MINISTRY OF ECONOMY
REPUBLIC OF MACEDONIA

FIRST ENERGY EFFICIENCY ACTION PLAN OF THE REPUBLIC OF MACEDONIA BY 2018

Skopje, 2011

TABLE OF CONTENTS

List of abbreviations

GDP	-	Gross domestic product
EA	-	Energy Agency of the Republic of Macedonia
EC	-	European commission
ED	-	Energy dealer/trader: a natural or legal person, that sells energy to final customers
EE	-	Energy efficiency
EEI	-	Energy efficiency improvement: an increase in energy end-use efficiency as a result of technological, behavioural and/or economic changes
EI	-	Energy intensity
EMS		Energy management system
EPBD	-	Directive 2010/31/EC on Energy Performance of Buildings
EU	-	European Union
ESCO	-	Energy service companies, implementing energy performance contracting
ESD	-	Directive 2006/32/EC on energy end-use efficiency and energy services
ETD	-	Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community
FEC	-	Final energy consumption
FEI	-	Final energy intensity
IPPC	-	Integrated Pollution Protection and Control
MACEF	-	Macedonian Centre for Energy Efficiency
MANU		Macedonian Academy of Sciences and Arts
MARKAL	-	Consistent multi-country energy/economy/environment/engineering (4E) analytical capability software
MEPSO	-	Macedonian Transmission System Operator
MoE	-	Ministry of Economy of the Republic of Macedonia
MB	-	Municipal budget
MS	-	Member States
NEEAP	-	National Energy Efficiency Action Plan
NGO	-	Non-governmental organization
PEC	-	Primary energy consumption
PEI	-	Primary energy intensity
SB	-	State budget
SME	-	Small and medium-sized enterprise
SO	-	State organization
TWC	-	Tradable white certificates
VA	-	Value added
ktoe	-	Thousand tons of oil equivalent

Pursuant to Article 131 from the Energy Law ("Official Gazette of the Republic of Macedonia" no. 16/2011), the Government of the Republic of Macedonia, on the meeting held on 05.04.2011, adopted

FIRST ENERGY EFFICIENCY ACTION PLAN OF THE REPUBLIC OF MACEDONIA BY 2018

EXECUTIVE SUMMARY

INTRODUCTION

The First Energy Efficiency Action Plan of the Republic of Macedonia by 2018 is developed pursuant to the Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services (ESD), and on the basis of the model adopted by the European Commission and adjusted by the Energy Efficiency Task Force (EETF) of the Secretariat of the Energy Community in Vienna to be used by the Contracting Parties to the Treaty on the Establishment of the Energy Community.

In 2009, the Ministry of Economy, with the technical assistance provided by USAID, initiated the procedure on developing the first EEAP of the Republic of Macedonia by 2018.

The Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services (ESD) requires Members States to prepare **three National Energy Efficiency Action Plans (NEEAP)** for the period 2008 – 2016 and report them to the European Commission. By 30 June 2007, most Member States have already submitted their first National Energy Efficiency Action Plan.

The present document represents the first Energy Efficiency Action Plan of the Republic of Macedonia by 2018 (hereinafter: EEAP or action plan).

The reported period for achievement of the indicative target for Member States of European Union under the Directive is 2009–2016. The primary aim is that all Member States achieve an energy savings target of 9 percent of the average final inland energy consumption for the period 2001-2005 for the ninth year of application of this Directive.

In the case of Contracting Parties of the Energy Community Treaty, Energy Community proposed the first EEAP to cover the period of 9 years, i.e. from 2010 to 2018, in order to determine measures and activities aimed to attain the overall national indicative target of at least 9 percent by 2018, inclusive. This EEAP covers the period 2010-2018 and sets the total national indicative target for energy savings of at least 9 percent of final inland energy consumption by 2018 compared to the average final inland energy consumption registered in the period 2002-2006, and also sets the intermediate national indicative target for energy savings of at least 4% for a period of three years, i.e., by 2012.

To implement the measures anticipated under the first EEAP of the Republic of Macedonia by 2018, indicative funds in the amount of around 406 million EUR are needed, while the financial, social and environmental benefits thereof are much higher. The implementation of these measures will result in around 835 million EUR of financial savings

according to the current energy market prices, or around 1,360 million EUR according to the liberalized energy market prices.

This Directive requires action to be undertaken by the Member States, with the fulfilment of its objectives depending on the effects that such action has on the final consumers of energy. The end result of Member States'action is dependent on many external factors which influence the behaviour of consumers as regards their energy use and their willingness to implement energy saving methods and use energy saving devices.

NATIONAL INDICATIVE ENERGY SAVINGS TARGETS PER SECTOR AND MEASURES FOR THEIR ATTAINMENT

Considering the important potential for energy savings in Macedonia, the Government of the Republic of Macedonia considers that an overall national indicative energy savings target of 9 percent set for the EU Member States is realistic for the country and that it can be attained by 2018.

The method and specific features of the assessment of the total and intermediate indicative target are described in details in this document.

Aggregate and individual data on energy consumption have been used to set the target. These data were provided by Ministry of Economy of the Republic of Macedonia, Macedonian Centre for Energy Efficiency (MACEF) and academic experts from specific fields.The MACEF' and the USAID/RESMD SSP[1] teams harmonized EEAP and MARKAL software entering data, using 2006 national energy balance data[2] to produce new baselineof the technology stock.

In the course of implementation of the Plan, the Republic of Macedonia should further introduce significant normative, tax, financial and organizational measures for the complete implementation of the Directive.

To accomplish the savings committed to by the indicative target substantial efforts will be necessary as described below:

- Significant financial resources need to be mobilized;
- Ongoing energy efficiency improvement efforts underway with the State support need to be expanded;
- The energy market has to be further liberalized, especially on the supply side of energy services; and
- Public-private partnerships must be cultivated in the field of energy efficiency.

The present first EEAP was prepared within the following framework:

- The measures proposed comply with the measures proposed by the EuropeanCommission in its document 'Action Plan for Energy Efficiency: Realisingthe Potential', COM(2006) 545;
- Proposed measures depend on the marketmechanisms and to a minimal level on financing from the budget;

[1] MARKAL's team consists of: IRG experts, ICEIM MANU, MEPSO and Ministry of Economy of the Republic of Macedonia members. They own licensed MARKAL software.

[2] The used material balances do not differ from those provided to EUROSTAT.

- The targets will be achieved according to the principle ofleast cost;
- All entities will participate in order to use the country's energy efficiency potential at full;
- The financial effects are calculated in Euro at the level of 2009;
- Conversion factors for different fuels (NCV) are shown in Annex I.

The expected energy savings of the measures envisaged in the framework of the Energy Efficiency Action Plan for each of the four most important sectors of final energy consumption are summarized in Table below. The expected savings per sector are calculated for the package of measures applied to that sector.

National Indicative Energy Savings Targets in ktoe

National indicative annual energy savings target 2018		147,2
National intermediate indicative annual energy savings target 2012		65,4
Packages of measures to improve energy efficiency planned for achieving the target by sectors	Annual energy savings expected by end of 2012	Annual energy savings expected by end of 2018
Residential sector	7,63	40,51
Commercial and services	4,96	24,19
Industry	40,96	90,45
Transport sector	12,55	44,63
Total ESD energy savings expected:	**66,10**	**199,78**

The expected savings from the energy efficiency improvement (EEI) measures are higher than the EEI target set.

The implementation of the measures anticipated under the first EEAP of the Republic of Macedonia by 2018 requires indicative financial means in the amount of around 406 million EUR, out of which 82.64 million EUR are indicative financial means anticipated to be secured from the Budget of the Republic of Macedonia. Budget allocations for the years 2010, 2011, 2012 and 2013 have already been made on the basis of the adopted Budgets of the Republic of Macedonia for the years 2010 and 2011, where individual budgets of the line ministries have allocated funds for the implementation of following measures/projects: social housing projects, renewal of public transportation bus fleet, implementation of informative campaigns on energy efficiency, retrofitting of buildings in the education sector, retrofitting of hospital buildings, etc. The 2011 Budget allocated indicative funds for the implementation of these project activities for the years 2012 and 2013. For the remaining period until 2018, the budget funds are calculated as approximate values and based on activities anticipated for that period.

The implementation of given measures is part of the competences of the following state administration bodies: Ministry of Economy, Ministry of Transport and Communications,

Ministry of Education and Science, Ministry of Health, Energy Agency of the Republic of Macedonia. Other measures defined in the present EEAP fall under the responsibility of different state administration bodies and institutions such as: the Ministry of Environment and Spatial Planning, the State Market Inspectorate, the Institute for Standardization of the Republic of Macedonia, local self-government units, and others.

The implementation of the first EEAP will serve as the initial phase in the implementation of overall national energy efficiency policy. In this period the remaining gaps in legislative and institutional framework for EE must be eliminated. In particular, the following key activities must be carried out to address these gaps:

- Transposition and implementation of Energy Performance of Buildings Directive (EPBD) requirements into Macedonian legislation;
- Transposition into Macedonian legislation and implementation of the requirements of the new Directive 2010/30/EU on the indication by labeling and standard product information of the consumption of energy and other resources by energy-related products;
- Institutional capacity building of the Energy Sector within the Ministry of Economy and the Energy Agency of the Republic of Macedonia (hereinafter – EA). This will be carried out through establishment of a separate Department for Energy Efficiency in the Energy Sector of the Ministry of economy and a separate Unit/Sector for Energy Efficiency in the EA. If the necessary budget funds are not secured for the realization of this EEAP, the employments and other activities related to institutional capacity building will be realized by re-assignment of staff from other institutions. The Energy Agency in cooperation with the Energy Sector of the Ministry of Economy is responsible for oversight and monitoring of Energy Efficiency Strategy and EEAP enforcement;[3]
- Establishment of a Fund for Energy Efficiency (hereinafter: the Fund);
- Establishment of an Energy Efficiency Council.

Due to the evolved financial complications all over the world in the recent years, the policy projections are made with expectation of a slower rate of penetration of predicted measures during the first three years. It is more realistic to predict slower achievements in this period, but still achieve the annual improvement rate of 1percent. In the second six-year period the savings are expected to be higher due to the established legislative and institutional frameworks and three years of experience. The period till 2020 will be characterized with the highest achieved savings because of the expected higher living standard of the population, increased GDP of the State, and better political conditions (realistic expectation to become NATO and EU member).

3 Detailed explanation of distribution of responsibilities between EA and MoE see in EE Strategy of the Republic of Macedonia by 2020, Chapter 5, item 5.1.1. Responsibilities for Energy Efficiency Improvements in Macedonia.

RESIDENTIAL SECTOR

Households have the largest consumption of electricity among all. The dominant forms of household energy consumption are electricity (largely for heating purposes) – 52,6 percent and biomass (firewood) – 33,3 percent (2006 data). Liquid fuels and thermal energy (district heating) contribute with similar shares (6,7-6,9percent). There is no use of natural gas in the residential sector, yet.

The high relative share of electricity use in households continues to grow – in 2006 was more than twice the share of electricity use in households of other European countries.

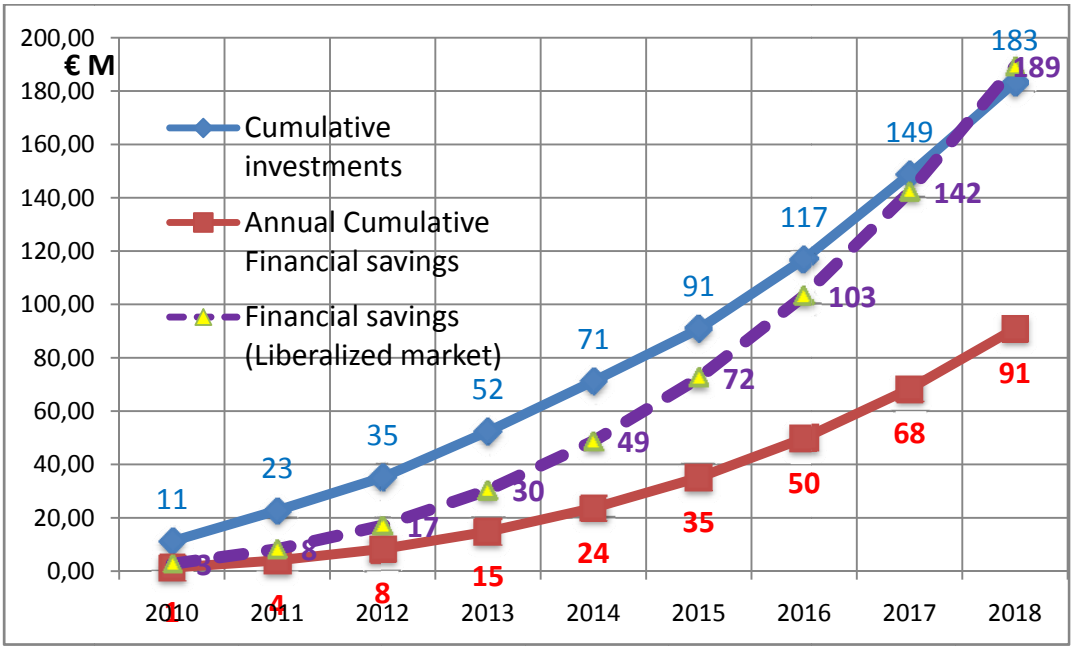
The penetration rate for energy efficiency measures will grow, following the promotional activities and financial incentives. The annual aggregate energy savings for all measures will grow up to 40.51ktoe in 2018, and the cumulative energy saved over the period until 2018 will equal 162.8 ktoe. The contribution of various proposed measures to the aggregate savings is presented in the Table below, confirming the strong impact building certification (building energy codes) and well organized promotional/awareness campaigns.

Contribution of individual energy savings measures in Residential Sector

No.	Title of the program/measure	Annual energy savings expected in	
		2012	2018
		(ktoe)	
1.	Installation of individual heat allocators for Skopje District Heating	0,37	1,38
2.	Social Housing Projects	0,263	0,93
3.	Adoption and enforcement of Building Energy Codes	2,98	8,9
3.1.	Electrical appliance and equipment labeling, and energy performance standards	*Included into savings accepted with building codes*	
4.	Replacement of fire wood furnaces with high efficiency models	0,486	6,4
5.	Establishing information centres and implementation of information campaigns on energy efficiency	108	7,6
6.	Use of new efficient boilers for individual central heating	0,39	2
7.	Financial support to natural persons for EEI investments	*Incorporated across other measures*	
8.	Use of solar collectors and geothermal heat pumps	0,42	2
9.	EE Retrofits in existing buildings	1,63	11,4
	Total for Residential Sector	**7,63**	**40,5**

The volume of investments in the residential sector is high for a relatively short period and payback period is long (see Figure). Positive results will be achieved by 2025. Further, during the period of buildings amortization (next 40 years) significant additional financial savings will be produced.

Taking in account the regional market electricity price (100 €/MWh at the end-user), the financial effects become attractive (dotted curve on the below graph indicates savings under liberalized energy prices), far more attractive than under the present energy prices.



Investments and financial savings in the residential sector

COMMERCIAL SECTOR AND SERVICES

The energy consumption in this sector comprises mainly electricity with a 43 percent share in the consumption, and oil products (heating oil, the so-called "D2" fuel and LPG) with almost 42percent of the total energy consumption in the sector in 2006.

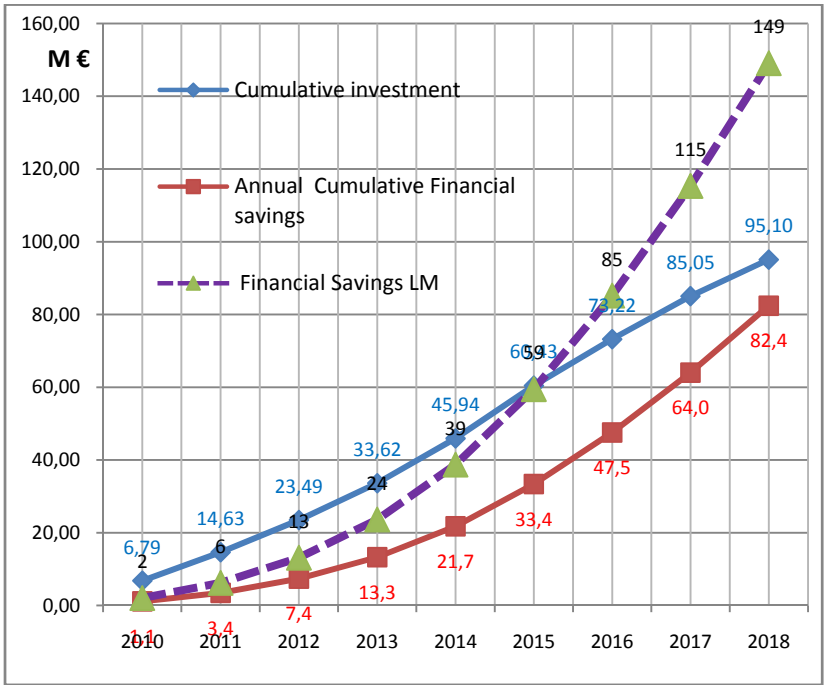
Public building interventions have proven to be fairly cost-effective whether they have targeted a single technology improvement (lighting, windows, motors, building envelope) or an integrated facility approach.

In the short-term, the focus will be 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 behaviour through education, training and information campaigns. Additionally, energy management systems (EMS) will be introduced supported by monitoring and reporting tools.

