expected impact on energy savings in 2020 (if available)	5.69%
	Assumptions*	The main assumptions are financial sufficiency (especially in the case of the tramway) and the citizens will not resist the implementation of the activities such as parking policy and bicycle use.
	Overlaps, multiplication effect, synergy	/

Title of the energy saving measure		Car free days
Index of the measure		T. 3
Description	Category	Information and mandatory information measures; Voluntary
	Timeframe	Start: 2011. End: 2015 (2020)
	Aim/brief description	A promotion of car free days can help to reduce the number of vehicles in use during this action. This measure should be applied on a national level and should be supported by nationwide promotion and marketing. The importance of establishment of the “car free days” is to make people to leave their cars and to get them acquainted to other modes of travel, he/she may find out to be unexpectedly good (value added).
	Target end-use	Road vehicles
	Target group	Citizens/Car users
	Regional application	National
Information on implementation	List and description of energy saving actions substantiating the measure	Accomplished: - European car free day, 22 September, annual event To be done: - Car free days of national level, 3 days in the year; - Preparation of campaign on a national and local level; - Preparation of daily vehicle fleet reports (3 days in the year) and - Information, nationwide promotion and marketing.
	Budget and financial source	Municipalities, City Skopje, NGO and Donors



<b>Energy savings</b>	<b>Implementing body</b>	Citizens/Car users
	<b>Monitoring authority</b>	State statistical office
	<b>Method for monitoring/measuring the resulting savings</b>	The monitoring and measuring of the resulting savings will be accomplished according to the BU national methodology and according to the EC recommendations for mobility. The calculation will be performed by the formula provided in the national BU methodology No. 15. Change of passenger mobility habits
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	0.39 ktoe
	<b>Savings achieved in 2012*</b>	0.40 ktoe
	<b>Expected energy savings in 2018*</b>	3.06 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	1.39%
	<b>Assumptions*</b>	The main assumption is that the car users will find it attractive to change the habit of using a cars with new urban transport system.
	<b>Overlaps, multiplication effect, synergy</b>	This measure overlaps with European car free day, 22 September, as annual event.

<i>Title of the energy saving measure</i>		<b>Promotion of greater use of railway for intercity travel and transport</b>
<i>Index of the measure</i>		<b>T. 4</b>
<b>Description</b>	<b>Category</b>	Information and mandatory information measures; Voluntary
	<b>Timeframe</b>	Start: 2013 End: 2015 (2018)
	<b>Aim/brief description</b>	The aim of this measure is to reduce energy consumption for intercity travel purposes, mostly affecting shuttle transport. Realization of this measure depends in the first hand to changing behavior of citizens. Their habit to use car even for longer trips, should be changed.
	<b>Target end-use</b>	Macedonian Railway JS Company
	<b>Target group</b>	Citizens
	<b>Regional application</b>	National
<b>Information on implementation</b>	<b>List and description of energy saving actions substantiating the measure</b>	<p>The railway system in Republic of Macedonia needs significant improvement. The infrastructure and the railway stock are very old. Since the railway is a very efficient mode of transport, the greater use of this mode can contribute a lot to a goal of saving of energy. However, railway services should be improved.</p> <p>The JSC Macedonian Railway Transport is using 50 milion EUR loan from EBRD for procurement of new wagons and locomotives and rehabilitation of existing locomotives. Also, PE Macedonian Railway Infrastructure is using EBRD loan for reconstruction of the railway. The JSC Macedonian Railway Transport created new tele-command center, bought 150 wagons for transportation of goods and 4 locomotives.</p>

		<p>The following activities have to be completed:</p> <ol style="list-style-type: none"> <li>1. JSC Macedonian Railways Transport Skopje have to improve their service offer: <ul style="list-style-type: none"> <li>- New wagons acquisition;</li> <li>- Publishing the rail timetables on internet and teletext;</li> <li>- Better service suited to the passenger needs as are information, modern ticket selling, Improvement of enterier (restrooms, gates, restaurants etc.) and</li> <li>- Preparation a media campaign for the advantages of railway transport.</li> </ul> </li> <li>2. Campaign promoting advantages of railway transport and</li> <li>3. Improve annual statistic data.</li> </ol>
	<b>Budget and financial source</b>	Budget cannot be estimated. Financial source: Government of RM, JCS Macedonian Railway Transport and FI.
	<b>Implementing body</b>	JSC Macedonian Railway Transport
	<b>Monitoring authority</b>	JSC Macedonian Railway Transport (self-control from ticket sales)
<b>Energy savings</b>	<b>Method for monitoring/measuring the resulting savings</b>	The monitoring and measuring of the resulting savings will be accomplished by the TD methodology indicators according to the EC recommendations for mobility.
	<b>Expected savings in 2012 as per 1<sup>st</sup> EEAP</b>	2.58 ktoe
	<b>Savings achieved in 2012*</b>	0.25 ktoe
	<b>Expected energy savings in 2018*</b>	0.66 ktoe
	<b>Expected impact on energy savings in 2020 (if available)</b>	0.3%
	<b>Assumptions*</b>	This measure assume that there will be remarkable financial sources for the realization of the activities.
	<b>Overlaps, multiplication effect, synergy</b>	/

3.3.2.8. *Horizontal measures*

Several measures in the first and the second EEAP achieve the effects in several sectors. Some such inter-sectors measures "assigned" are to certain sectors of final consumption because it is expected to be in them to have the greatest impact. They are not re-described in this chapter, but for the sake of the integrity of the revue are stated in Table 3.3.19. The most important cross-sectors and horizontal measures are briefly described in this section. They are not given in tabular views and ratings of the savings because it was impossible to assess.