Contribution of individual energy savings measures in Commercial and Services Sector

No.	Title of the program/measure	Annual energy savings expected in	
		2012	2018
		(ktoe)	
1.	Adoption and enforcement of Building Energy Codes	1.15	7.55
2.	Inspections of boilers/air conditioning systems	0.30	1.1
3.	EE retrofits for buildings in the education sector	0.7	3
4.	Establishment of information centers, municipal EE network and implementation of information campaign on EE	0.11	1.71
5.	Energy managementand auditing	0.3	2.3
6.	Projects on Street Lighting	0.11	092
7.	Electrical applianceand equipment labelling and energy performance standards	0.1	1.5
8.	EE Retrofitting for Hospital Buildings	1.5	3.61
9.	Use of solar collectors and geothermal heat pumps (GHP)	0.69	2.49
	Total for Commercial and Services Sector	**4.96**	**24.19**



Financial savings in the commercial and services sector

Calculations show that with financial investment of 95.11M € it is possible to realize financial savings (mostly electrical energy) of 149.5M € until 2018, assuming electricity price of 120 €/MWh, expected to be reached around year 2015 (dotted curve on the above graph indicates savings under liberalized market (LM) prices).

INDUSTRY

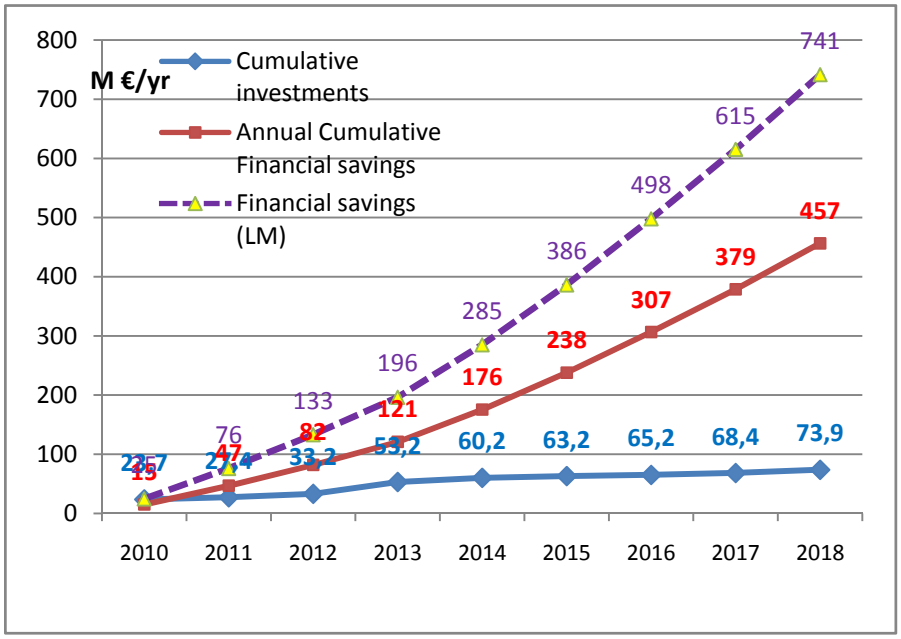
Industrial sector accounts for more than 28 percent of GDP and engages over 30percent of total occupied labour force. Textiles, iron and steel, power generation, cement, food and tobacco are the important manufacturing industries of Macedonia.

The industry sector used mostly electricity and oil products with 33percent and 32 percent respectively in 2006, followed by coal with 19percent, thermal energy with 10 percent, natural gas with almost 6 percent and wood with less than 1percent. 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.

Contribution of individual energy savings measures in Industrial Sector

No.	Title of the program/measure	Annual energy savings expected in	
		2012	2018
		(ktoe)	
1.	Improvement of process performances	6	5
2.	Energy Auditing	0.3	0.65
3.	Co-generation	25.1	38.6
4.	Energy performance of non-residential buildings	0.15	0.35
5.	Improved performance of lighting systems	0.11	0.25
6.	Improved performance of HVAC systems	0.3	0.4
7.	Fuel type change	0.6	0.8
8.	Clean Development Mechanism (CDM)	2.8	26
9.	Waste heat utilization (non CDM)	2.5	8
10.	Variable speed drives	1	3.9
11.	Compressed air supply	0.1	0.5
12.	Good house-keeping	2	6
	Total for Industrial Sector	41	90.45

Financial investment of 73.9 M € till 2018 will enable 457M € financial savings (see Figure below) with current energy prices.Positivefinance savings influence, because of energy market liberalization (electrical energy prices at level of 120 €/MWh for industry and commercial sector), is shown with dotted curve.



Break-down of financial results in the Industry sector

TRANSPORT

The transportation sector is a significant consumer of energy. The energy consumption in the traffic sector in Macedonia in 2006 was 350 ktoe. This consumption (2002-2006) was 24-20.6 percent of the total final energy consumption in Macedonia.

Regarding the type of fuel used in the transportation sector, the fuels with the biggest share are oil products (petrol, diesel, kerosene, butane etc.). Electricity consumption of about 2 ktoe (24 GWh)[4] represents the share consumed by the railways for powering their electric engine locomotives.

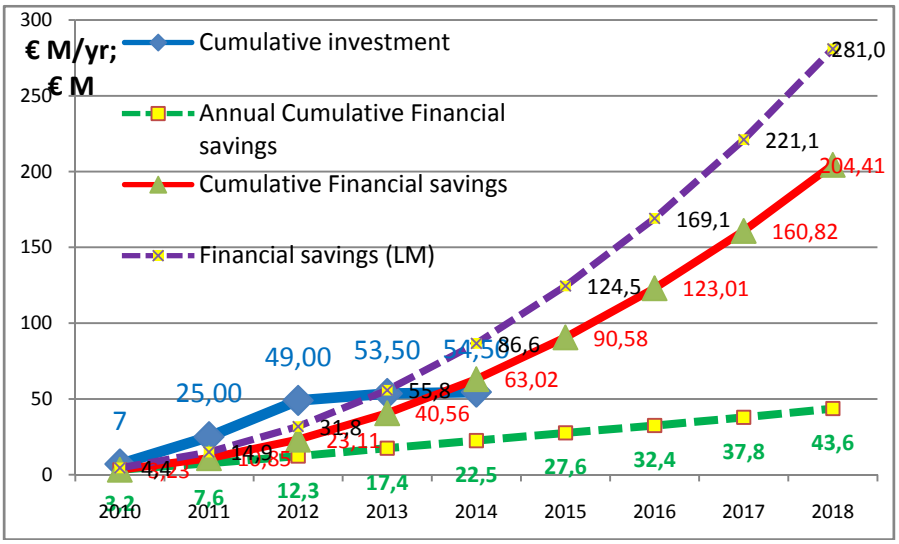
Investments in this sector are cost-intensive. Financial revenues generated by fuel savings from new bus fleet (investments of around 50 M €), are not sufficient to ensure short, financially justified pay-back period. It is a public need, service for the citizens, in the same time protecting the environment, hence the Government is considering subsidizing transportation fares (ticket price).

[4]TRANSPORT AND OTHER COMMUNICATIONS, Statistical reviews no. 289, 337, 393, 452, 485, 544, State Statistical Office, Skopje.

Contribution of individual energy savings measures in Transport Sector

No.	Title of the program/measure	Annual energy savings expected in	
		2012	2018
		(ktoe)	
1.	Renewal of the national road vehicle fleet	2,18	14,11
2.	Promotion of sustainable urban transport systems	5,02	14,93
2a.	Introduction of tramway in Skopje		
2b.	Renewal of public transport bus fleet		
2c.	Introduction of integrated traffic management center		
2d.	Promotion of greater use of bicycle		
2e.	Parking policy		
3.	Fuel quality and fuel economy standards	2,39	7,54
4.	Car free days	0,39	1,05
5.	Promotion of greater use of railway for intercity travel	2,58	6,99
	Total for Transport Sector	**12,55**	**44,63**

History of liquid fuel prices in the period 2004-2008 shows energy prices increasing of liquid fuels. The most significant changes were on the side of diesel fuel (64% in the monitored period), the most utilized in the State. With simple extrapolation of the liquid fuel prices, expectations are for the price's growth for at least 30%. Thus, financial benefits because of today investment become more attractive (dotted curve on the Figure below).



Break-down of financial results in the Transport sector

OVERALL NATIONAL TARGET

In pursuance of the ESD, the Republic of Macedonia has set the overall national indicative energy savings target of above 9 % of the final inland energy consumption for 9 years by 2018 (a quite high rate for the existing conditions an average 1 % per year), which means that the country should ensure energy savings to the amount of above **147.2ktoe**.

The calculation of the national indicative target has been carried out according to the methodology provided in Annex I of ESD. The national target has been calculated on the basis of the average final consumption of energy for the last five years (2002-2006) for which data were available and are in harmony with Strategy for Energy Development in the Republic of Macedonia by 2030.

Penetration of energy savings of new measures by sectors

Savings ktoe/yr`	2010	2011	2012	2013	2014	2015	2016	2017	2018
Residential	2,33	2,38	2,92	3,81	4,29	4,68	6,11	6,97	7,02
Commercial and Public Building Sector	1,45	1,54	1,97	2,57	3,30	4,02	3,58	3,19	2,57
Industry sector	17,7	19,1	4,16	4,36	18,21	8,96	7,51	4,06	6,39
Transport Sector	3,31	4,48	4,76	5,31	5,13	5,22	4,99	5,50	5,93
Total for key sectors	24,79	27,50	13,81	16,05	30,94	22,88	22,19	19,71	21,91

The assessment of energy savings in 2012 (including by sectors and by energy) has to be made on the base of EC-recommended standard methodology in relation to the list of recommended EEI measures. It includes combination of two approaches, „top-down" and "bottom-up" and has to be made on the base of the official statistical data. Harmonized methodology has to be adopted at national level.

Monitoring in the frame of this Plan will be done every year on the base of data from national statistical energy balances.

HORIZONTAL AND CROSS-SECTORAL MEASURES

A significant number of EU normative documents in the Republic of Macedonia have already been introduced. They contain a variety of activities and measures including measures introducing different EE standards and norms. Their effect can be hardly estimated due to lack of available methodologies and statistical information. The effects of the measures and activities could be estimated after development of the corresponding standards and methodologies. Especially cumbersome would be the potential impact in terms of energy savings for horizontal and cross-sectoral measures.

For this purpose energy efficiency indicators on the macro-economic level will be utilised. These include: primary energy intensity (total and total with climatic corrections), final energy intensity (total and total with climatic corrections), adjusted final intensity (at constant structure, adjusted according to the economy, climate and structure), energy intensity index, and CO_2 index (CO_2 intensity, CO_2 per capita).

MEASURES REQUIRED BY THE DIRECTIVE 2006/32 ON ENERGY END-USE EFFICIENCY AND ENERGY SERVICES

Provisions of the ESD's Article 5, 6 and 7 require the public sector to play an exemplary role in meeting the national energy saving target, requirements to the energy distributors/ distribution system operators and availability of information, consequently.

Based on the initiatives already undertaken, the possibilities provided through the Energy Law and Rulebooks, as well as additional legislation which is in the phase of preparation the most appropriate measures to be applied in the Republic of Macedonia were proposed. The measures, which would require adequate legal and regulatory actions described in the present Plan include the following:

1. Building Certification;
2. Energy Performance Contracting;
3. Requirements to purchase equipment based on lists of energy-efficient product specifications of different categories of equipment;
4. Introduction of mandatory certificates for buildings and building units, new and such that are subject to major renovation, preceded by energy audits prescribing energy savings measures;
5. Obligations for energy dealers:
    - to provide statistical information of their final customers to the authorities;
    - to ensure the offers to their final customers, and the promotion, of competitively priced energy services;
    - to ensure the availability to their final customers, and the promotion, of competitively-priced energy audits conducted in an independent manner and/ or energy efficiency improvement measures;
    - to contribute to the funds and funding mechanisms.
6. Promotion of EEI measures;
7. Expanding the ongoing activities and a potentially capacity/structure of the existing authorities and organizations;
8. Ensuring the availability of efficient, high-quality energy audit schemes which are designed to identify potential energy efficiency improvement measures and which are carried out in an independent manner, to all final consumers, including smaller domestic, commercial and small and medium-sized industrial customers.

LEGISLATIVE CHANGES RELATED TO THE TRANSPOSITION OF THEDIRECTIVE 2006/32 ON ENERGY END-USE EFFICIENCY AND ENERGY SERVICES

In order to implement the ESD a number of changes are required to be made in effective normative documents.

These changes can be realized as amendments to the existing laws or through adoption of new secondary legislation acts as follows:

- Amendments to the relevant Distribution Grid Codes for Electricity and Natural Gas – to enable energy distributors to get involved in the implementation of EEI measures and activities anticipated under ESD (Article 6 of the ESD);
- Rulebook for energy audits(Article 12 of the ESD);
- Rulebook for the Procedure and Conditions for Regulation of Electricity Prices (additional regulation of the activities in the power sector (electricity and gas) in accordance to Article 10 of the ESD about EEI tariffs).

1. DESCRIPTION OF THE ENERGY END-USE MARKET

Macedonia belongs among the countries with high primary energy consumption per unit of GDP and has specific primary energy consumption almost 4 times greater than that of the developed European countries.

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.

With regard to the present analysis it is especially important to determine the Primary Energy (PE) needs of the country thus representing the country‘s economic development input energy as well as the Final Energy Consumption (FC), which is a portion of the primary energy basic conditions input and of which the gross domestic product is being realised. The Table1.1 lists the energy sector basic conditions starting with the primary energy (PE) up to the final energy consumption (FC).

Table 1.1. Basic energy indicators for PE and FC in ktoe

	2000	***2001***	***2002***	***2003***	***2004***	***2005***	***2006***
Primary Energy Generation	1532	1572	1510	1568	1536	1459	1450
Nett Imports	1113	1019	1187	1100	1163	1246	1322
Trade/ Exchange	64	17	-141	43	-2	34	-13
Total Primary Energy (PE)	2709	2608	2556	2711	2697	2740	2759
Total Final Consumption (FC)	1601	1436	1504	1653	1624	1691	1708
FC/PE(%)	59,12	55.05	58,83	60,97	60,22	61,72	61,91

The Table clearly indicates the stagnation of the primary energy consumption as well as the final energy consumption in the last years. The efficiency expressed as ratio FC/PE is between the limits of 55% to 62%.

The first EEAP provides a package of measures for the most important final energy demand sectors: residential (households) commercial and public services, industry and transport.

Official statistics additionally identifies the sector of agriculture and non-energy use. However, due to the small percentage of the overall energy consumption, it was decided not to specify separate measures targeted to these sectors alone. The first EEAP contains measures which are already being or have been implemented as well as new measures which are planned for implementation in first three-year period (2010-2012) and will, for the most part, continue to be implemented in the next six year period at least until 2018.

The expected energy savings of the measures envisaged in the framework of the National Energy Efficiency Action Plan for each of the four aforementioned most important sectors of final energy consumption are summarized in Table 1.2. below. The expected savings per sector are calculated for the package of measures applied to that sector.

Table 1.2.: National Indicative Energy Savings Targets in ktoe

National indicative annual energy savings target 2018		**147,2**
National intermediate indicative annual energy savings target 2012		**65,4**
Packages of measures to improve energy efficiency planned for achieving the target by sectors	Annual energy savings expected by end of 2012	Annual energy savings expected by end of 2018
Residential sector	7,63	40,51
Commercial and services	4,96	24,19
Industry	40,96	90,45
Transport sector	12,55	44,63
Total ESD energy savings expected:	**66,10**	**199,78**

Table 1.2. provides indicative national targets for 2012 and 2018, expressed in ktoe. As demonstrated in the table, the expected savings from the energy efficiency improvement (EEI) measures are higher than the EEI target set. However, the implementation of the first EEAP is actually the initial phase in the implementation of overall national energy efficiency policy. Namely, in this period the remaining gaps in legislative and institutional framework for EE must be eliminated. In particular, the following key activities must be carried out to address these gaps:

- Transposition and implementation of Energy Performance of Buildings Directive (EPBD) requirements into Macedonian legislation;
- Transposition into Macedonian legislation and implementation of the requirements of the new Directive 2010/30/EU on the indication by labeling and standard product information of the consumption of energy and other resources by energy-related products;
- Institutional capacity building of the Energy Sector within the Ministry of Economy and the Energy Agency of the Republic of Macedonia (hereinafter – EA). This will be carried out through establishment of a separate Department for Energy Efficiency in the Energy Sector of the Ministry of Economy and a separate Unit/Sector for Energy Efficiency in the Energy Agency. If the necessary budget funds are not secured for the realization of this EEAP, the employments and other activities related to institutional capacity building will be realized by re-assignment of staff from other institutions. The Energy Agency in cooperation with the Energy Department of the Ministry of Economy is responsible for oversight and monitoring of Energy Efficiency Strategy and EEAP enforcement;
- Establishment of a Fund for Energy Efficiency (The Fund). The establishment of the Fund will depend on the actual need for its creation, the possibility to secure funds which would also determine the model of the Fund's organization, management, operation and financing;

- Establishment of an Energy Efficiency Council.

The Fund for Energy Efficiency can be created with a view to provide support for the public and private sector in order to implement EEI programs and promote EEI investments. Key principles underlying the Fund will include, but will not be limited to the following:

- It has been recommended for the Fund to be maintained and operated by an entity outside the Government, i.e., the funds to be managed by the commercial banks on the basis of on-going loan giving. Nevertheless, pursuant to Article 130, paragraph 6 of the Energy Law ("Official Gazette of the Republic of Macedonia" no. 16/2011), these aspects should be regulated under a special Law on the Creation of a Fund for Energy Efficiency;
- The Fund will be used for direct loans, co-financing with commercial banks or to provide guarantees on loans issued by the commercial banks with their own capital;
- Initial funding could come from several different sources, including donations, loans, commercial banks' capital, program revenues (such as fees for building permits, natural gas applications, etc.), possible governmental surcharges on heating fuels and gasoline, as well as individual contributions/donations (certain companies as part of their corporate social responsibility could invest funds intended for subsidizing citizens with low income and other affected categories in order to purchase equipment and appliances (such as bulbs, freezers, air-conditioners, washing machines, dish-washing machines and like) of higher energy efficiency class and/or with relevant labels on their compliance with the eco-design requirements). In front of the entire international community, the Government will promote the benefits from the EEI investments for the purpose of attracting investments in the Republic of Macedonia;
- 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 mechanismshould be applied in cases where additionally of its application will be deemed additional;
- The Fund for Energy Efficiency will need to finance energyefficiencyprojects (including grant funding for market studies, project development, energy auditing, support for ESCO and energy services contracting, energy management systems on municipal level, implementing public awareness raising programs, i.e., promotion of energy efficiency in different fields, etc.) with terms and conditions matched to the techno-economic features of various EE project categories.

To enhance the participation of stakeholders in EES implementation, and to increase transparency, the Ministry of Economy will establish an independent Energy Efficiency Council (observation committee) that would bring together disparate energy efficiency stakeholders, monitor implementation of EE measures and reform progress, identify the needs for intervention and further reform. The Energy Efficiency Council will be established as a coordination body with representatives from different state administration bodies, other competent institutions, public, non-governmental and private sector, consumer groups and, when needed, external experts. This Council will convene meetings to discuss the direction

and effectiveness of reform in energy efficiency and recommend actions, thus building a consensus on energy efficiency among different stakeholders and providing a platform for public discussion and lobbying for new legal initiatives. The Energy Efficiency Council, which will operate as an oversight committee/watch group, should exist on voluntary basis, or – if possible – should be financed by the Fund for Energy Efficiency, donations from financial institutions (such as the World Bank, European Bank for Reconstruction and Development, USAID, GIZ) and from other sources. This proposal should be further developed as part of the secondary legislation/rulebooks on the watch group's duties and priorities, as well as its coordination mechanism/department.

Due to the evolved financial complications all over the world, the policy projections are made with expectation of a slower rate of penetration of predicted measures during the first three years. It is more realistic to predict slower achievements in this period, but still achieve the annual improvement rate of 1 %. In the second six-year period the savings are expected to be higher due to the established legislative and institutional frameworks and three years of experience. The remaining period till 2020 will be characterized with the highest achieved savings because of the expected higher living standard of inhabitants, increased GDP of the State, and better political conditions (realistic expectation to become NATO and EU member).

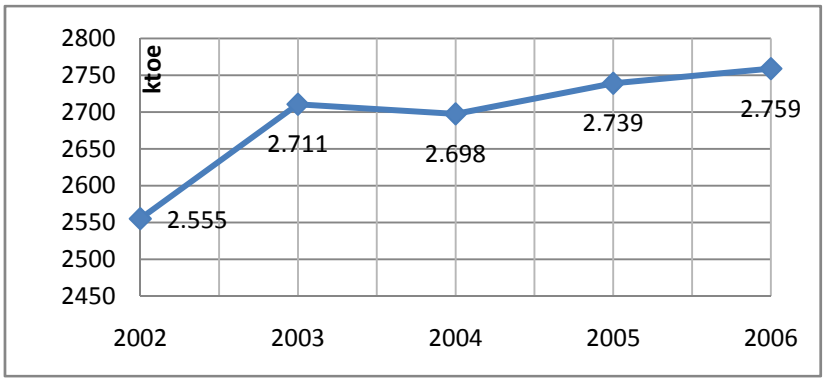


Figure 1.1. Primary energy supply in the analyzed period

Based on the above analysis and assumption, the target for energy savings of 4,04% by 2012 and12,21% - by 2018are therefore adopted (Table 1.3.)

Table 1.3.: Adopted targets in the 4 key sectors compared to average consumption for the latest 5 years

Sector	Average consumption for the 5 latest yers	Energy Saving Targets			
		Year 2012		Year 2018	
Residential	482	7,63	1,58%	40,51	8,41%
Commercial and Public Building	226	4,96	2,19%	24,19	10,70%
Industry	507	40,96	8,08%	90,45	17,84%
Transport	348	12,55	3,61%	44,63	12,82%
Others	73				
Total	**1636**	66,10	4,04%	199,78	12,21%

The final energy consumption, as defined by the Energy Services Directive (ESD) in the Republic of Macedonia in 2006was equal to 1708 ktoe. Within the scope of the ESD, the distribution of consumption among the sectors is as follows (**Figure 1.2**): 29,2 % in households; 20,5 % - in transport; 33,8 % - in industry; 13,1% - in commercial and services; and 3,5% agriculture and non energy use.

Distribution of final energy consumption is presented in **Figure1.3.**

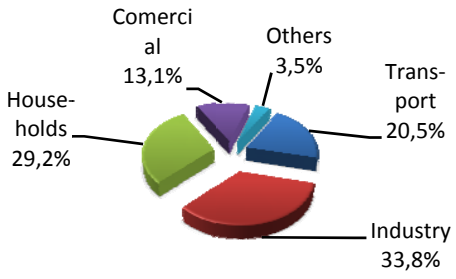


Figure 1.2.Final energy consumption by sectors in 2006

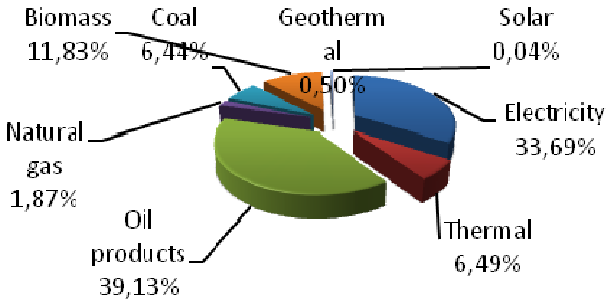


Figure 1.3. Final energy consumption by primary source in 2006

1.1. RESIDENTIAL SECTOR

As it can be seen from the **Figure 1.2.,** households are the second largest energy end-use consumers in Macedonia with 29% of total final energy consumption according to data from 2006. 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) - 52,6% (**Figure 1.1.1**) and biomass (firewood) - 33,3%. Liquid fuels and thermal energy (district heating) contribute with similar shares (6,7-6,9%).There is no use of natural gas in the residential sector, yet.

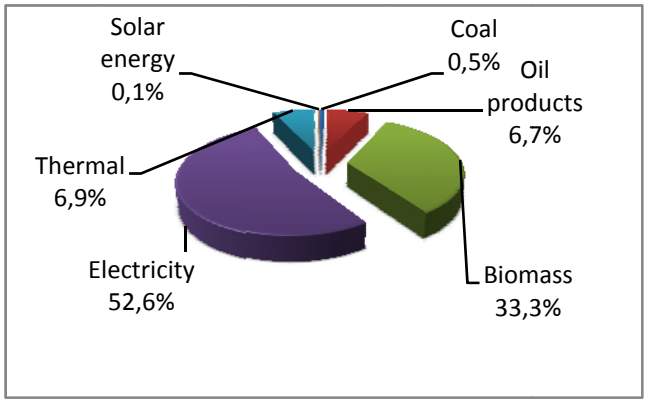


Figure 1.1.1. - Percentage share of the primary energy sources consumed in the households in Macedonia in 2006[5]

The household energy consumption in Macedonia, expressed per capita, is very low. This indicator usually remains relatively constant for very long period, not only in Macedonia but in the other European countries as well (**Figure 1.1.2**). 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 trees, 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.

However, relative to the energy consumption in other sectors, the aggregate household energy consumption is quite high in comparison to the other countries.

[5] © OECD/IEA, [2008], IEA Online Database: Energy Balances of Non-OECD and OECD Countries and Energy Statistics of Non-OECD and OECD Countries

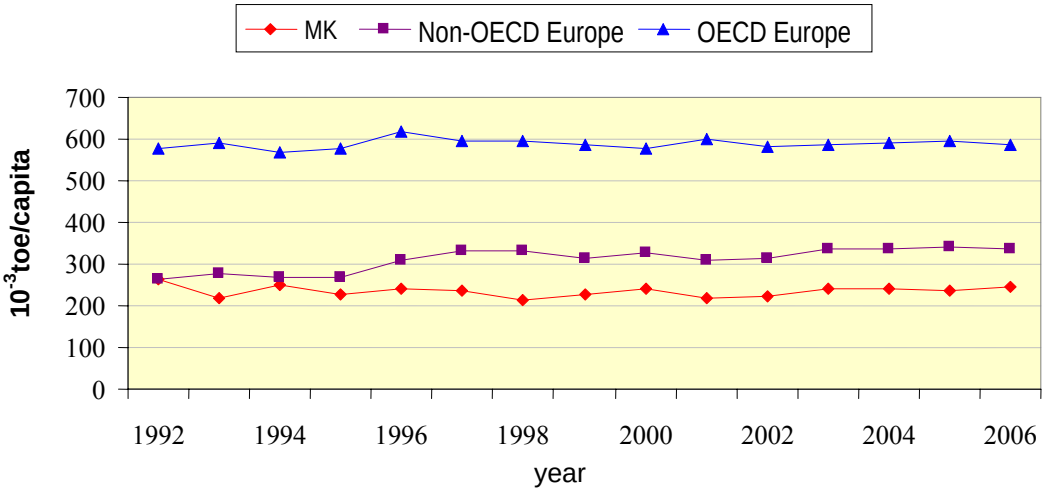


Figure 1.1.2.Household energy consumption per capita[6]

The relative share of electricity use in households is high and it continues to grow. The relative share of electricity in the households in 2006, according to the statistical data, was 52,6% and is more than twice the share of electricity use in households in other European countries. The household electricity consumption in Macedonia in 2006, according to the official statistical data, was 262 ktoe.

The consumption of biomass in the households has reduced in the last few years both in absolute and in relative quantities. The share of biomass in the total household energy consumption declined from 40% in 1997 to 30% in 2006. However, this reduction appears only in the official statistical data. According to expert judgement, unregistered wood consumption is very high and, after 2001 grows continuously. Once this illegal consumption is taken into account, the biomass consumption shall appear relatively constant with mild variations depending on the meteorological conditions during the year. The registered consumption of biomass in 2006 was 150 ktoe. The relative share of biomass energy useis similar to the level of European countries that are not in the OECD and three times higher than in OECD-.

The household thermal energy consumption in Macedonia is 6,9% of the total household energy consumption, while in the European OECD countries this percentage is 4%, and in the non-OECD European countries this percentage is 13.7%. The household thermal energy consumption in the European countries has been falling for the past ten years both in absolute and in relative terms, whereas in Macedonia this consumption varies and, in 2006 it was on the same level of consumption as in 1994, which was 42 ktoe.

One characteristic of the European countries, particularly the developed European countries, is the large share of household natural gas consumption (close to 40%). Macedonian households still do not use natural gas.

The consumption of oil products has been growing since 1998, however, the growth rate of 0.5% per year is very low considering the small share of the oil products (6,7%

[6] © OECD/IEA, [2008], IEA Online Database: Energy Balances of Non-OECD and OECD Countries and Energy Statistics of Non-OECD and OECD Countries

in2006). In that context intensive measures have to be taken to introduce natural gas in the households and to increase the share of oil products (LPG, heating oil) replacing electricity.

With a share of 0,5%, the use of coals in the households in Macedonia is ¼ the use of coals in the households of the developed European countries. The participation of coals in the households in Macedonia dropped by a factor of 3 during the period from 1996 to 2001, and has remained constant since, at a level of 3 ktoe.

Given the above, Macedonia's household sector needs intervention in increasing the efficiency of energy use, particularly improving the efficiency (or switching fuels) for space heating, introducing natural gas for residential consumption.

Energy policy for the residential sector is characterized by a set of instruments targeted at various aspects of residential energy use. This package of instruments aims to increase awareness on energy use and energy savings, to provide incentives to home owners to take measures to improve the efficiency of their houses and addresses regulations for new building construction and renovation of existing buildings.

1.1.1. Energy efficiency improvement measures in the residential sector

Table 1.1: Overview table of all existing Energy Efficiency Improvement (EEI) programs and measures in Households

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
-	-	note 1	National / regional / local	share in FEC	list	note 2	
1	**2**	3	4	5	6	7	8
1.	**Installation of individual heat allocators for District Heating in Skopje**	Information and mandatory information measures	Local	Households	Metering and informative billing Increased awareness on energy use. Prescribe the content and the frequency of delivering bills for the net-bound forms of energy (heat). The bill must be easy to understand. It must contain a graphical comparison of the consumption in the billing period of the present year compared to the corresponding period of the previous year. The bills must be based on actual consumption instead of an estimated consumption of	New EEI measures under consideration. The measure will be implemented in the period 2010-2018.	**0,37/1,38**

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
					each period. The invoice must also contain information on sources where advice on energy efficiency can be received		
2.	**Social Housing Projects**	Financial instruments / subsidies	National	Low income inhabitants	Energy poverty reduction. Living comfort improvement.	New EEI measures under consideration. The measure will be implemented in the period 2010-2016.	**0,26/0,93**
3.	**Adoption and Enforcement of Building Energy Codes**	Regulation	National	Experts (Project developers, manufacturers of building materials, contractors and craftsmen), building/ home owners	Building codes will regulate the technologies used building materials such as windows, doors, insulation materials, lighting and HVAC systems.	Building codes have been put in place through the Rulebook for Energy Efficiency of Buildings. Secondary legislation is needed to fully transpose the requirements of the EPBD directive. Its adoption is expected in 2011. This measure will be implemented after the adoption of all necessary regulation.	The saving potential of this measure is estimated to **2,98/8,9** This estimation includes all fuel types.
3.1	**Electrical appliance and equipment labelling, and energy performance standards**	Information and mandatory information measures/Regulation	National	Households	Increased market share of energy efficient appliances	Remaining regulations in the field of eco-design end energy efficiency requirements for equipment will be adopted in 2011. The labelling scheme will be promoted through information campaign. This measure will be implemented after the adoption of the secondary legislation.	Included into savings accepted with building codes

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
4.	**Replacement of fire wood furnaces with high efficient models**	Information and mandatory information measures	National	Residential sector – households/home-owners	EEI actions targeted the building system technologies, dedicated for the use of fire wood for heating purposes	A nation-wide information campaign will have to be organized The measure will be implemented in the period 2010 – 2018.	The saving potential of this measure is estimated at **0/486/6,4**
5.	**Establishment of information centres; implementation of information campaigns on energy efficiency**	Information and mandatory information measures	National	Households, municipalities and tenants	Increased awareness and consequently modified end-user behaviour; training and technical support	A nation-wide information campaign will have to be organized to achieve envisaged targets. The measure will be implemented in the period 2010-2015.	The saving potential of this measure is estimated at **1,08/7,6,** with possible additional large potential of no/low cost measures. This estimate includes all fuel types.
6.	**Use of new efficient boilers for individual central heating**	Information and mandatory information measures/Regulation	National	Experts/ Municipal authorities	Increased awareness and consequently modified end-user behaviour;	The nation-wide information campaign will have to be organized. The implementation of the measure is on-going and will continue until 2018.	The saving potential of this measure is estimated to **0,39/2** This estimate includes all fuel types.
7.	**Financial support to natural persons for EEI**	Financial instruments / subsidies	National	Residential sector – households/home-owners	EEI actions related to all building system technologies, and especially for the use of RES for heating purposes (solar	A financing scheme to be developed.	The saving potential of this measure is incorporated in all of respective measures proposed.

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
	investments				thermal, biomass furnaces and heat pumps)		
8.	**Use of solar collectors and geothermal heat pumps**	Information and mandatory information measures/ Financial instruments / subsidies	National	Residential sector – households/home-owners	Increased awareness and consequently modified end-user behaviour;	A nation-wide information campaign will have to be organized. The implementation of the measure is on-going and will continue until 2018.	The saving potential of this measure is estimated at **0,42/2,0.** This estimate includes electricity savings
9.	**EE Retrofits for Buildings**	Information and mandatory information measures/ Financial instruments / subsidies	National	Residential sector – households/ home-owners	Increased awareness and consequently modified end-user behaviour;	The nation-wide information campaign will have to be organized A financing scheme to be developed. The implementation of the measure is on-going and will continue until 2018.	The saving potential of this measure is estimated to **1,63/11,4** This estimate includes all fuel types.

1.1.2. Description of individual EEI measures

1.1.2.1 *Installation of individual heat allocators in the District Heating in Skopje*

Accurate information on energy consumption can affect the end-users' decisions in demand-management and making investment in energy efficiency improvements. The ESD requires, therefore, that Member States ensure individual metering and informative billing. These requirements for measurement and billing have only been partly transposed in Macedonia. The relevant legislation exists, but there are constrains produced by old fashioned design of building heating systems (vertical risers). The consumed energy is measured at substations, and not on individual apartment level within the building. The use of heat allocators is envisaged to solve this problem.