Table 3.3.19 *Horizontal measures*

Id.	Measure	Buildings	Residential	Public	Commercial	Industry	Transport	Energy
<b>B. 1</b>	Implementation of BEP into new buildings through energy audits and providing EPB certificates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>

<b>B. 2</b>	Inspections of boilers/air conditioning systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<b>R.2.</b>	Electrical appliance and equipment labelling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<b>R.3.</b>	Promotional Program for wider application of solar collectors		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<b>R.4.</b>	Promotional campaign		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>E.1.</b>	Heat allocators		<input type="checkbox"/>		<input type="checkbox"/>			
<b>E.2.</b>	Co-generation				<input type="checkbox"/>	<input type="checkbox"/>		
<b>E.3.</b>	Intelligent networks		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>H. 1</b>	<b>Financial subventions</b>		<input type="checkbox"/>	<input type="checkbox"/>				
<b>H. 2</b>	<b>EE in education, investigation and science</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>H. 3</b>	<b>Feed-in tariffs</b>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
<b>H. 4</b>	<b>Credit lines</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 3.3.2.8.1 H.1 Financial Subventions and Incentives

#### Program for subsidizing of solar thermal collectors in households

The Government of Republic of Macedonia every year adopts Program for subsidizing of part of the cost for purchased and installed solar thermal collector home systems. For 2014, the Program is published in Official Gazzete of the Republic of Macedonia No. 7/2014.

The purpose of this program is to provide funds to compensate part of the cost of purchased and installed solar thermal collector systems in households, in order to encourage the use of renewable energy sources. The funds from the budget for the program are assigned by the Ministry of Economy.

#### Financial Support for EE in Public Buildings

A GEF Grant approved by International Bank for Reconstruction and Development (World Bank) acting as an implementing agency of the GEF Sustainable Energy Project provided technical and financial support for the EE retrofitting of public buildings, focusing on municipal schools and kindergartens. This activity's purpose was to develop some simple and replicable models that will serve to inform and influence National Program for EE in Public Buildings. Activities have been implemented in two phased, as follows:

Phase 1 - The MoE/PIU has selected a number of municipalities based on a set of criteria related to the level of preparedness, potential for energy savings, stage of decentralization. The MoE/PIU then engaged external consultant's companies for the purpose of carrying out energy audits, basic designs and tendering documentation and, subsequently, engaged construction companies which were fully financed by the GEF Sustainable Energy Project.

Phase 2 - The municipalities were selected, in large part, based on their ability to provide co-financing. The MoE engaged external consultant's companies for the purpose of carrying out energy audits, basic designs and tendering documentation for all identified facilities but provided financing of 50% of the investment with the GEF Sustainable Energy Project. The level of co-financing depended on the funds that were available for co-financing in the municipal budgets.

### 3.3.2.8.2 H.2 EE in education, investigation and science

*Higher and high education capacity building: Introducing new programs concerning EE measures into education sector at all vertical levels (primary education, high schools,*

*faculties*). The Ministry of Education and Science will facilitate this measure supporting applied scientific investigations (new laboratory equipment), grants for higher education (MSc and PhD preparation at foreign institutions with high reputation).

*Research and innovation: Connecting and helping actors promoting energy efficiency innovation, and launching a research initiative with a strong emphasis on energy efficiency.* Government will continue supporting financially academic institution donating financial means for new laboratory equipment, as well as translation to Macedonian language of technical books prepared the most prominent authors.

Research, development and deployment (RD&D) of new energy efficiency technologies and practices will be crucial if Macedonia is to achieve large-scale improvements in its energy productivity. However, investing in RD&D presents a degree of risk for businesses, because the benefits are often shared by competitors and the community as a whole. This creates a barrier to the private sector investing in socially beneficial RD&D.

*Education and awareness at all levels: As the best method for fast energy savings, public awareness and educational initiatives will be targeted to all consumer groups and launched on national, regional, and local levels.* They will include a wide spectrum of awareness-raising initiatives, including a broad range of issues from guided purchasing decisions in home-appliances to decision-making on national and municipal energy efficiency planning issues. Ministry of Economy is in charge to manage and facilitate information campaign. Ministry of Education and Science is responsible institution which has to accept new EE education programs in different educational organization (primary schools, high schools, universities) and to accredit new teaching programs.

*Professional trainings - Energy Auditor Authorization:* Training and authorization of energy auditors can help to ensure that proper energy efficiency improvements are identified and recommended for buildings and industrial facilities and that the suggestions are uniform across the country. Consumers will be more comfortable if the energy auditors that they hire can demonstrate that they have successfully completed the training and examination program as well as authorization, and are competent in energy auditing techniques and principles. Responsible institutions are MoE and EARM. The training of energy auditors will be realized by the selected legal entities. Authorizations will be issued by EARM, in accordance with Energy Law, Rulebook for energy audit and licenses for carrying out of energy audits by the Ministry of economy to the sole traders or legal entities.

#### 3.3.2.8.3 H.3 Feed-in tariffs

On the base of Energy Law and in relation to the Strategy for Energy Development of the Republic and the Strategy for exploitation of renewable energy sources in the Republic of Macedonia, a *Ordinance for Feed-in tariffs for electricity* is adopted (Official Gazette of the Republic of Macedonia No. 56/2013).

The goal of this regulation is to encourage investments for optimal utilization of available potential of renewable energy in the country and achieve the target percentage share of electricity produced by renewable energy in total consumption, in line with the conditions for sustainable operation during energy generation by providing preferential energy price to compensate the investment and operating costs of the power plant ensuring an appropriate return of capital, as well as fulfilling requirements for the protection and improvement of the environment.

The total installed capacity of wind power plants that will use preferential tariffs for production of electricity till the end of 2025 is maximum 150 MW according to the following timetable:

- until 2016 maximum 65 MW.
- until 2020 maximum 100 MW.
- until 2025 maximum 150 MW.

The total installed capacity of photovoltaic power plants with installed capacity up to 50 kW, which will use preferential tariffs for production of electricity, is maximum 4 MW. By 11.07.2013 this quota is fulfilled even that there is further interest for building.

The total installed capacity of photovoltaic power plants with installed capacity greater than 50 kW, up to 1 MW that will use preferential tariffs for production of electricity is maximum 14 MW. By 11.07.2013 this quota is fulfilled even that there is further interest for building.