Table 1.1.2.1 Basic financial and energy results of end-use metering and consumption-based billing for consumers of Toplifikacija Skopje DH company

		2012	2018
Number of connected customers (households)		53408	
Installed allocators (HCAs)		3200	11800
Overall penetration rate till 2020	%		24,9
Average en. saving per flat	%		15%
Energy savings/flat	ktoe		0,000117
Energy savings/flat	kWh/a		1362
Yearly energy saving	ktoe/a	0,37	1,38
Cumulative energy saved	ktoe	0,73	6,37
Average investmentper flat	€		300
Investment (sum)	M €	0,96	3,54
Cumulative Financial Savings	M €	0,3	2,6
Simple Payback Period	year		6,27

The district heating company Toplifikacija AD Skopje, with its newly established heat supplier companies (off-shoots of the mother company Toplifikacija) are going to offer this opportunity to their customers, as an ESCO service.

Simulation of the penetration rate (**Figure 1.1.2.1**), in accordance with existing preconditions gave following aggregated results presented in Table 1.1.2.1.

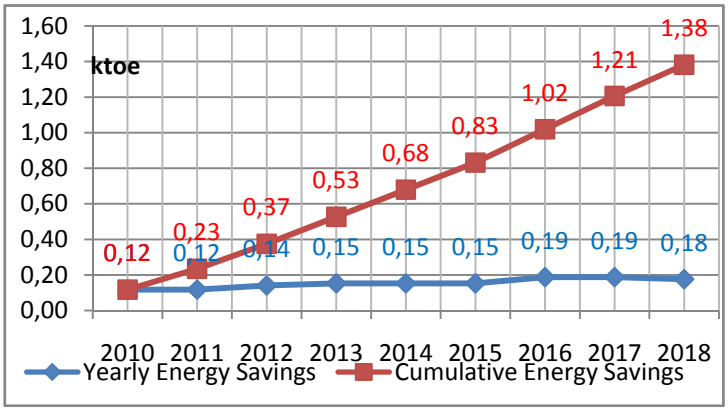


Figure 1.1.2.1.Yearly penetration rate and energy savings from end-use metering and consumption-based billing

The blue curve in Figure 1.1.2.1 presents the savings (Yearly Energy Savings in ktoe/year), showing the level of penetration of savings in this particular year.

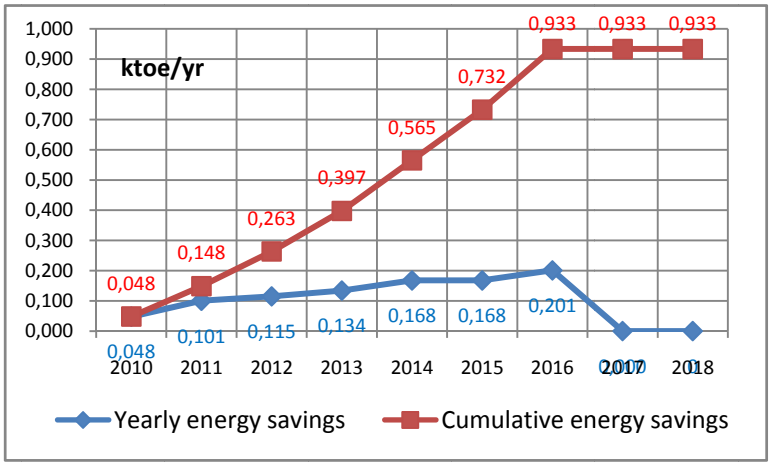
The red curve presents the savings (Cumulative Energy Savings in ktoe/ in particular year), presents cumulated savings in a particular year, together with achieved savings in the former periods. The cumulative savings in some time period presents the savings cumulatively summarized for a set period of years in ktoe.

The financial performance of these measures becomes positive after 6 years since the start of implementation. Later positive effects justify the viability of this measure.

The realization of this measure is under the responsibility of the Ministry of Economy, more specifically in organizing information campaign for the customers. DH energy providers are not interested in taking part in the project because this measure will result in profit reduction on their end.

1.1.2.2 *Social Housing Projects*

Targeted social assistance for low-income citizens and construction of social housing formost vulnerable families is a significantly more appropriate solution to energy affordability in the long-run than subsidies given to the suppliers. The yearly levels of penetration, as well as yearly savings, are presented on **Figure 1.1.2.2**



.

Figure 1.1.2.2. Yearly penetration rate of EE in social housing and savings

Expecting that the Governmental policy is going in this direction, social housing is the test for implementation of the building energy performances codes, and additional support for implementation of efficient lighting and solar water heaters.

Investments in the social housing refer to building envelope, windows, new lighting, and partially efficient appliances. It produced longer pay-back period of investments equal to 7,2 years (**Figure 1.1.2.4).**Dotted curve shows financial savings with liberalized energy prices.

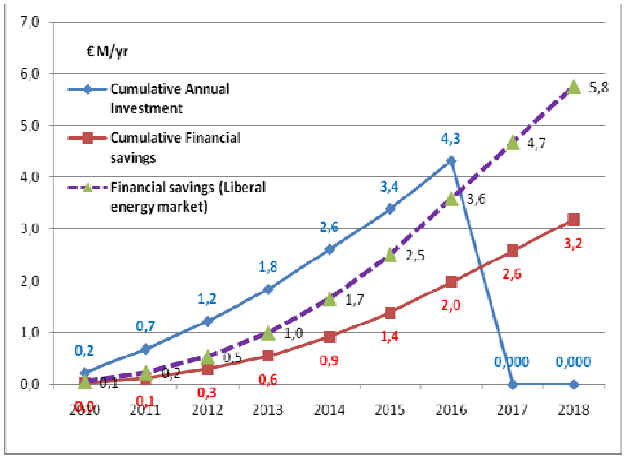


Figure 1.1.2.4. Financial performance of energy efficiency investments in social housing

There is need for significant financial support coming from the international community and donors to realize the referent ambitious project - 7000 social dwellings until 2020, with integration of the building energy efficiency best practices..

The responsibility for implementation of this project is under the authority of the Ministry for Transport and Communications. The budget of the Ministry of Transport and Communications allocated the following funds for the implementation of this measure:

- for the year 2010 – 2,1 million EUR (128.275.000 MKD); and
- for the year 2011 – 1,761 million EUR (108.375.000 MKD);

Whereas in compliance with the 2011 budget adopted, the following indicative finds have been allocated:

- for the year 2012 – 3,25 million EUR (199.930.000 MKD); and

- for the year 2013 – 3,62 million EUR (222.388.000 MKD).

1.1.2.3 Adoption and enforcement of Building Energy Codes

Building codes and their enforcement represent an efficient tool to secure the compliance of building contractors and construction companies with best practice solutions through official building codes. Completion of the legal framework in this field is expected in 2011. The Ministry of Economy (MoE) is the responsible government authority. Additionally the MoE will establish promotional/ educational programmes about the building codes to both target groups: experts and building/home-owners. The MoE will investigate possibilities for strengthening building inspection capacity (note, that this is a cross-sector measure that includes the residential and tertiary sectors, i.e. the entire building sector).

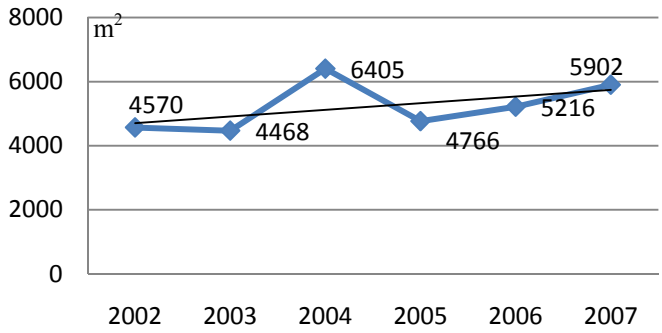
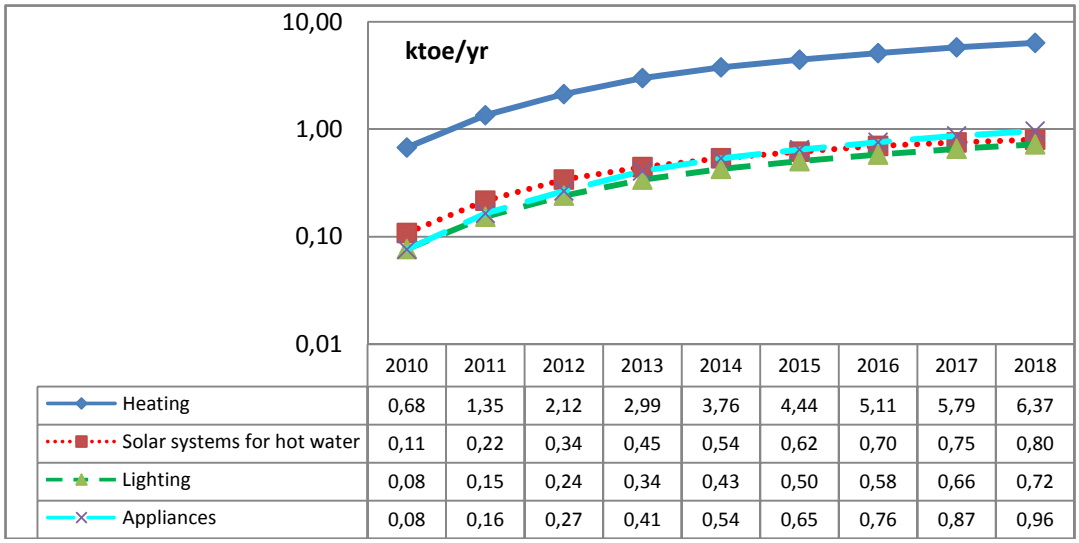


Figure 1.1.2.5. New construction trend by added area

The effectiveness of this measure is rated as high, while cost effectiveness is rated as medium, depending on the number of the new buildings constructed. The history of building stock expansion is presented on **Figure 1.1.2.5**.



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Heating	0,68	1,35	2,12	2,99	3,76	4,44	5,11	5,79	6,37
Solar systems for hot water	0,11	0,22	0,34	0,45	0,54	0,62	0,70	0,75	0,80
Lighting	0,08	0,15	0,24	0,34	0,43	0,50	0,58	0,66	0,72
Appliances	0,08	0,16	0,27	0,41	0,54	0,65	0,76	0,87	0,96

Figure 1.1.2.6. Contribution of Simulated Measures to Aggregate Energy Saving Potential of Efficient Building Codes in the Residential Sector

Seeking diversification of proposed measures in accordance with the Directive on Energy Performances of Buildings, simulations took into account particular measures:

building envelope improvements (ensuring 35-40% reduction of energy needs for heating purposes), efficient lighting, application of solar collectors for hot water preparation, and efficient electrical appliances. Contribution of each of the analysed measures to the aggregate savings potential is presented on **Figure 1.1.2.6.**

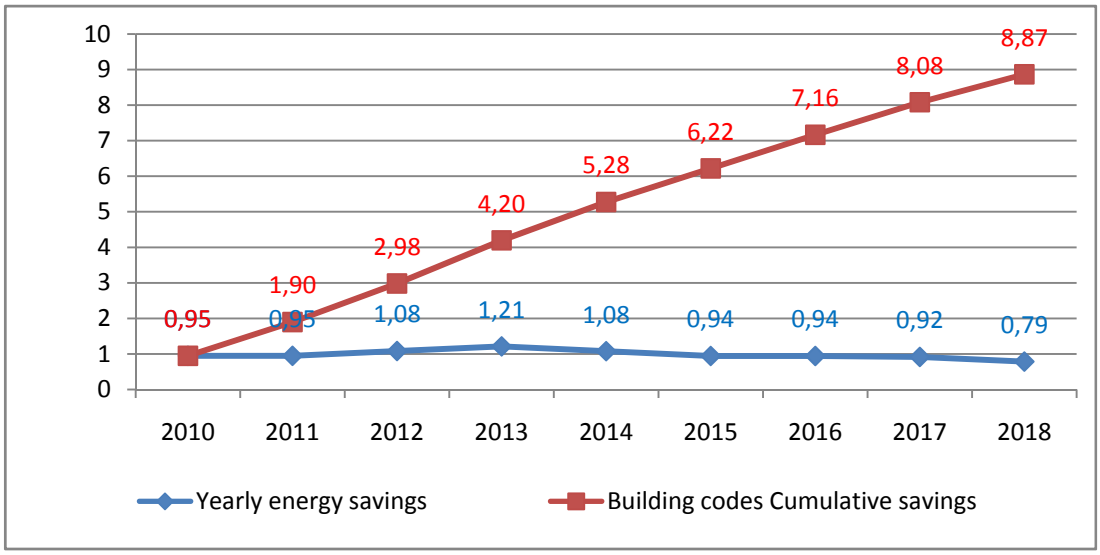


Figure 1.1.2.7.Penetration ratio of efficient building codes and yearly savings

Taking into account the proposed measures of the EPB Rulebook, the assumed number of new dwellings to be built until 2020 is 39000.[7]
The yearly penetration ratio is within the range of 0,8-1,2 ktoe (**Figure 1.1.2.7**). Cumulative energy savings range from 0,9 to 8,87 ktoe.

The Ministry of Economy and the Energy Agency are responsible to ensure the progress in penetration of the building energy codes for Macedonian society, while the role of municipalities is mainly motivational.

1.1.2.4 Electrical appliance and equipment labelling and energy performance standards

An appliance labelling scheme has already been introduced in Macedonia and has to be applied since January 1, 2010. It must be strengthened by regular inspections and reporting by the State Inspectorate. Energy performance standards will be introduced into the legislation – especially on eco-design requirements. The effectiveness can be boosted by combining this instrument with other instruments (especially the information campaign) and by regular updates.

[7]Number of average families with 70 m^2 household average surface in accordance with Chapter 4 of the Strategy for improvement of Energy Efficiency in the Republic of Macedonia until 2020.

The new electrical appliances ensure at least 15% energy savings compared to the existing ones that have been in use over than 10 years and without energy labels. Only a part of the new houses will be equipped with new appliances – expected level of replacement starts at 40% to reach 90% in 2020.

Energy savings results are shown in Figure 1.1.2.6 as contribution to Aggregate Energy Saving Potential of the Efficient Building Codes.

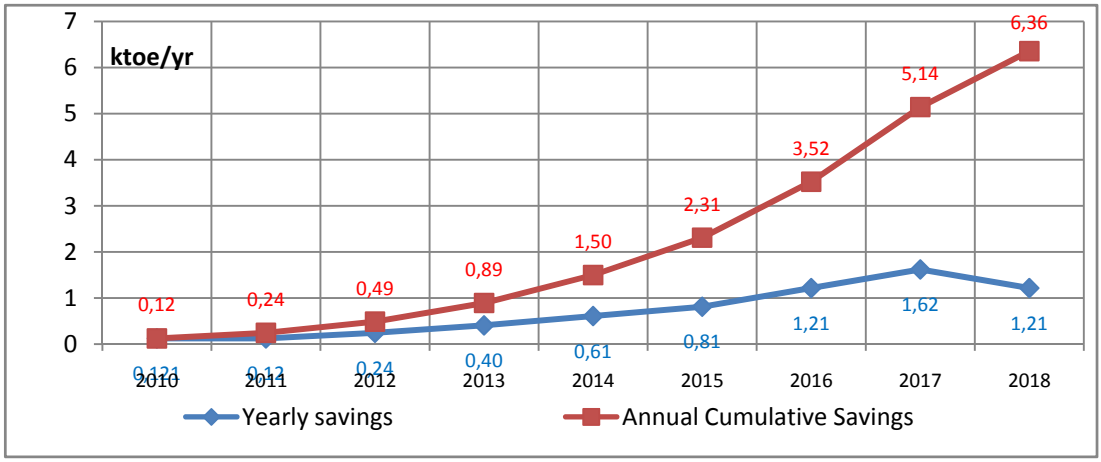
1.1.2.5 Replacement of fire wood furnaces with high efficiency models

Introduction of the new generation of high-efficiency, multi-functional furnaces (heating, cooking and/or hot water preparation) will reduce fire-wood consumption. The expected benefit is not merely saved energy, but also reduced rate of deforestation.

Under the assumption that 67420 families (of the 429429 presently using fire-wood furnaces) introduce new furnaces, the saved energy will be equal to 20,6ktoe till 2018.

The projected efficiency of the new generation furnaces is 20% higher, compared to the existing ones used in the rural settlements.

The level of penetration and yearly saving of energy from this measure are shown on Figure **1.1.2.8.**



1.1.2.8.Penetration rate of high-efficiency furnaces and yearly savings

1.1.2.6 Establishment of information centres and implementation of information campaigns on energy efficiency

Information campaigns will be launched on different levels: nationally, regionally or locally, depending on the expected effect, interest and the ownership of residential buildings. Campaigns over the course of a limited period of time provide the most effective impact.

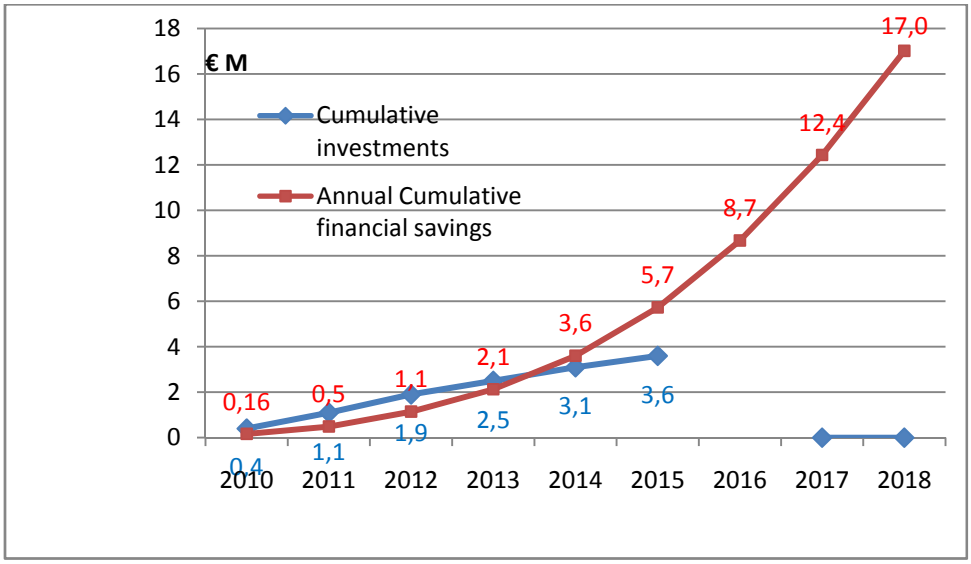


Figure 1.1.2.9. Financial results produced with information campaigns

Campaigns will be targeted towards encouraging specific actions, e.g. new insulation, lighting by communicating the consumers how much energy loss can be avoided, how much financial saving can result, what comfort improvement and energy supply reliability results can residential energy efficiency measures yield. A well planned campaign with clear target groups and objectives will have a positive impact on attitudes and awareness about home maintenance and energy use. Both the effectiveness and cost-effectiveness are rated as high (**Figure 1.1.2.9**).

Eight regional informational centres/offices will be established. Municipalities will take care on their function.

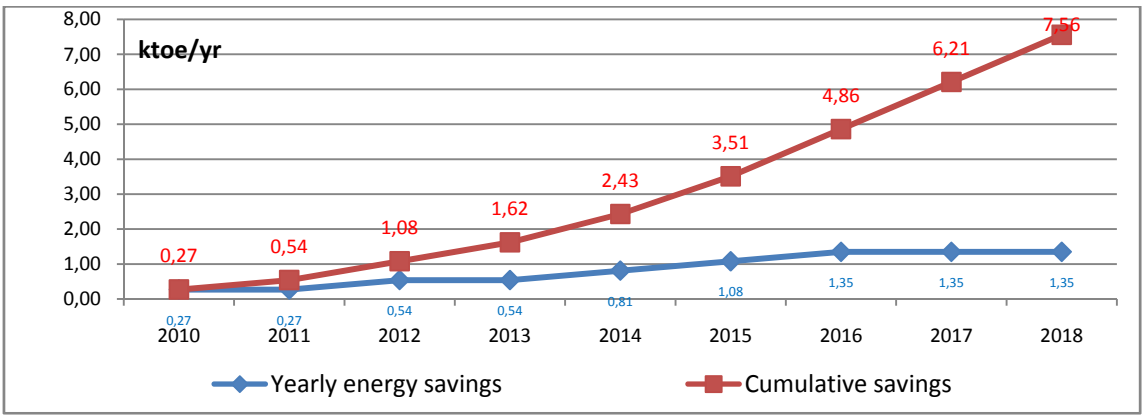


Figure 1.1.2.10. Generated yearly savings correlated with penetration ratio for the information campaigns

Expected rate of penetration increases over time, generating more and more savings (**Figure 1.1.2.10**).It is assumed that the penetration level of average families implementing different EE measures will start with 0,5% of the whole number of families, reaching summit of 2,5% in 2016/2017, and later slowly decreasing to the value of 1%. The cumulative number of the families introducing EE measures depending to the campaign will be about

22%. Average savings are assumed on the level of 10%/family, accounting average family consumption of energy which is estimated as 0,000957 ktoe/average family yearly.

Public media and NGOs are envisaged as the implementers of the campaign as well. The responsibility to finance, control and evaluate goes under the authority of the Ministry of Economy and EA.

1.1.2.7 Use of new efficient boilers for individual central heating (Hot water boilers and air conditioners labelling and energy performance standards control)

Over 16900 houses use boilers for individual centralized heating. Significant number of them is old-fashioned and outdated (over 20 years old), using old-fashioned inefficient burners. It is assumed that 1000 customers will buy new boilers till 2012, and this number should reach 4980 in 2018.

The assumptions for higher efficiency of the new boilers for individual centralized heating are at the level of 15%.

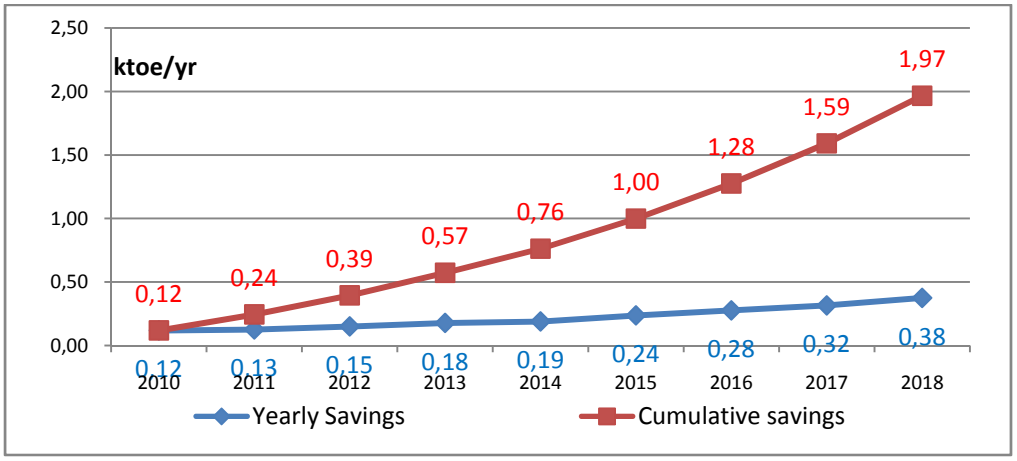


Figure 1.1.2.11 Energy savings trend for hot water boilers and air conditioners control

Energy savings and yearly penetration of energy savings are presented on **Figure 1.1.2.11**.

The investments for new boilers are high. Simple pay-back period is longer compared to other measures –12,9 years, after which the measure produces savings.

1.1.2.8 Financial support to natural persons for EEI investments

The program for investment subsidies for natural persons will be developed and administered by the Ministry of Economy (for example: subsidy for installation of solar collectors) and the Fund for Energy Efficiency.

The Government will enable the environment for the commercial banks to design specialized funds aimed at the residential sector, moreover offering soft loans.

1.1.2.9 Application of solar collectors and geothermal heat pumps (GHP)

Solar energy utilization in Macedonia is not yet on the scale feasible and appropriate given its potential in the country. The Government had once provided financial support to investors installing solar collectors. The initiative was spontaneous and limited in scale, without long-term policy application.

Subsidies for investment in new solar collector systems for hot water preparation (substituting electrical energy) and high-efficiency geothermal heating pumps offering free of charge preparation of hot water in the summer time should be supported by the Energy Efficiency Fund.

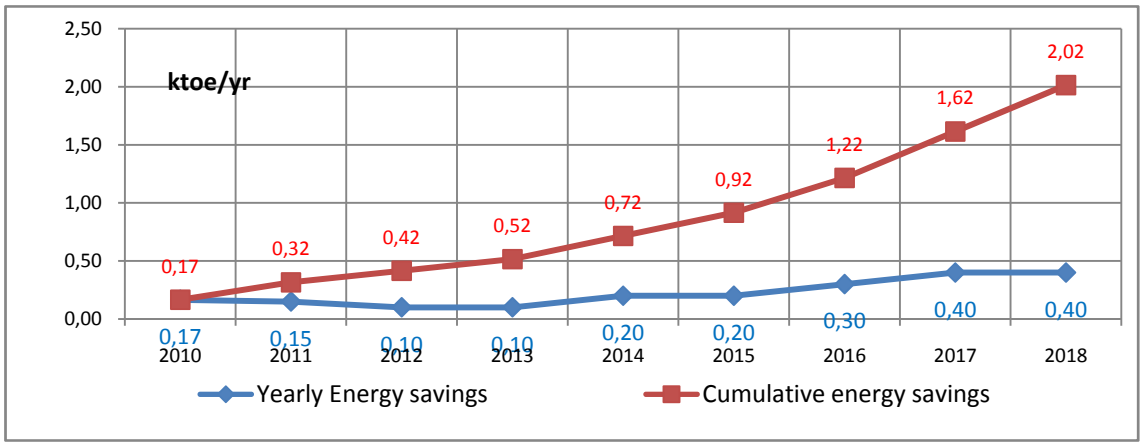


Figure 1.1.2.12.Energy savings and yearly penetration rate for solar water heaters and GHP

To estimate the potential savings of this measure, a conservative level of penetration was assumed, with an average yearly savings in the frame of 0,17to 0,4 ktoe in 2018.

Calculations were realized taking in account that an average household (with 70 m^2 space) uses a collector with 2m^2, utilizing over 900 kWh of solar energy per year. Hence, saved energy up to 2018 will be 7,89ktoe.

1.1.2.10 EE Retrofits in existing buildings

The existing building stock offers a major field for introducing EE measures all over the State. The building stock has mixed ownership, as follows:

- Total number of dwellings is 697 529, of which 690 961 are privately owned
- Total number of buildings is 446 235, of which 105 640 belong to the multi-family real estate.

The implemented measures for renovation of dwellings until 2020: 98 750.

The dynamic of penetration of assumed measures is from 0,5 till 4%/year (2821 till 22572 average dwellings, accordingly).

Disaggregated EE measures of building envelope are presented in Table 1.1.2.2:

Table 1.1.2.2: Energy savings, investment and financial savings with introduction of EE measures for building envelope elements

Heating energy for average household	ktoe/yr	0,0005513	Energy savings with EE measures		Surface affected	Investment	
Elements of energy transfer		ktoe/yr	%	ktoe		Specific €/m2	one average apartment € M
Roof	0,25	0,000138	0,5	0,000069	70	4,5	0,000315
Walls	0,4	0,000221	0,5	0,000110	56	20	0,00112
Windows and doors	0,25	0,000138	1	0,000138	14	100	0,0014
Floor	0,1	0,000055	0,5	0,000028	70	6	0,00042

Building element	Energy price		Financial savings € M/year		SPB		Investment in savings
	Electricity	Fire wood	Electricity	Fire wood	Electricity	Fire wood	€M/ktoe
Roof	0,727	0,186	0,00005	0,00001	6,29	24,58	4,57
Walls			0,00008	0,00002	13,97	54,62	10,16
Windows and doors			0,00010	0,00003	13,97	54,62	10,16
Floor			0,00002	0,00001	20,96	81,92	15,24

Assuming that most families should start with the most promising measures as electrical lamp changing (SPB only 2,47 years) and roof insulation (SPB=6,29 years) the average SPB period for this sector, affected with introduction of much expensive measures with longer SPB period is 10 years. This estimation is quite conservative, considering the electricity market liberalization after 2015, affecting electricity prices increasing, the same EE measures will be realized with SPB of 6,24 years.

The age structure of buildings is presented in Table 1.1.2.3:

Table 1.1.2.3: Building stock age structure

Total number of dwellings		Period of construction							
Number	Floor surface m^2	Until 1918	1919-1945	1946-1960	1961-1970	1971-1980	1981-1991	1991-1999	After 1999
697 529	49 671 709	7759	27521	73688	136418	181969	151434	74475	44265

In general, the opaque parts of the building were not regularly taken care of, except for emergencies. Thermal insulation of the opaque parts was never used in older buildings.

Expected level of EE measures' uptake in the existing buildings, starting with the cheapest ones(windows and doors weatherization, efficient lighting implementation, windows replacement, the use of thermostatic valves, roof insulation) and continued to application of the best available techniques (new good insulated facades, introduction of special ventilation with recuperation, heat pumps introduction, new condensing boilers application, small scale CHP units introduction), is on the level of 11 ktoe till 2018 (Figure 1.1.2.13):

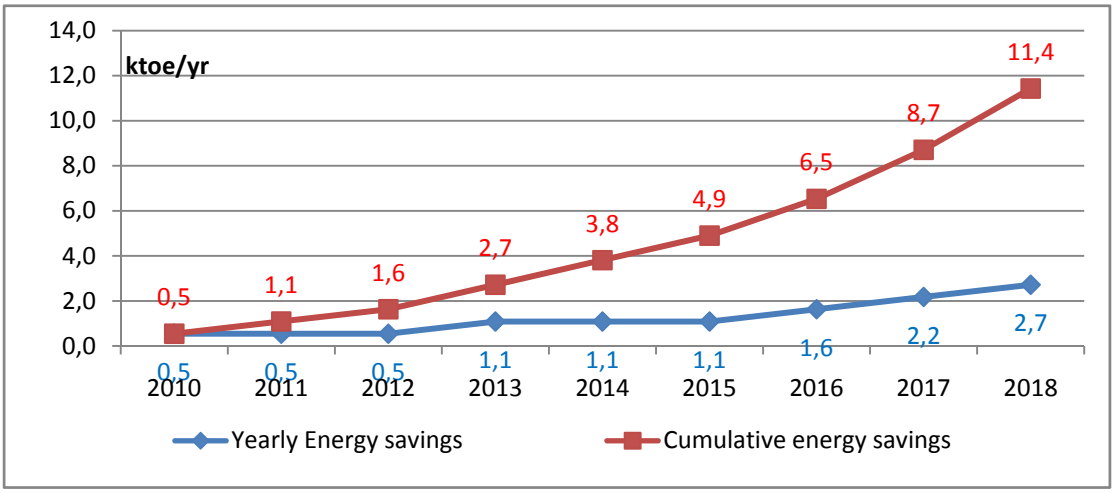


Figure 1.1.2.13.Energy savings and yearly penetration rate for buildings stock EE retrofits

The current market conditions for enabling private investments in Residential Energy Efficiency are complex and there are many challenges to it. Analysis[8] identifies the need for sector restructuring, introduction of financing tools and development of human resources to facilitate lending to the multifamily real estate owners for investing in energy efficiency improvements.

In the course of the implementation of the program for improvement of the housing conditions in the existing residential buildings and homes and in order to grant better and more efficient maintenance conditions, among other things, the following shall be realized:

- The multi-apartment building managers (appointed individual or management company) shall organize the building energy efficiency upgrades along with the general maintenance of the building. The process shall be based on building audit recommendations; followed by an organized procurement process (tender, technical/purchasing documents, acquisition) in compliance with the BEP rulebook. A targeted financing tools is under development (ProCredit Bank, EBRD on-lending scheme with two other participating banks, EIB also upcoming).
- Landlords who are responsible for paying for building improvements may not directlyget the benefits, such as lower energy bills or increased comfort. Likewise, tenants may not want toinvest in improving homes or buildings that they donot own or may not occupy for long periods.Incentive programmes, such as assistance to

[8]Balkan Regional Residential Energy Efficiency Report, MACEF, March 2010, IFC

landlords to insulate properties and the setting ofminimum standards, can help overcome this.

- The sector is characterized with high potential for development and needs to be further liberalized. Special emphasis has to be placed on the registration and capacity building of the Homeowners Associations (HOAs), and related bodies to support their growth and rights in the first years of functioning. The HOA, as outlined in the law on Housing, will be eligible for borrowing loans from commercial banks for EE renovation.

Depending on the level of renovation, and different measures undertaken, the investment parameters have a very wide range (borrowing conditions depend to the level of the loan, the status of the borrower, margin, banks). Assuming average prices, the necessary financial investments are estimated over 80 M € up to 2018.

1.1.3. Assessment of total ESD energy savings in the sector

The assessment of energy savings in the residential sector for the period 2010– 2012 and 2010– 2018 are shown in the above Table 1.1. It is based on the expert judgement and international experience collected through reviews of EU member states' EEAPs.

It was assumed that the penetration rate for energy efficiency measures will grow, following the promotional activities and financial incentives (**Figure 1.1.3.1**).The annual aggregate energy savings for all measures will grow up to 40,51ktoe in 2018, and the cumulative energy saved over the period until 2018will equal 162,8ktoe.

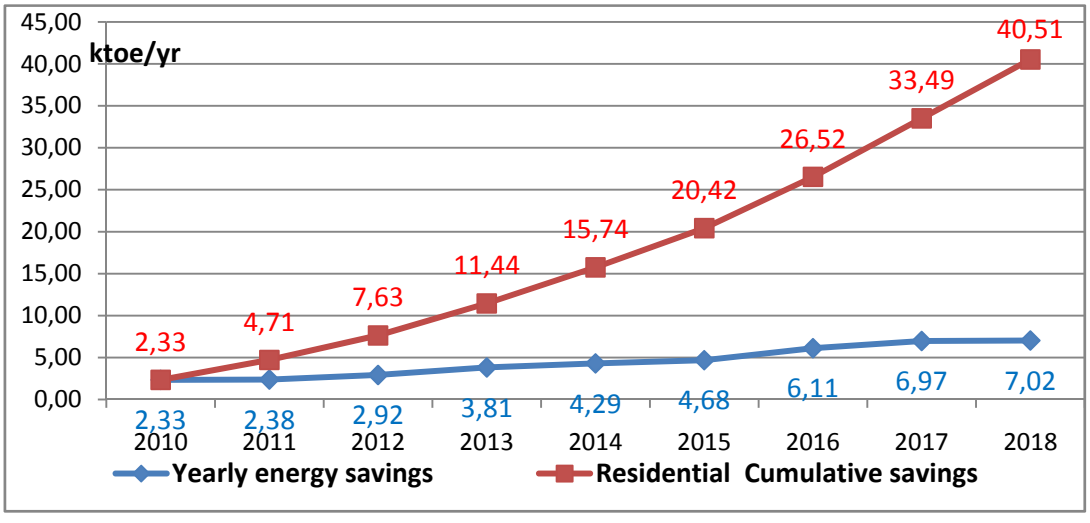


Figure 1.1.3.1 Yearly and cumulative energy savings trend

The contribution of various proposed measures to the aggregate savings is presented on **Figure 1.1.3.2**, confirming the strong impact of building certification (building energy

codes), EE retrofits in existing buildings and well organized promotional/awareness campaigns.