The total installed capacity of biogas power plants that will use preferential tariffs for production of electricity is maximum 6 MW. Until now there is no such plant build.

The *Rulebook on CHP Plants (Official Gazette of the Republic of Macedonia No. 128/2011)* determines conditions which CHP can be approved as high-efficient and to have preferential status in the energy system.

The purpose of this regulation is to promote and establish the mechanisms for support of producers of electricity from high efficient CHP plants. This national regulation is harmonized with Directive 2004/8/EC for promotion of cogeneration based on a useful heat demand on the internal energy market. It has to be harmonized with Directive 2012/27/EU on energy efficiency, repealing Directives 2004/8/EC and 2006/32/EC, when Republic of Macedonia will be obliged to transpose and implement this Directive.

The participation of electricity produced with support of feed-in tariffs in the State energy balance is negligible.

#### 3.3.2.8.4 H.4 Credit lines for EE and OIE Measures

In Macedonia there are several credit lines for implementation of EE and RES measures, thus directly support the implementation of the EPB Directive. All of the Credit lines are implemented by the Commercial banks.

##### Financing Investments from MBDP Funds

Besides working of the Sustainable Energy Financing Facility (SEFF), the Macedonian Bank for Development Promotion facilitates other funds and offers loans for financing investments and development of small and medium sized enterprises, including EE and RES measures. Potential loan beneficiaries shall be companies registered in the Republic of Macedonia which capital is more than 51% privately owned and which number of employees is up to 250.

##### Financing Investments for Small and Medium Enterprises and other priority projects from the EIB – the third phase

The total amount available to this credit line is 100 million Euro, and is intended for entities which among other have invested in modernization, saving of energy, environment protection. The projects may reach minimum amount of 10.000 Euros and maximum amount of 3.5 million Euros.

At least 70 million Euros of this credit line are dedicated for financing small and medium enterprises.

Under other priority projects that can be funded with up to 30 million Euros of the funds provided for this credit line involves investment to be undertaken by end users in the field of economics that is based on the knowledge, energy, environment, industry, tourism, health, education, and other services. The amount of individual credit for priority projects amounts to

a maximum of 6 million Euros. As of November 2013, the third phase of the EIB credit line dropped eleven tranches totaling 95 million Euros and the remaining amount is planning to be used by initial period of second quarter of 2014.

Credit for investment in Small and Medium Enterprises and other priority projects from the EIB - the fourth stage

Due to the great interest of SMEs for this type of credit line, the Ministry of Finance at the request of the Macedonian Bank for Development launches new procedure, fourth loan of 100 million Euros in order to promptly meet the needs of SMEs and their future support. It is expected that the funds to be available for using in the month of May 2014.

Western Balkans Sustainable Energy Financing Facility (WeBSEFF) - Phase II

This financing facility is intended for implementation of EE and RES projects and is continuation of WeBSEFF I credit line that was available through the local banks to support businesses for EE and RES project investments, measuring up to 2 million Euros.

Under WeBSEFF I EBRD provided cash grants through the European Commission for encouraging investments. The cash grant was distributed in the following manner: industrial energy efficiency - 15% in total, and 20% for boiler replacement and small co-generator/trigenerator implementation; independent RES projects - 15% and 20% for projects without preferential tariffs (general) and Building energy efficiency subprojects - 20%. The final payment of cash grants was made upon the verification and establishment of project savings by financing banks. Local banks, HALKBANK AD SKOPJE, NLB TUTUNSKA BANKA AD SKOPJE, and OHRIDSKA BANKA AD OHRID offered credits with around 7% interest rate for local SMEs. In the previous period, 38 smaller EE and RES Projects in total were implemented in Macedonia (18 EE Projects, 16 RES Projects and 4 combined EE and RES Projects), in total amount of the investment of 11,7 milion Euros.

Second Phase of this credit line was approved by EBRD, that started to function in December 2013. The addendum in this phase is the availability of this credit line for the public institutions and enterprises, trough an ESCO principle.

Western Balkans Sustainable Energy Direct Financing Facility (WeBSEDFF)

The Western Balkans Sustainable Energy Direct Financing Facility (WeBSEDFF) is an investment facility implemented by the EBRD endowed with up to 100 million Euros of loan funds.

WeBSEDFF operates in Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia (including Kosovo). The facility is open to local small and medium enterprises (SME) or project developers to implement:

- Industrial energy efficiency;
- Renewable energy projects and
- ESCO: EE projects in public sector through ESCO contracts.

Under the WeBSEDFF the EBRD provides direct loans from EUR 2 million (for certain countries from EUR 1 million) up to EUR 6 million for eligible projects. In the previous period six companies were supported in order to implement EE and RES Projects in the Republic of Macedonia, in total amount of the investment of 24.5 milion Euros.

The Green for Growth Fund, EKO+ Credit by HALKBANK AD Skopje

The Green for Growth Fund, Southeast Europe (GGF) has been initiated in December 2009 by the European Investment Bank and KfW (The German Development Bank) with the financial support of the European Commission and European Bank for Reconstruction and Development.



The credit line is intended for small and medium enterprises, business owners, agricultural producers for investments in fixed assets that provide energy savings or CO<sub>2</sub> emissions saving of minimum 15%.

The total sum of the fund is 5 millions Euros for Loans up to a maximum of 500000 Euros. The loans for energy efficiency investments in Macedonia is implemented through Halkbank AD Skopje, and offers medium to long-term senior loans for EE projects. The credit rate is 5,5% annually for period of up to 5 years (including grace period of up to 6 months).

#### ECO Loan by ProCredit Bank

The credit lines are intended for private clients, as well as for small and medium enterprises, business owners, agricultural producers for investments in fixed assets that provide energy savings of 20%.

Since the start of this programme, the bank has disbursed 53 home improvement energy efficiency loans and 69 loans to businesses to finance investments in energy-efficient fixed assets. At the end of 2011 the home improvement loan portfolio amounted to approximately 500000 Euros, while business energy efficiency loans totaled just over EUR 1.2 million Euros.

The height of the loans is up to 750000 Euros and the credit rate is 7% for period of up to 180 months.

#### Alpha Green Loan by Alpha Bank

The credit line is intended for private clients, for investment in EE measures and OIE utilization. The height of the loans is up to 10000 Euros.

The credit rate is between 7% and 9% annually, for period of up to 84 months.

### *3.3.3. Summary of overall final energy savings*

The final energy savings achieved with implementation of 1<sup>st</sup> EEAP, expected energy savings in 2015 and 2018, and projected end-use energy savings by 2020 are shown in the Table 3.3.19. The methodology used for energy savings evaluation for every particular measure, is presented in the same table.

*Table 3.3.19 Summary of final energy savings*

Sector/ reference to chapter 3.3.2	Calculation methodology	Achieved energy savings in 2012 (ktoe)	Assumed energy savings in 2015 (ktoe)	Expected energy savings in 2018 (ktoe)	Energy savings projection for 2020 (ktoe)
<b>B.1.</b>	TD accommodate to local conditions	2.44	5.41	16.70	30.70
<b>B.2.</b>		0.06	0.20	1.54	2.50
<b>R.1.</b>	National BU and data from realized cases	1.94	4.60	11.95	18.00
<b>R.2.</b>	TD	0.26	0.50	0.66	1.00
<b>R.3.</b>	National BU	1.46	1.90	2.37	4.00
<b>R.4.</b>	TD	0.99	1.69	5.12	8.00
<b>P. 1</b>	NBU	2.08	5.10	8.17	14.00
<b>P. 2</b>	TD	0.36	1.60	2.57	4.00
<b>P. 3</b>	NBU	0.66	1.00	1.29	2.00
<b>P. 4</b>	NBU	0.18	0.85	1.57	3.00
<b>P. 5</b>	TD	0.08	0.50	1.05	2.00
<b>C. 1</b>	TD	0.79	2.48	4.25	6.00
<b>C. 2</b>	TD	0.34	0.87	1.69	3.00

<b>C. 3</b>	TD	0.28	0.85	1.92	4.00
<b>I.1.</b>	TD	3.46	3.98	4.01	6.00
<b>I.2.</b>	TD	1.48	2.55	4.87	8.00
<b>I.3.</b>	TD	0.52	1.14	2.48	3.00
<b>I.4.</b>	TD	2.74	9.10	21.65	22.00
<b>I.5.</b>	Engineering calculation	12.98	18.30	24.58	25.00
<b>E.1.</b>	Engineering calculation	0.00	0.20	0.39	1.50
<b>E.2.</b>	TD	0.70	2.60	5.50	7.00
<b>T. 1</b>	TD	3.73	6.80	10.66	13.00
<b>T. 2</b>	TD	3.76	5.50	12.51	16.00
<b>T. 3</b>	TD	0.40	1.85	3.06	3.00
<b>T. 4</b>	TD	0.25	0.50	0.66	1.00
<b>H. 1</b>	TD	N/A	N/A	N/A	N/A
<b>H. 2</b>	TD	N/A	N/A	N/A	N/A
<b>H. 3</b>	TD	N/A	N/A	N/A	N/A
<b>H. 4</b>	TD	N/A	N/A	N/A	N/A
<b>SUM</b>		<b>41.94</b>	<b>80.06</b>	<b>151.22</b>	<b>207.70</b>
<b>SUM in %</b>		2,56	4,89	9,24	12,70
Energy savings under ESD		41.16	76.96	145.33	198.70
Energy savings outside ESD		0.78	3.10	5.89	9.00

The necessary investments for realization of assumed EE measures are presented in the Table 3.3.20:

Table 3.3.20 Summary of financial investment

<b>Sector</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>Sum</b>
<b>Buildings</b>	60.47	130.17	130.17	320.81
<b>Residential</b>	847.39	989.78	1084.08	2921.25
<b>Public</b>	321.55	1165.91	1796.64	3284.10
<b>Commercial</b>	192.31	509.23	509.23	1210.77
<b>Industry</b>	113.55	527.65	527.65	1168.85
<b>Transport</b>	0	1126.29	1126.29	2252.58
<b>Energy</b>	N/D	N/D	N/D	N/D
<b>Total</b>	1535.27	4449.04	5174.06	<b>11158.36</b>

Financing of energy efficiency measures provided in 2<sup>nd</sup> EEAP derived from many different sources. Table 3.3.21 presents financial flows based on past reasonable extrapolation of previous years, while Table 3.3.22 shows investment responsibilities and expectations from State, municipalities, private sector, financial institutions and donors.

Table 3.3.21 Timing of investment responsibility (in Milion Denars)



Year / Financial source	Budget of the RM	Municipalities	EEF	ESCO	Financial Institutions (foreign, domestic and donors)	Energy suppliers	Private sector	Total investments for the period 2013- 2015
<b>2013</b>	153.56	152.02	0	0	867.48	576.49	842.15	2591.72
<b>2014</b>	134.04	194.92	219.77	340.06	867.48	864.74	842.15	3463.16
<b>2015</b>	94.87	194.92	879.07	1360.25	867.48	864.74	842.15	5103.48
<b>Total</b>	382.48	541.86	1098.84	1700.31	2602.45	2305.96	2526.46	11158.36

Table 3.3.22 Investment responsibility

Sector/ Financial source	Budget of the RM <sup>33</sup>	Municipalities	EEF	ESCO	Financial Institutions (foreign, domestic and donors)	Energy suppliers	Private sector	Total investments for the period 2013- 2015
<b>Buildings</b>	219.92	32.08	0.00	0	0	0	68.81	320.81
<b>Residential</b>	25.07	0	0	409.59	1141.75	84.87	1259.97	2921.25
<b>Public</b>	137.49	509.78	1098.84	672.20	865.80	0	0	3284.10
<b>Commercial</b>	0	0	0	302.69	302.69	0	605.39	1210.77
<b>Industry</b>	0	0	0	292.21	292.21	0	584.43	1168.85
<b>Energy</b>	0	0	0	23.62	0	2221.09	7.87	2252.58
<b>Mobility</b>	N/D <sup>34</sup>	N/D	0	0	N/D	0	N/D	N/D
<b>Total</b>	382.48	541.86	1098.84	1700.31	2602.45	2305.96	2526.46	11158.36

The figure 3.3.18 below illustrates the range of estimated specific costs/estimated saving and the accumulated estimated savings by 2018. On the same it can be seen that information for the level of investments per energy savings can be used to compare the relative cost of the measures, as the totals for savings and investments refers to different periods.