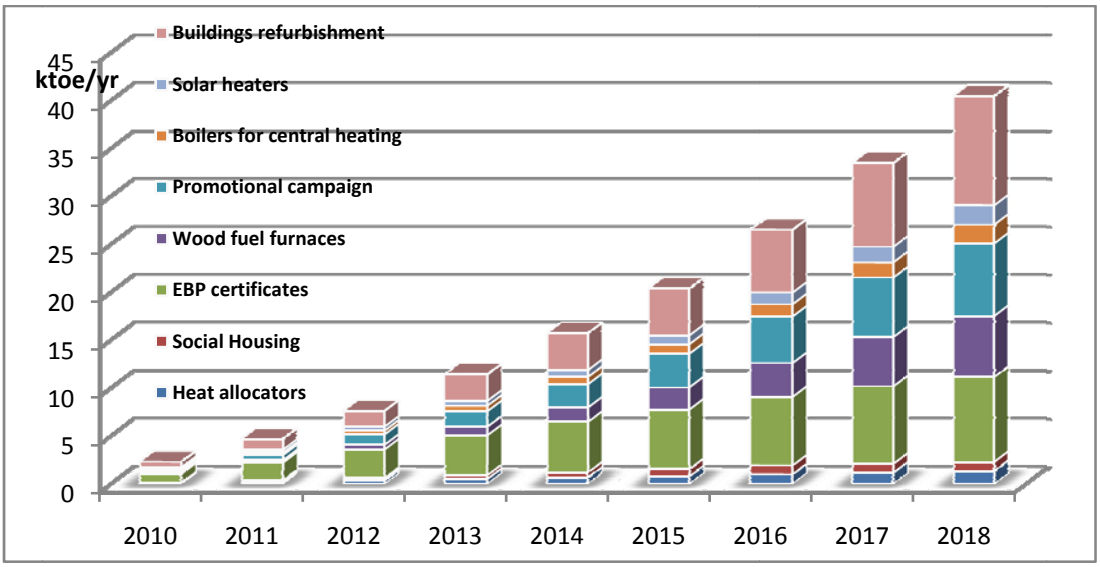


Figure 1.1.3.2. Contribution of individual energy savings measures to the nationwide energy savings

The volume of investments in the residential sector is high for a relatively short period, and payback period is longer (**Figure 1.1.3.3**). Further, during the period of buildings amortization (next 40 years) significant financial savings will be produced.

Energy prices in the State will be harmonized with regional market (by 2015) reaching level of at least 100 €/MWh, at the end-user side, compared to the present prices on the market of 60-65 €/MWh(excluding transportation and distribution cost, as well as VAT). The dotted curve on below figure 1.1.3.3 is realistic, showing the viability of EE measures, despite a first impression of little viability of such investments due to depreciated price of electrical energy.

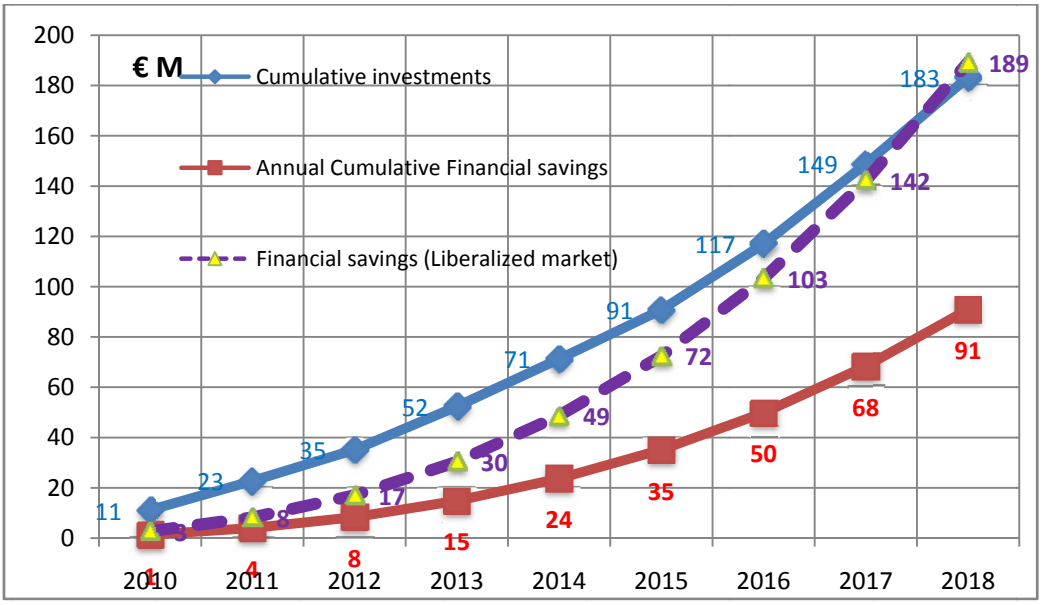


Figure 1.1.3.3. Investments and financial savings in the residential sector

The specific price of adopted saving measures and the values of saved energy, depending to the current energy prices in Macedonian market are presented in the Table 1.1.3.1.

Table 1.1.3.1 – Assumed average investment prices, saved energy values and simple payback period for individual energy savings measures

		The price of investment M€/ktoe		Simple payback period (Years)
1	Installation of individual heat allocators in the District Heating in Skopje	2,56		6,3
2	Social Housing Projects	4,62		7,2
3	Adoption and enforcement of Building Energy Codes	3,16		6,42
4	Replacement of fire wood furnaces with high efficiency models	3,712		20,0
5	Establishing information centers and implementation of information campaigns on energy efficiency			
6	Use of new efficient boilers for individual central heating	9,4		12,9
7	Application of solar collectors and GHP	10,34		14,2
8	EE Retrofits in existing buildings	7,26		10
	Average	5,86		11,00

Participation of assumed programs differs depending to the monitoring year (Table 1.1.3.2)

Table 1.1.3.2 Participation of assumed programs into Energy Savings in the Residential sector

	Title of the program/measure	Savings ktoe			Participation in savings		
		2012	***2018***	***2020***	***2012***	***2018***	***2020***
1	Installation of individual heat allocators in the District Heating in Skopje	0,37	1,38	1,56	4,91%	3,41%	2,73%
2	Social Housing Projects	0,26	0,93	0,93	3,45%	2,30%	1,63%
3	Adoption and enforcement of Building Energy Codes	2,98	8,87	10,31	39,09%	21,89%	18,04%
3.1.	*Heating in new apartments*	*2,12*	6,37	7,43	*27,82%*	*15,72%*	*13,00%*
3.2.	*Solar collectors for new appartments*	*0,34*	0,80	0,89	*4,46%*	*1,98%*	*1,55%*
3.3.	*Lighting in new appartments*	*0,24*	0,72	0,84	*3,16%*	*1,79%*	*1,48%*
3.4.	*Efficient electrical appliances*	*0,27*	0,96	1,14	*3,49%*	*2,38%*	*1,99%*
4	Replacement of fire wood furnaces with high efficiency models	0,486	6,4	7,98	6,37%	15,69%	13,96%
5	Establishment of information centers and implementation of information campaigns on energy efficiency	1,080	7,6	10,26	14,16%	18,66%	17,96%
6	Use of new efficient boilers for individual central heating	0,395	2,0	3,03	5,17%	4,85%	5,31%
7	Application of solar collectors and GHP	0,415	2,0	4,02	5,44%	4,97%	7,03%
8	EE Retrofits in existing buildings	1,633	11,4	19,05	21,40%	28,22%	33,35%
	Sum	**7,630**	**40,515**	**57,139**	100,00 %	100,00 %	100,00 %

Interdependence between investments, energy savings as well as financial savings (energy prices level 2009) is presented on the Table 1.1.3.3.

Table 1.1.3.3Energy and financial savings in correlation with investments for the particular energy savings program

Residential Energy savings program/mesure	Energy savings ktoe		Investments M€		Financial savings M€	
	2012	*2018*	*2012*	*2018*	*2012*	*2018*
Installation of individual heat allocators in the District Heating in Skopje	0,37	1,38	0,96	3,54	0,3	2,6
Social Housing Projects	0,26	0,93	1,22	0,00	0,3	3,2
Adoption and enforcement of Building Energy Codes	2,98	8,87	9,41	25,96	2,9	22,7
Replacement of wood furnaces with high efficiency models	0,49	6,36	1,80	23,60	0,16	3,81
Establishment of information centres and implementation of information campaigns on energy efficiency	1,08	7,56	1,90	3,6	1,1	17
Use of new efficient boilers for individual central heating	0,39	1,97	3,71	18,49	0,55	5,76
Application of solar collectors and GHP	0,42	2,02	4,29	20,83	0,651	5,733

EE Retrofits in existing buildings	1,63	11,43	11,85	82,95	2,4	30,1
Sum	**7,63**	**40,51**	**35,15**	**183,28**	**8,36**	**91**

In compliance with the requirements of the ESD, Macedonia will establish the system for monitoring and verification of energy savings.

First, the data collection of final energy consumption in the residential sector will be established (consumption growth of different energy forms, consumption growth by purpose).

Improvements in monitoring energy consumption in the residential sector must be made. It is necessary to monitor the number of dwellings, floor area, the number of houses and flats, thermal insulation characteristics, number and sorts of appliances, energy performance of the appliances, specific consumption of certain appliances, etc.

The structure of energy consumption in households should be determined in more detail (energy/fuel structure and purposes of use, such as for space heating, domestic water preparation, cooking, etc.). The data collection system will also include questionnaires and surveys among the households.

The EE indicators to be used for monitoring the energy savings in the residential sector will include: unit consumption per household (total, for specific purposes, per dwelling, per m^2, climate adjusted, expressed in useful energy), energy efficiency index, specific consumption of new dwellings (houses, flats), specific consumption of electrical appliances (refrigerators, freezers, washing machines, dishwashers, dust cleaner televisions), CO_2 emissions (per dwelling, for space heating).

Private capital is dominant in the residential sector investments (Table **1.1.3.4):**

Table 1.1.3.4 Investment responsibility in the residential sector (in € M)

Measure			Donors/IFIs	Private sector
	Budget of the Republic of Macedonia	Municipalities		
	2018			
Installation of individual heat allocators in the District Heating in Skopje				3,54
Social Housing Projects	2,6		0,9	0,9
Adoption and enforcement of Building Energy Codes			1,3	24,7
Replacement of fire wood furnaces with high efficiency models				23,60
Establishment of information centres and implementation of information campaigns on energy efficiency	1,44	0,72	1,08	0,36

Use of new boilers for individual central heating				18,49
Application of solar collectors and GHP				20,83
EE Retrofits for existing buildings			24,9	58,1
Sum	**4,0**	**0,7**	**28,1**	**150,4**

1.2. COMMERCIAL SECTOR AND SERVICES

The energy consumption in the commercial and the service sectors, according to the data from the International Energy Agency (IEA) varied in a wide diapason (Figure 1.2.1). This sector consists of small and medium sized enterprises (SMEs) - and the public sector.

The registered energy consumption in 2006 was 224 ktoe and represents 13,1 % of the total final energy consumption[9].

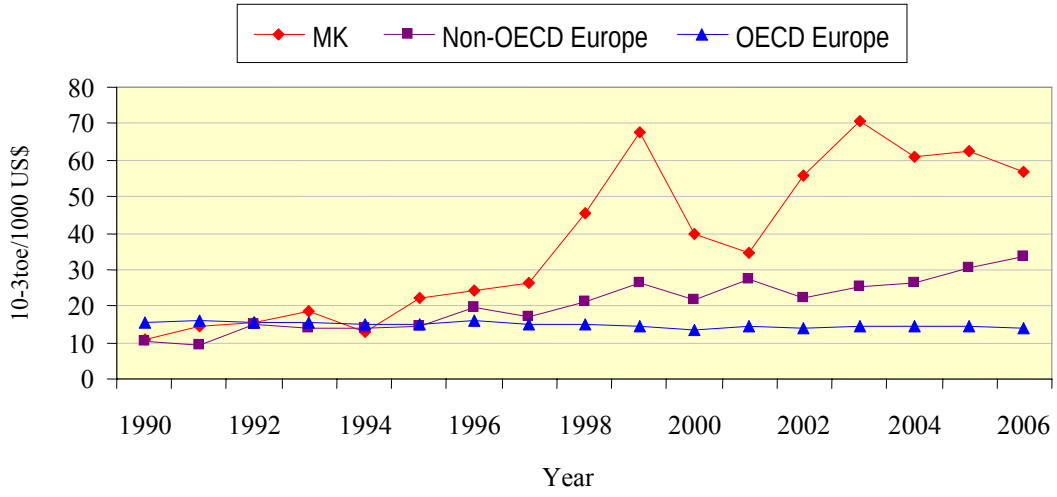


Figure 1.2.1 Consumption of energy in the commercial and the service sector[10]

Expressed per capita, the energy consumption in this sector is very small (**Figure 1.2.2**). The energy consumption per capita is similar to that in the European non-OECD countries and 2.5 times smaller than that of the developed European countries.

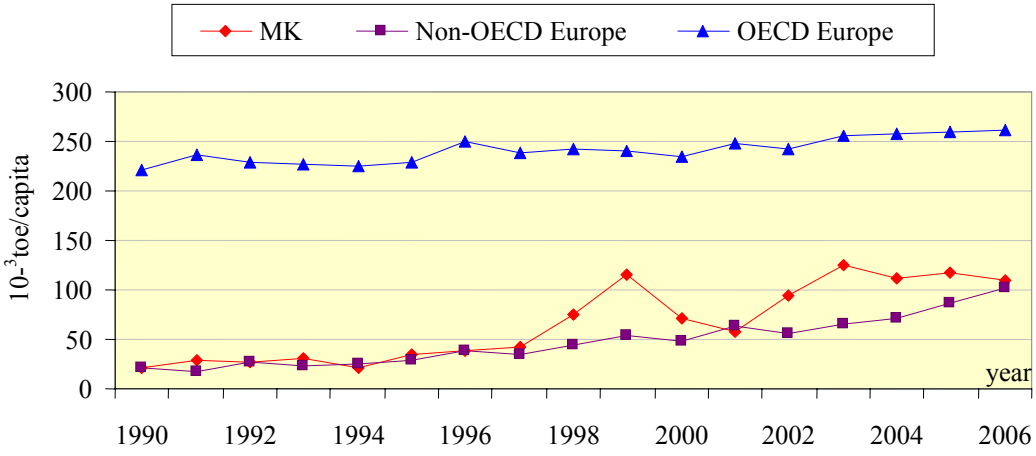


Figure 1.2.2 Energy consumption in the commercial and service sector[11]

[9] © OECD/IEA, [2008], IEA Online Database: Energy Balances of Non-OECD and OECD Countries and Energy Statistics of Non-OECD and OECD Countries
[10] IBID
[11] IBID

And on contrary, taking into account economic power, Macedonia still has very high energy intensity in this sector.

The energy consumption in this sector comprises mainly 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 (**Figure 1.2.3**[12]). The electricity consumption in this sector has been growing continuously during the analyzed period. The consumption of thermal energy is relatively constant both in absolute and in relative terms and remained at 9% in 2006. The share of other fuels is small, wood contributed 3.7%, coal was at 1.8%, geothermal energy was 0,6% and natural gas - 0.2%.

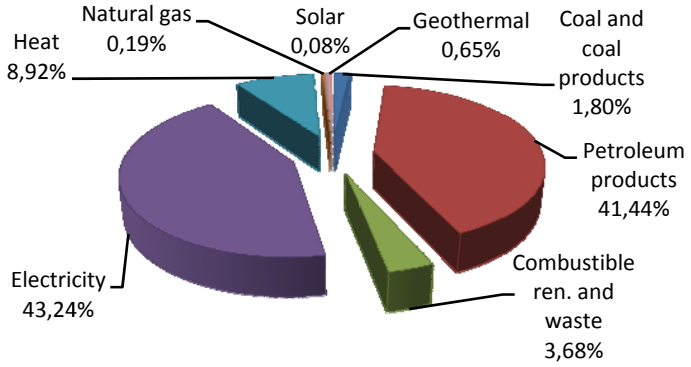


Figure 1.2.3 Consumption of energy in the commercial and service sectors by primary energy source

In the short-term, the focus will be 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 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 (project in the stage of establishment – **MAMNEE, Ma**cedonian **M**unicipal **N**etwork for **E**nergy **E**fficiency)[13]. Finally, energy efficiency criteria in public procurement will enable the faster penetration of energy efficient products and technologies into the market, which will eventually lower their prices and trigger utilisation on a much wider scale.

Two latest trends can influence the approach to improving energy efficiency in publicfacilities. First, allocation of greater financial responsibilities on municipalities maystimulate initiatives for the introduction of energy efficiency measures to decreasemunicipal expenditures. Second, privatisation has started in the social sector of theeconomy and in the public administration. A portion of non-core activities in health,education and administration has been carved out from the state entities and they havebeen subcontracted to private sector entities.