<sup>33</sup> For the implementation of measures and activities included in the present Action Plan, the Budget of the Republic of Macedonia has taken into consideration the budgets of the Ministry of Economy, Ministry of Transport and Communications, Ministry of Education and Science, Ministry of Health, Energy Agency of the Republic of Macedonia, Ministry of labor and social policy, Ministry of finance, SOZR, Ministry of internal Affairs and Office for execution of sanctions.

<sup>34</sup> There are no sufficient data to estimate needed funds.

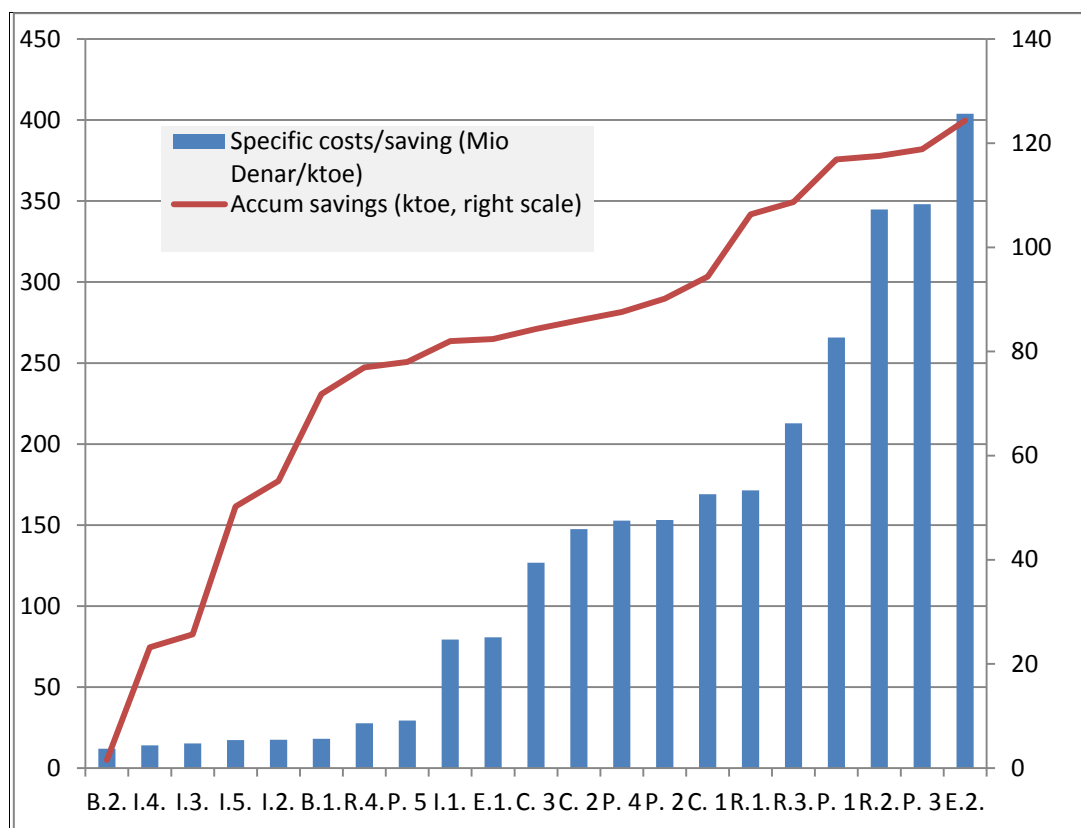


Figure 3.3.18 Specific costs per savings for EE measures and accumulated savings

### 3.4. Public sector

The focus of the implementation of national energy efficiency policy is placed on the public sector. This approach is not only a consequence of the ESD, but also the fact that the measures of incentive policies and regulations of the easiest to start activities in that particular sector. In addition, this approach was necessary because of the still immature market energy efficiency. The public sector with its activities and decisions can affect and motivate individuals and entities from other sectors to take similar actions to reduce energy consumption, and because of their purchasing power has the force streamline and transform the market towards more efficient products and services.

#### 3.4.1. Public sector leading end exemplary role

The public sector generally has a leading role in the implementation of actions to improve energy efficiency, in particular the implementation of the measures P.1, P.2 and P.3. In the coming period, emphasis is placed on the reconstruction of the existing stock of public buildings, implementing Project EPUBIL.

These measures as defined in section 3.3.2.3. satisfy the requirements of the EPBD II (Article 9.2 and Article 11.5), but more importantly a significant contribution to achieving the overall national target by 2018, without which no renovation measures of existing buildings of all kinds of purposes will be possible to achieve.

#### *3.4.2. Specific measures for public procurement*

According to the requirements of ESD, the public sector is required to apply at least two of the six proposed measures set out in Annex VI to Directive.

In the Macedonian legislation there are prescribed following requirements which comply with proposed measures:

- a) According to the Article 134, paragraph (6) and paragraph (8) of the Energy Law, requirements are set to purchase equipment that has efficient energy consumption in all modes, including in standby mode, using, where applicable, minimised life-cycle cost analysis or comparable methods to ensure costeffectiveness;
- b) According to the Article 134, paragraph (2) of the Energy Law requirements are set to carry out energy audits, to provide certificates for energy performance of buildings and implement the resulting cost-effective recommendations and
- c) According to the Article 134, item (7) of the Energy Law requirements are set for public sector entities when lease commercial premises, buildings or building units, the owner of the building where the commercial premises are located should hold a building energy certificate.

#### **3.5. Ensuring availability of advice and information**

Activities related to informing consumers of energy, as well as special programs to raise awareness of the need for greater use of energy efficiency measures are implemented in different ways and at different levels.

These activities are successfully implemented through the mass media (newspapers and TV programs), and partially delivered with electricity consumption bills.

Were prepared special booklets aimed to participants in the secondary education sector funded by GIZ. A special multi-year program is implemented in elementary education, financed by EVN Macedonia, implemented by NGOs. Appropriate brochures were prepared and training for employees in the health sector have been organized, funded by the World Health Organization.

UNDP, through financing enabled training for administrative staff of all 85 municipalities to implement measures for EE and RES. As a part of this training it was conducted training of municipal officials for using software EXITE. In this program all municipalities started to enter on-line information on energy consumption in buildings with heated surface greater than 1000 m<sup>2</sup> in their jurisdiction. The city of Skopje, established Info-center for the citizens as a part of the project realization during preparation of the strategical document SEAP. UNDP financialy supports initiative for establishing Information Centres for EE and RES in the eight Macedonian planning regions. The first one is already open in the city of Negotino for the necessities of the Vardar Planning Region.

#### **3.6. Obligations of energy companies to promote energy savings in end-use consumption**

ESD sets the following requirements to distribution system operators and energy suppliers: delivery of data on energy consumption in their territory (Article 6.1.a.), offer energy services (Article 6.2.ai) and provide account information and individual metering its customers (Article 13).

These obligations are implemented by the electricity distributor EVN Macedonia and Public enterprises for water supply throughout the country.

The realization of this commitment is difficult in the heat supply sector, with unbundling of energy consumed to actual measurements and real consumption but realizing flat rate invoicing according to heated apartment surface. This is a serious problem in buildings with multiple apartments, which measure energy consumption in one place, at the entrance to the building. Additional explanation can be seen in 3.3.2.6.

The energy providers realize obligation to promote energy savings in end-use consumption through different manners. There are several promotional programs that are broadcast regularly on TV and newspapers prepared and financed by them. EVN Macedonia is financing special program for Primary schools for promoting energy savings, EE and application of RES, performed by NGOs. This project is lasting 5 years was granted with prestigious award “Energy Globe”.

### 3.7. Market for energy services

The State, through its financial mechanisms will provide special measures to stimulate the Public-Private Partnerships (PPP). The measures include providing the real estate necessary for implementation of PPP-funded energy efficiency projects with a symbolic price/rent, exemption from utility taxes, etc. PPP can allow municipal utilities to get access to private capital, project implementation experience, more progressive management practices, cost-minimization skills, and better service and customer focus.

Through the EEF the State will help faster establishment of energy service companies (ESCOs) and implementation of Performance Contracting. The framework for ESCOs and performance contracting will be developed including the necessary secondary legislation and exemplary performance contract template for adaptation to the conditions of the RM.

### 3.8. Strategy for the increase of nearly-zero energy buildings

The Strategy to increase the number of nearly-zero-energy buildings is not on a list of priorities, in the next three years. The priority is the implementation of the project to refurbish public buildings (EPUBIL) that will occupy considerable financial resources. For that reason, in the reporting period it is not expected that such a strategy for these facilities have to be prepared.

The country will proceed by firstly analyzing the preconditions necessary to fulfill this requirement. Analyze realized during 2014 year will include scanning of the situation in the construction sector (construction growth, business environment, financial and administrative barriers, socioeconomic conditions, market principles, education and training etc.). This will be supported by realization of the 2.5 years Project supported by Intelligent Energy Europe (IEE) Program, named as RePublic\_ZEB - *Refurbishment of the Public building stock towards nZEB*.

Later (2015), the process will continue by amending the relevant legal and regulatory framework, which will set new stricter requirements on the energy performance of buildings that are yet to build (new) and the existing buildings that will be reconstructed. Reference numerical values will be envisaged to be established as national parameters for the annual energy consumption indicators.

Next step is preparation of national plan establishing a baseline year for measuring the fulfilment of the targets sought and will define the national targets for nearly zero-energy buildings.

### **3.9. Alternative measures for heating and air conditioning systems**

On the base of the Energy Law, Article 136, paragraph (8), items 5, 6 and 7, in the Rulebook on energy performance of buildings are prescribed:

- the manner and timing of inspection of systems for heating with boilers for heating the space in buildings with an effectuated rated output of more than 20 kW;
- the manner and timing of inspection of air conditioning systems in buildings with an rated output of more than 12 kW;
- the types of buildings and units owned by the public sector entities for which is compulsory installation of solar collectors for hot water in new construction and substantial rehabilitation of existing facilities, if it is economically justified.

Pursuant to this provision, as well as waiting to prepare a Handbook dedicated which could facilitate realization of these inspections, will begin the intensive implementation of the planned measure B.2. that is described in chapter 3.3.2.1.

The purpose of the inspection of these systems is to determine whether dimensioned, operated and maintained in the manner provided by technical documentation and manufacturer's recommendations, to determine their actual energy efficiency and make recommendations for improvements.

It should be noted that the provision for installation of solar panels on public buildings that have to be refurbished, promote the implementation of measures P.4 and P.5.

### **3.10. Measures to support EPBD implementation**

Measures to support the implementation and fulfillment which requires EPBD, were defined in this EEAP are listed and described in detail in sections 3.3.2.1, 3.3.2.2. 3.3.2.3. and 3.3.2.4.

#### 4. ESTABLISHMENT OF COMPETENT BODIES AND ASSIGNED ORGANIZATIONS

The successful implementation of the energy policy of the Republic of Macedonia depends on the active engagement of all stakeholders in the sector. The realization of the EEAP is a necessity. All planned measures should be implemented to achieve the anticipated results. None of them has a low priority, all individually and as a whole are necessary.

The envisaged measures and policies are the best energy source for the country. The advantages are obvious: once invest in energy efficiency measures, and the benefits extend from 10 to 30 years (from home appliances, light bulbs and processes to new buildings or their modernization).