[12]© OECD/IEA, [2008], IEA Online Database: Energy Balances of Non-OECD and OECD Countries and Energy Statistics of Non-OECD and OECD Countries
[13]MACEF to manage start up process.

1.2.1. Energy efficiency improvement measures in the Commercial and Services sector

Table 1.2.1: Overview table of all existing EEI programs and measures in Commercial and Services

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
-	-	Note1	National/ regional/ local	Share in FEC	List	Note2	
1	2	3	4	5	6	7	8
1.	Adoption and enforcement of Building Energy Codes	Regulation	National	Project developers, manufacturers of building materials, contractors and craftsmen, building/ home owners	Building codes will define the technology connected to building materials like windows, doors, insulation materials, lighting and HVAC systems.	Building codes are established by the Rulebook for Energy Efficiency of Buildings. Secondary legislation is needed to fully transpose requirements of the EPBD directive. Its adoption is expected in 2011. Related activities will follow the adoption of all necessary regulations. Implementation will start in 2011.	The saving potential of this measure is estimated to equal approx. 1,15ktoe in 2012, 7,55ktoe in 2018. The estimate includes all fuel types.

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
2.	Inspections of boilers/air conditioning systems	Regulation	National	Owners, energy managers and maintenance staff	Increased efficiency of boilers and HVAC systems in buildings	The legal framework will be adopted by the end of 2010. Implementation is expected to start in 2011.	The saving potential of this measure is estimated to be equals approx. 1,1ktoe in 2018, 0,3ktoe in 2012. The estimate includes light oil and electricity.
3.	EE refurbishments of buildings in the education sector (400 schools refurbishment – Ministry of Education and Sciences Plan)	Voluntary agreements and coopera-tive instru-ments. EE public procurement /Regulation/ Financial measures	National	Municipal authorities/ Citizens	Increased efficiency of school's installations	New EEI measure process of implementation is on-going	The saving potential of this measure is estimated to be at least3 ktoe in 2018 and 0,7ktoe in 2012.
4	Establishment of information centres and Municipal Network and implementation of information	Information and mandatory information measures	National	The entire service sector	Increased awareness and changed behaviour of end-users; Increased efficiency of municipal and county facilities and offices; Increased efficiency of state facilities and offices	Ministry of Economy, in cooperation with AD ELEM and AD MEPSO is implementing an energy savings campaign. Similar campaigns were and are implemented by EVN Macedonia. The	The saving potential of this measure is estimated to be approximately 1,71ktoe in 2018, and 0,11ktoe in 2012. The estimate includes all fuel types.

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
	campaigns on energy efficiency					implementation of this measure will continue until 2015 should be supported by Fund for Energy Efficiency.	
5.	Energy management and auditing	Information and mandatory information measures	National	The entire service sector, Administration in cities and municipalities	Increased energy efficiency in commercial sector and facilities, public buildings and facilities. Energy metering - Prescribe the content and the frequency of delivering bills for the grid-connected forms of energy (electricity, heat, gas). The bill must be easy to understand. The bills must be based on actual consumption instead of an estimated consumption of each period. The invoice also must contain information on sources where advice on energy efficiency can be obtained.	A nation-wide campaign accompanied with trainings. The measure started in 2010.	The saving potential of this measure is estimated to be at least 2,3 ktoe in 2018 and 0,3ktoe in 2012. This estimate includes all fuel types.
6.	Street Lighting Projects	Information and mandatory information	Local/ National	Municipal authorities/ Citizens	Increased Energy Efficiency at Municipal level	"Early action"- EEI measures implemented after 2005 and having results in 2010	The saving potential of this measure is estimated to be approximately 0.92 ktoe in 2018

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
		measures/Financial					and 0,11 ktoe in 2012. This estimate includes only electrical energy savings.
7.	Electrical appli-ance and equip-ment labelling and energy performance standards	Information and mandatory information measures/Regulation	National	Institutions/ Public buildings	Increased market share of energy efficient appliances	The Rulebook on Energy Efficiency Labelling for Household Appliances was adopted in 2008. The remaining regulations will be adopted in 2011 (in compliance with the new Directive 2010/30 and new Rulebook on Energy Consumption Labelling and Other Energy-Related Products) and the Act on Eco-Design. The labelling scheme can be promoted through the information campaign.	The saving potential of this measure is estimated to be approx. 1,5 ktoe in 2018 and 0,1 ktoe in 2012. The estimate includes only electricity.
8.	EE Retrofits for hospital buildings	Information and mandatory information measures/R	National	Institutions in the Health sector	Increased awareness and changed behaviour of end-users; Increased efficiency of hospital buildings' facilities and offices;	The implementation of this measure started in 2010.	The saving potential of this measure is estimated to approx. 3,61 ktoe in 2018 and 1,5ktoe in 2012. This estimate includes light oil and electricity.

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
		egulation/Financial					
9.	Application of solar collectors and geothermal heat pumps	Information and mandatory information measures/Regulation/Financial	National	Institutions/ Public buildings	Increased awareness and changed behaviour of end-users;	A nation-wide campaign, escorted with financial incentives.	The saving potential of this measure is estimated to be approx. 2,49 ktoe in 2018 and 0,69 ktoe in 2012. This estimate includes light oil and electricity.

1.2.2. Description of individual EEI measures

1.2.2.1 *Adoption and enforcement of Building Energy Codes*

Building Energy Codes and enforcement represent an efficient method to secure the compliance of building contractors and construction companies with best practise solutions through official building codes. Completion of the legal framework is expected in 2011. The MoE is the responsible ministry. MoE will establish the promotional/educational programme on the building codes oriented towards both target groups: experts and energy managers.

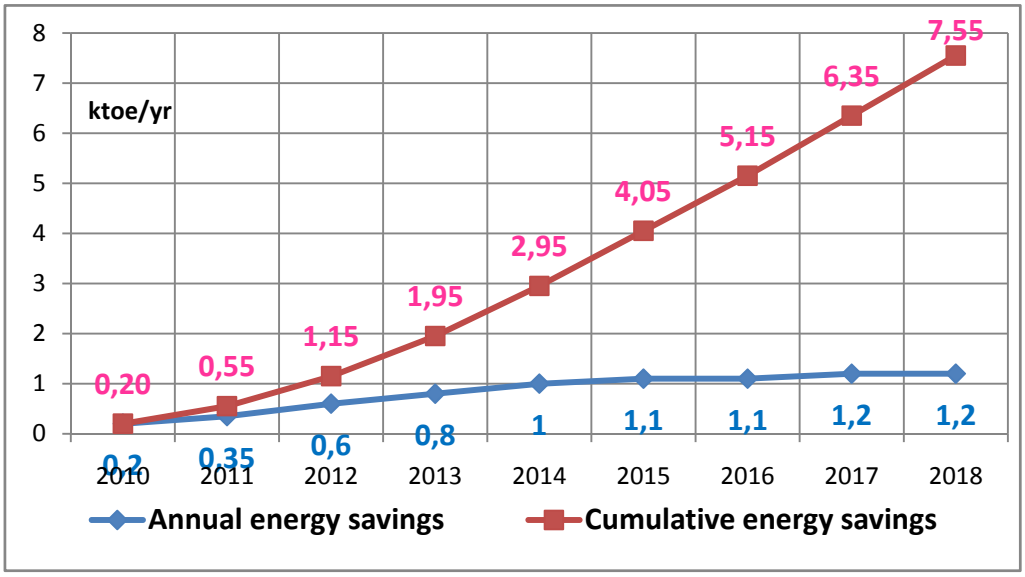


Figure 1.2.2.1.Yearly and cumulative energy savings

The MoE in cooperation with the Ministry of Transport and Communications will investigate possibilities for strengthening building inspection capacities (note that this is a cross-sector measure including the residential and commercial sectors, i.e. whole building sector). The effectiveness of the measure is rated as high (**Figure 1.2.2.1**), while the cost effectiveness is rated as medium.

There is not sufficient data to refer to in regard to the commercial sector, thus the values for the projected savings were based on the estimate on how they compare to residential buildings and the heating systems of those buildings. Below are some of the factors that were considered:

- commercial buildings are mainly heated during their hours of operation. For some buildings this may be for 5 days a week, for others 6 or 7 days a week, each 9 to 12 hours per day.
- commercial buildings tend to have a lot of traffic in and out of the buildings, requiring the building doors to open and close frequently. The efficiency improvements do not address this issue.
- many of the heating systems in these buildings are space heating systems.

The particular space heating systems do not have proper controls, and even in the event of implemented energy improvements, energy will not be saved. Rather, the temperature in the space will increase.

Therefore, given these features the potential for energy savings in the commercial buildings is lower.

The savings' estimate for the commercial sector is likely somewhat conservative because it does not include savings from conversion to high efficiency lighting (e.g., fluorescent and compact fluorescent lamps, electronic ballasts). Lighting is an important factor for many commercial establishments.

Nonetheless, since no disaggregated statistics was available for the subcategories of commercial energy use, any estimates of savings and economic results of lighting upgrades in commercial sector would not be credible. Nonetheless, on the national scale the enforcement of the Building Energy Performance requirements through building codes and certification will cumulatively promote efficiency improvements in this subsector.

The level of savings is cca. 34% compared to other measures in this sector.

In addition, the continuous growth of the energy prices will remain strong impetus for the private commercial sector to accept the building codes instantly.

1.2.2.2 *Inspections of boilers/air conditioning systems*

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 will be stipulated under the Rulebook on Energy Performance of Buildings, which is anticipated for adoption pursuant to the Energy Law ("Official Gazette of the Republic of Macedonia" no. 16/2011).

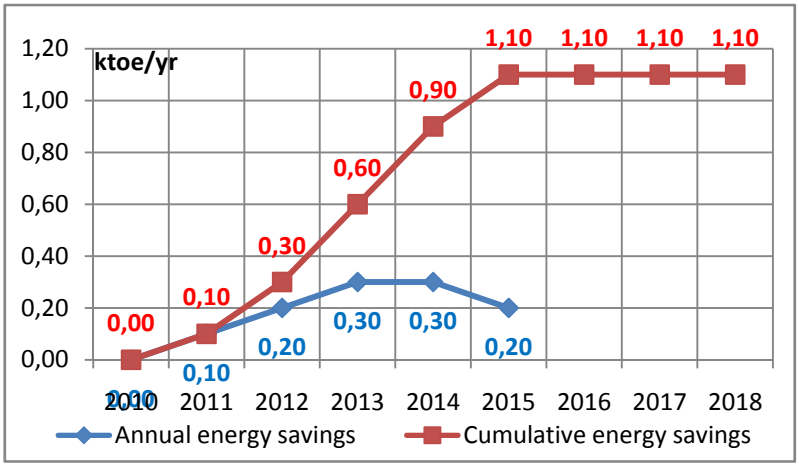


Figure 1.2.2.2 . Energy savings trend due to hot water boilers control

Realization of Energy Services Directive will produce efficient work of existing hot water boilers, expected to be efficient after 2010 (**Figure 1.2.2.2**).

Limited investments are necessary to realize training of inspectors, or energy auditors, if this task will be delegated to them *(***Figure 1.2.2.3)**.

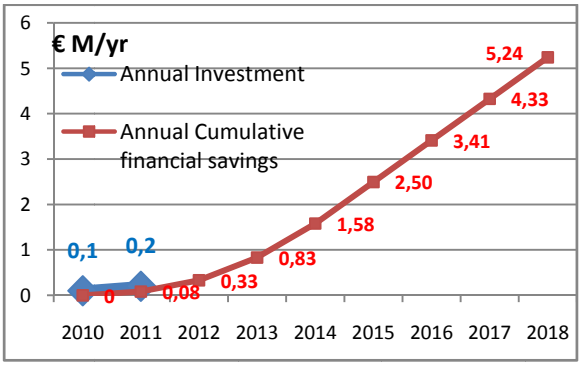


Figure 1.2.2.3.Financial savings due to hot water boilers control

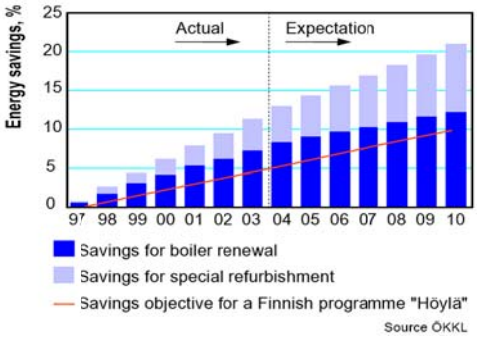


Figure 1.2.2.4. Actual and expected results in a 10 years period

The conclusions of an Irish study based on a theoretical determination of efficiency loss versus fouling of the boiler, depending on hours of operation, justifying the 2,5% loss per year. Similar results are expected with Finnish program (**Figure 1.2.2.4**[14]).

1.2.2.3 *EE refurbishments for buildings in the education sector*

The Ministry of Education and Science has a plan to continue with the refurbishing of primary education schools in Macedonia, as well as secondary ones (449 schools).

An investment of 19,9 M€ can annually achieve energy consumption reduction of 3ktoeup to 2018 (cumulative savings till 2018 will be equal to 13,6 ktoe). For the implementation of this measure, the budget of the Ministry of Education and Science has allocated the followings funds:

- for the year 2010 – 1,44 million EUR (88.500.000 MKD); and
- for the year 2011 – 1,80 million EUR (110.789.000 MKD);

whereas in compliance with the adopted 2011 budget, the following indicative funds have been allocated:

- for the year 2012 – 1,84 million EUR (113.066.000 MKD); and
- for the year 2013 – 2,02 million EUR (124.371.000 MKD).

The required financial means will come from the State Budget, commercial banks loans, dedicated IFI funds for EE measures (WB, EBRD, EIB, KfW), public-private partnerships and donations. The dynamics of investments from the State Budget will be harmonized with the Ministry of Finance.

[14]Inspections of Boilers and Air Conditioners, Supporting Transposition and Implementation of the Directive 2002/91/EC CA – EPBD (2005 – 2007) , Published 2008

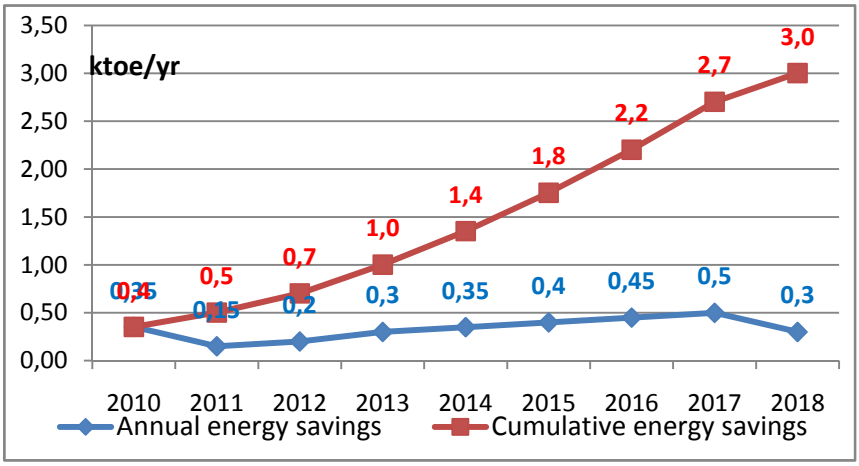


Figure 1.2.2.4 . Energy savings in the education sector

Taking in account the building stock in the education sector, and their age of utilisation, it is obvious that the project implementation will be treated with special attention. Below is a listing of schools divided by their educational focus:

- Number of Regular elementary schools 1005[15]
- Number of Special elementary schools 45
- Number of Adult elementary schools 16
- Number of Secondary education schools 101
- Number of Higher education schools 3
- Number of University education schools 43
- Sum: 1213

As recommended by successful practices, the USAID Primary Education Projectensured renovation of 100 primary education schools, mostly focusing on window replacement with higher efficiency ones.The municipalities were obliged to participate in the referent project with their own financial contribution of at least 10%.

1.2.2.4 *Establishment of information centres and the municipal network and implementation of information campaigns on energy efficiency*

Information campaigns will be launched on different levels: nationally, regionally or locally, depending on the target group, expected effect, interest and ownership of buildings.

[15]2006/ 2007Data

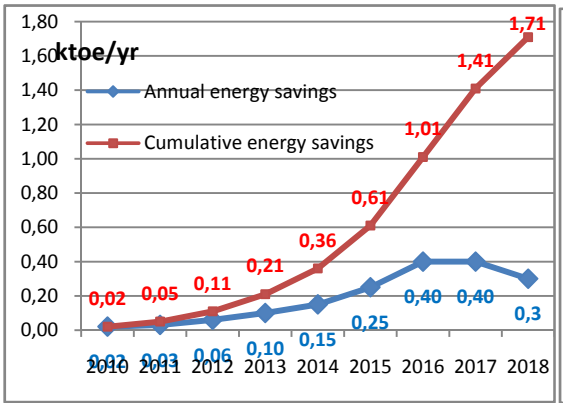


Figure 1.2.2.5. Energy savings generated by information campaigns

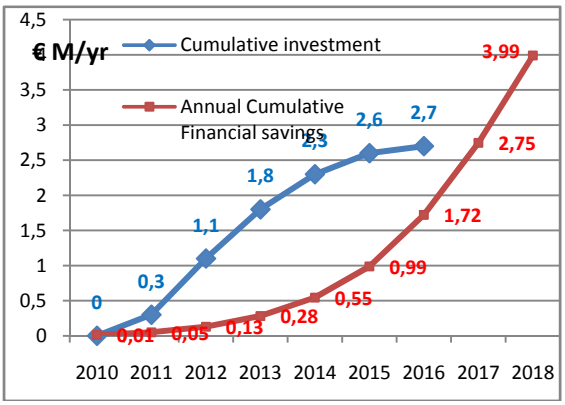


Figure 1.2.2.6. Financial savings due to information campaigns

Targeted campaigns are the most effective tool for promoting energy saving under time constraints. Campaigns will be targeted towards encouraging specific actions, e.g. installing new insulation, changing lighting methods, use of solar thermal applications in hotels, etc. A well planned campaign with clear target groups and objectives will have a positive impact on awareness and attitudes about home maintenance and patterns of energy use. Expected savings will have accelerated growth after 2013 (**Figure 1.2.2.5**).