The application of EE measures reduces dependence on imports of primary and transformed energy, decreases environmental pollution, improving the living conditions of citizens (less pollution, better health conditions, lower energy costs), create new jobs. The scope of the benefits of energy efficiency is clearly seen from the Figure 4.1.



Figure 4.1 The multiple benefits of energy efficiency (Source: IEA)

An essential prerequisite for the successful implementation of energy efficiency policy is certainly favorable and enabling legal framework prescribed in the Energy Law which clearly define the responsibilities of institutions in creating and in particular the implementation of energy efficiency policy.

The implementation of the Government policies are conducted through hierarchical institutional network (Shown on Figure 4.2):

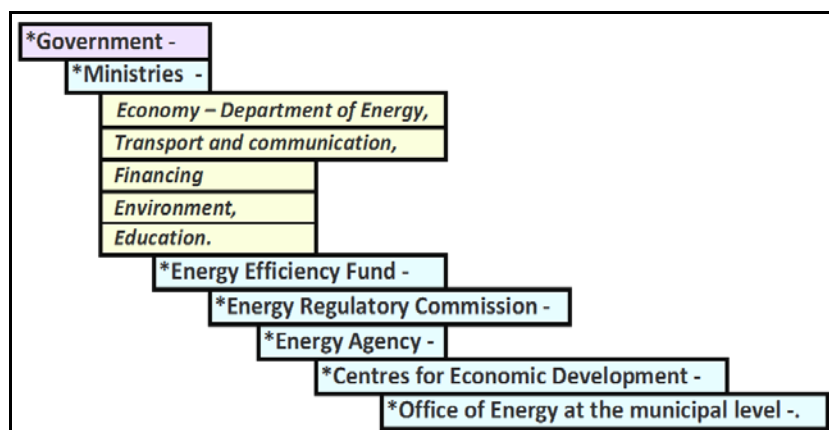


Figure 4.2 The scheme of institutional framework for EEAP realization

The existing organizational structure has proved to be insufficient and inefficient during the realization of 1<sup>st</sup> EEAP. The administrative capacities within MoE and EARM were scarce with employees capacity in the implementation of the national policy of energy efficiency. This situation of understaffed bodies responsible for the overall implementation and monitoring of energy efficiency policy is causing great difficulties and delays in the execution of the obligations. Additionally, in the previous period some of the important by-laws were adopted with delay which caused delayed implementation of the part of energy efficiency policy. Also, in 2013 the establishment of a comprehensive information system for monitoring of the EE activities conducted at national and local level has started, and without such systematic monitoring is not possible to accurately assess the achieved energy savings. Work on the second EEAP confirmed that without this information system is difficult to monitor, report and evaluate the energy savings from all of the activities.

The competent bodies and assigned organizations are Energy Department at the Ministry of Economy, Energy Agency of the Republic of Macedonia and State Statistical Office.

The **Energy Department**, within the Ministry of Economy, oversees the entire energy sector and is currently in charge of all energy efficiency-related issues, especially from a policy perspective, including the Strategy for improvement of the energy efficiency.

The Ministry of Economy also oversees the industrial sector. Hence the Strategy for improvement of the energy efficiency implementation in this sector will have to be coordinated with the sectoral development plans.

The Government will continue to be a lead actor for initiating, promoting and implementing the majority of new investment in energy efficiency in Macedonia. The creation of an enabling institutional and regulatory framework is the primary responsibility of the Government.

The main responsibility of the Ministry of Economy, as determined by the Energy Law is to prepare a strategy for energy efficiency, to prepare legislation arising from the strategy to adopt secondary legislation, to implement the enforcement measures provided in Strategy, for improvement of the energy efficiency to monitor the implementation measures by individual participants. Thus care Strategy for improvement of the energy efficiency to comply with the Energy Strategy of the Republic of Macedonia, and the Strategy for Sustainable Development.

The main tasks of the **Energy Agency** are the following:

- Develop and maintain appropriate and transparent data bases on energy efficiency and renewable energy sources (monitoring and reporting services);



- Monitoring, verification of savings and preparing reports on realized energy audits in building sector;
- Organize and monitor the implementation of trainings and examinations for energy auditors;
- Cooperate with non-governmental sector in developing the awareness of the need of EE and RES;
- Encourage innovative approaches for investment including third party financing or co-financing;
- Support investment in cogeneration systems (CHP) and
- Undertake measures for raising the awareness of consumers on end-use heat efficiency and increasing the efficiency of urban systems for heating production and distribution to buildings and industries within the State distribution systems, where improvement of distribution performance, insulation, efficiency of pumps, flow regulation and other distribution efficiencies can occur. Also, EARM verifies the energy savings as a result of energy services and other energy efficiency improvement measures and report the results.

The *State Statistical Office* is specialised institution within the state administration in the Republic of Macedonia. The basic functions of the institution are collecting, processing and disseminating statistical data about the demographic, social and economic situation of the Macedonian society. Besides that, the State Statistical Office is the primary bearer and coordinator of the statistical system of the country, the responsible institution for international cooperation in the field of statistics, for defining the statistical methodologies and standards, as well as for providing protection of the individual data collected from individual persons and legal entities. The State Statistical Office is realising its activity in accordance to the Law on State Statistics (Official Gazzete of the Republic of Macedonia No. 54/1997 and No. 21/2007), together with the other participants in the statistical system of the country defined in the Programme for Statistical Surveys, 2013-2017 (Official Gazzete of the Republic of Macedonia No. 20/2013).

The missing but necessary bodies which have to be established are Energy Efficiency Fund and Watch Group.

Energy Efficiency Fund<sup>35</sup> needs to be established to support faster implementation of a successful energy efficiency programs and promotion of investments. The key principles of Fund will include but not be limited to following:

- The fund will be maintained and operated outside of the government; funds to be operated by commercial banks on on-lending basis. The fund need to provide support as direct loans, or to provide guarantees on loans issued by the commercial banks with their own capital as well as support through energy performance contracting;
- Initial funding could come from several different sources, including loans from international financing institutions, grants from donors, program revenues (such as fees for building permits, liquid fuel and natural gas applications, etc.), government surcharges on heating fuels and gasoline, environmental and carbon taxes, energy auditor certification fees, as well as individual contributions of companies belonging to the energy sector and possibly donor sources;

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<sup>35</sup> Energy Law, Article 130

- The financial incentives for the use of flexibility mechanisms of the Kyoto Protocol or in reduction of greenhouse gas (GHG) emission. As economically attractive energy saving opportunities decrease, Clean Development Mechanism should be applied in cases where its application will be necessary;
- The Fund need also exercise promotional programs for energy efficiency in various fields. This shall include but not be limited to support program for ESCOs and performance contracting, municipal energy management, etc. and
- The full scope of the EE Fund's operational principles and rules shall be defined by the Fund's Charter and Operational Manual.

As an important step, the Government should establish a **Watch Group –Committee (WG)**<sup>36</sup> to draw on private sector and community expertise during the implementing EEAP and Strategy for improvement of the energy efficiency for improvement of the energy efficiency. WG an interagency group of experts from key stakeholders in the government, academia, public/non-governmental and private sectors, consumer groups, etc. will be established as a formal committee, adjacent to the Government, to convene on regular basis and discuss the direction and effectiveness of reform in energy efficiency and recommend actions, thus building a consensus among disparate energy efficiency stakeholders, while providing a platform for public discussion and lobbying of new legal initiatives.

It can provide information to Government on lessons learned and best practice in implementing energy efficiency strategies which will underpin the long-term success of the Strategy. An organization such as this has proven to be critical to the success of other governmental energy efficiency programs.

Main tasks of the WG will be:

- Oversee existing and proposed Government funds and Grants;
- Engage stakeholders to enhance the effectiveness of existing and proposed funds and incentives (e.g. work with banking and property industry to increase awareness).
- Support national and sector specific information campaigns to increase awareness of energy efficiency options;
- Suggest, coordinate and enhance energy data collection;
- Report annually to Parliament on the effectiveness of all policies and measures and make recommendations for improvements;
- Engage with state and local authorities to encourage coordination, consolidation and collaboration of programs and policies and
- Lead a national program to stimulate EE skills, knowledge and work needed for a sustainable economy development.

The WG shall have equal parity of governmental versus non-governmental members to ensure fair ruling and unbiased decision-making.

To implement the measures envisaged, necessary prerequisites should be created in parallel. The creation of the preconditions and implementation of the measures is two-way - from the government to energy consumers and vice versa.

**Awareness and education of the stakeholders.** Continuous consumer information is an important measure assumed before and during the implementation of EEAP. Through it promote benefits for the application of EE measures. It envisage realization of education at all levels vertically, creating new working places and businesses and acquire new skills that are missing from the market by way of qualification which solves the problem of

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<sup>36</sup> Strategy for improvement of the energy efficiency in the Republic of Macedonia until 2020, page 10

unemployment; mitigated problem outflow of educated people (brain drain) and pressure on EU countries with economic migrants.

Crucial element for the realization of the envisaged action plan is **providing the necessary funding**. The efficient functioning of the EEF is of very high importance for the implementation of the state policy in the sector of energy efficiency. Through the fund energy efficiency projects in different sectors should be defined (especially EPUBIL but not excluded other sectoral measures). They define the precise timeframe for implementation, expected results, implementation dynamic and direct control of the execution. The responsibility is on a higher level and not left solely to market mechanisms.

The implementation of the programs should be orchestrated from one center.

The political decision through legal benchmark for compulsory implementation of energy efficiency measures in public buildings, paved the way to a successful implementation of the measures envisaged. Credit for investment in SMEs from the EIB - the third and fourth phase is highly welcomed and accepted by the private sector.

In the scope of concrete plans have to be underlined:

- Implementation of control measures for EPUBIL project to be achieved through the use of software tool EXCITE;
- Modernization of boilers and low pressure part of the turbines in TPP Bitola;
- Realization of the Project EPUBIL;
- Modernization of the electrical transmission grid;
- Capacity building of the Energy Department (Ministry of Economy) and Energy Agency;
- Training of few industry enterprises to introduce standard on energy management ISO 50001, escorted with energy audit of the production processes (USAID Industrial Management Project);
- Centralized regulation of the City transport and
- Credit for investment in Small and Medium sized Enterprises and other priority projects from the EIB - the fourth stage.

**Incentive instruments** for the implementation of EE measures are extraordinary impulse to potential investors. The measure of financial incentives for installing solar panels should not remain single. Positive results have been achieved during participation in the cost of refurbishment of private housing by municipalities and donors (HABITAT/USAID). The possibility of reducing the municipal fees payed for construction of EE buildings will be studied (achieved primary results are positive). The potential to exempt part of investors from Income Tax on investment in energy efficiency measures should also be explored.

The state needs to provide funds for financial assistance to industry, manufacturing and services in order to become more market competitive by the cheaper products, while simultaneously increasing quality, due to lower energy costs by adopting new technological processes. Donors Aid in this direction is valuable, but should not be the only one.

**It is necessary to engage the whole society to fulfill envisaged targets!**

- ❖ *Strengthening the links in the institutional network to deliver the EEAP.*
- ❖ *Develop and maintain appropriate and transparent databases on energy efficiency and renewable energy sources.*
- ❖ *Parallel implementation of all EE measures provided in EEAP.*
- ❖ *Organizing sector projects to ensure EEAP realization .*
- ❖ *Putting the EE Fund into operation.*
- ❖ *Introduction of Incentive instruments for accelerated implementation of EE measures in the private sector - residential, industry and manufacture.*
- ❖ *Strengthening and coordinating activities for raising the awareness of consumers.*
- ❖ *Education and training – qualify for new skills for implementation of EE measures.*
- ❖ *Ensuring climate for stronger connection with the private sector and delegation of responsibilities from the state institution to private and NGO organizations.*