The effectiveness and cost-effectiveness are rated as high. Results, using benefits of realized campaigns, are expected to become more attractive after 2015 (**Figure 1.2.2.6**).

1.2.2.5 *Energy management and auditing*

This measure has two specific goals:

1. Establish the organisational structure (energy manager and energy management team) within local self-governments that will enable continuous monitoring and analysis of the authorities' own energy consumption, awareness raising activities and capacity strengthening on energy management and local energy planning – as mandated in the Energy Law.
2. Introduction of a software package for implementation of Energy Management Systems (EMS).

An Energy Efficiency Office will be established in each municipality. These offices would be interconnected by a central national EE network (MAMNEE[16] - **Ma**cedonian **M**unicipal **N**etwork for **E**nergy **E**fficiency). This will make the monitoring and analysis of energy consumption in municipal facilities feasible from one central location. Such organization of local authorities will be done on the voluntary basis but strongly supported by the EE Fund. By joining this programme every municipality will make a public commitment to decrease its own annually energy consumption. It is estimated that these savings are possible even if only organisational and behavioural changes are implemented. Further

[16]In the phase of registration

energy savings will be achieved by undertaking technical measures that have been identified for EEI.

Top level municipal decision makers i.e. the mayors will be encouraged to participate in the EU initiative *Covenant of Mayors*. As a part of GTZ Open Regional Fund, the City Skopje is partnering in Capital Cities Initiative, which will enable the City administration undergo energy management training. It is expected that after the Skopje' Mayor sign the Covenant of Mayors, other City Mayors will follow this action.

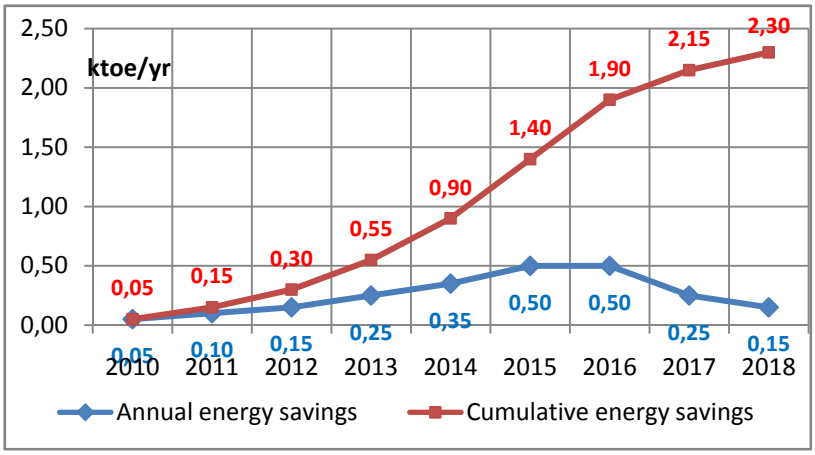


Figure 1.2.2.7 . Energy savings generated from improved municipal energy management

The level of expected savings is 2,3 ktoe in 2018 (**Figure 1.2.2.7**).

1.2.2.6 *Street Lighting Projects*

The street lighting projects are known with their best economical parameters – the shortest pay- back period of investments.

The level of expected savings is 0,92ktoe (3,77 ktoe cumulative) till 2018 (**Figure 1.2.2.8**).

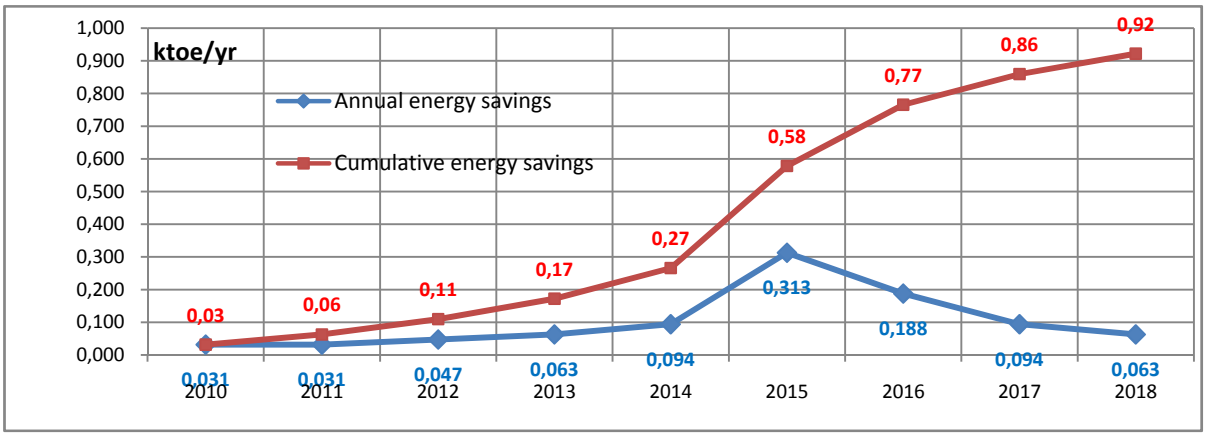


Figure 1.2.2.8 . Energy savings generated from Public Lighting Project

Such particular already realized "Skopje street lighting" project, which can be easily replicated in other municipalities, is realized with the sum of 1,2 M€, obtaining 1,77 ktoe (20,6 GWh) savings of electrical energy till 2016.

1.2.2.7 *Electrical appliance and equipment labelling and energy performance standards*

Labels and standards include a variety of policy instruments that play different roles in government efforts to encourage the development, marketing and sale of energy efficient products.

The energy efficiency labels must become a mandatory requisite in public procurement for governmental and municipal institutions. Generated savings, depending to passing of the time will reach 1,5ktoe (5,86 ktoe cumulatively) till 2018 (**Figure 1.2.2.9**).

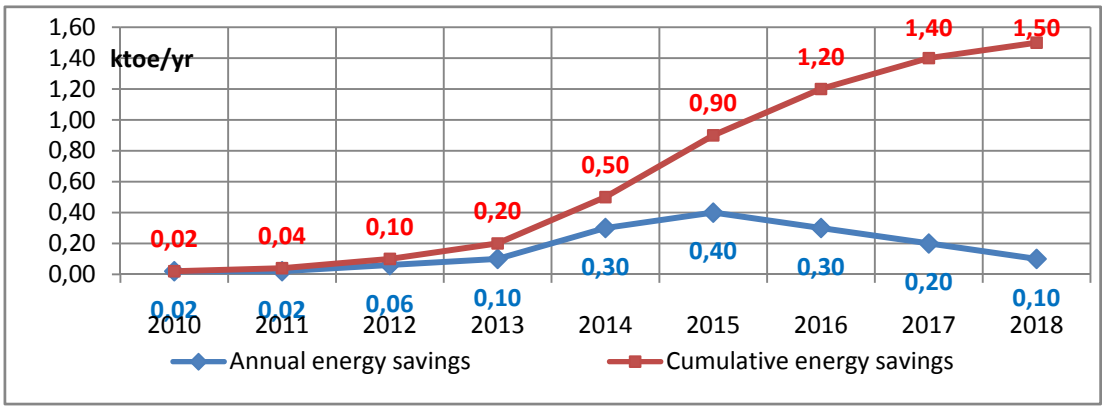


Figure 1.2.2.9 . Yearly energy savings from new electrical appliances procurement

1.2.2.8 *EE refurbishments for hospital buildings*

Buildings refurbishment in existing hospitals has great potential for energy savings. The limited experience with such projects is based on a pilot project for refurbishment of two buildings during 2009/2010, setting a good example for other hospitals and the government (as the owner).

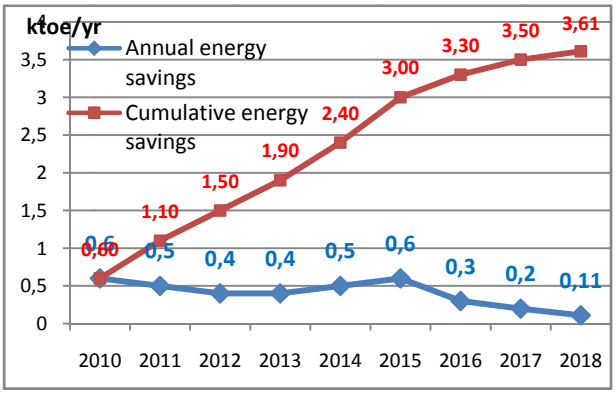


Figure 1.2.2.10.Energy savings from refurbishing hospital buildings

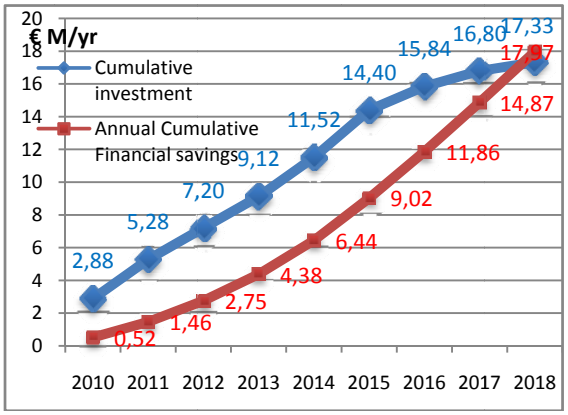


Figure 1.2.2.11. Breakdown of financial results

Energy savings are limited (**Figure 1.2.2.10)**, as well as the financial savings (**Figure 1.2.2.11**). Better indoor comfort for patients as the most important, as well as reduction of local emission of hazardous pollutants, mostly SO_2, NOx, etc.

For the implementation of this measure, the budget of the Ministry of Health has allocated the following funds:

- for the year 2010 – 2,539 million EUR (156.120.000 MKD); and
- for the year 2011 – 4,31 million EUR (264.489.000 MKD);

whereas, in compliance to the adopted budget for 2011, the following indicative finds have been allocated:

- for the year 2012 – 5,037 million EUR (325.556.000 MKD); and
- for the year 2013 – 11,835 million EUR (727.851.000 MKD).

The technical measures for increasing building energy efficiency can be grouped into three categories:

- passive-technology measures, such as insulation, ventilation improvements, improved heat balancing, and low-flow shower heads, which all reduce the energy required to produce given levels of comfort and service independent of occupant behavior;
- behavior-related measures, such as valves and controls, which allow occupants to regulate and control their energy consumption;
- meters, which alter the way heat payments are calculated and create incentives for energy efficiency investments and energy consumption reductions.

Windows are often the weakest point of a building in terms of energy and comfort. The experience indicates that the energy escapes through windows 10 times more per unit of surface than through exterior walls. It is possible to reduce the heat loses with low-energy windows (double or triple glazing with low emissivity coating and gas filling presents a well established technology already).

Advanced technology windows as well as wall insulation reduce the energy use in existing buildings. They also have some peculiar additional benefits such as:

- the heating system in the building can be substantially simplified, or reduced: radiators are not needed beneath the windows to eliminate cold downdraughts; and;
- if the windows are glazed with high performance solar control glass, the cooling demand is reduced to a minimum or may be eliminated.

There is no statistical data on building stock in this sector, except the numbers of the hospital campuses:

- *Number of General hospitals* *16*[17]
- *Number of Clinics and Institutes hospitals* *21*
- *Number of Specialized hospitals* *18*

Furthermore, it should be pointed out that the data used is based on Energy Audits[18] of 3 hospital campuses (first complex with fourteen buildings, second one with eleven buildings, and third had building and 4 pavilions). The saving potential is very high (over 20 % estimated) mostly due to the energy production site (new burners, fuel switching, pipe insulation, solar collectors and geothermal heat pumps implementation, introduction of small scale cogeneration using natural gas – obtaining ecological, energy and financial savings).

The Ministry of Health, as responsible institution for the relevant project, will continue with the hospitals' refurbishment in Macedonia. The required financial means will come from the State Budget, commercial banks loans, dedicated funds for EE measures (EBRD, EIB, KfW) as well as donations. The dynamics of investments will be harmonized with the Ministry of Finance.

1.2.2.9 *Application of solar collectors and geothermal heat pumps*

Main investments in the near future are expected in the commercial sector – construction of new hotels buildings and commercial shopping buildings. The necessary amount of hot water will be obtained by solar collectors and geothermal heat pumps (**Figure 1.2.2.12)**, the long-term continuous use of which offers a few times better financial benefits (**Figure 1.2.2.13)**, compared to the household use (dotted curve shows savings under liberalized energy market prices).

[17] 2006 data

[18] Study works prepared for Ministry of Environment and Physical Planning (2005-2008) as client

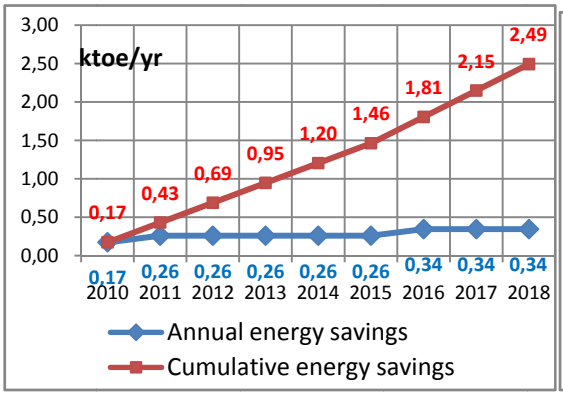


Figure 1.2.2.12. Energy collected with solar collectors

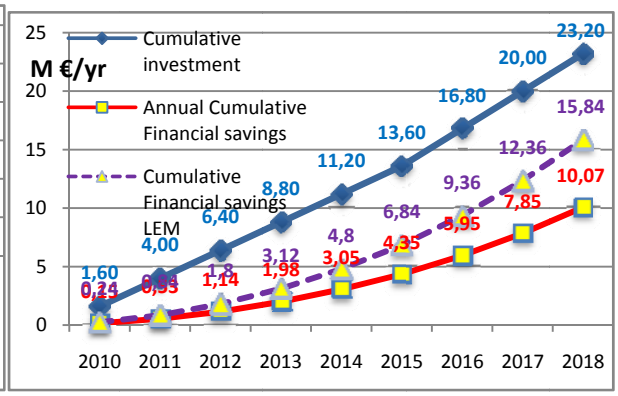


Figure 1.2.2.13. Solar collectors and GHP application financial effects

Geothermal heat pumps (GHP) become an optimal solution to satisfy needs for heating and cooling with one device, generating hot water free of charge during summer time.

1.2.3. Assessment of total ESD energy savings in the sector

The assessment of energy savings in the commercial and service sector for the period 2010–2012 and 2010– 2018is provided in the tables above. It is based on the expert judgement and international experience collected through the study of EU Member States' EEAP. Graphical picture representing trends of development is shown on **Figure 1.2.3.1.**

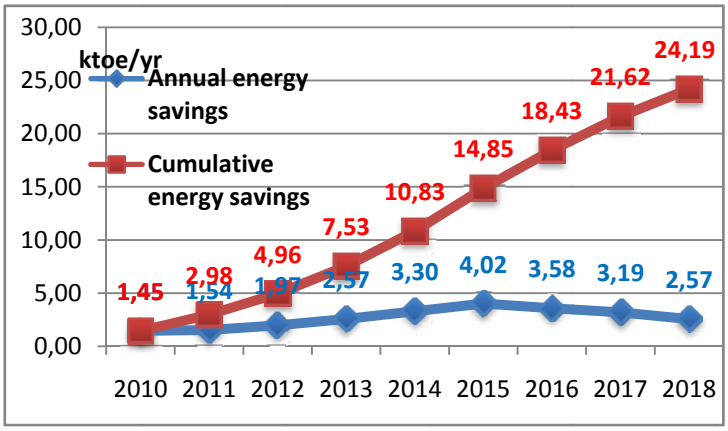


Figure 1.2.3.1. Energy savings generated from the commercial and public services buildings sector

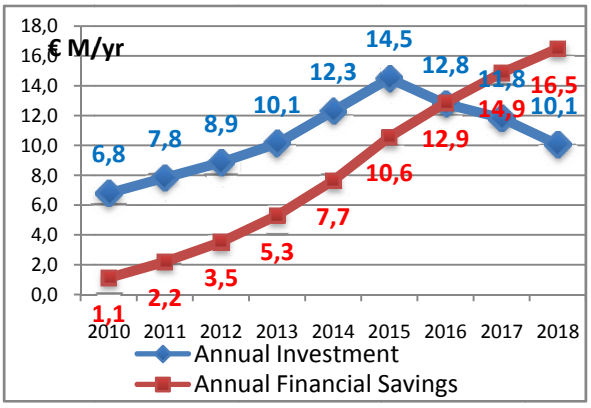


Figure 1.2.3.2. Estimated annual investments and financial savings

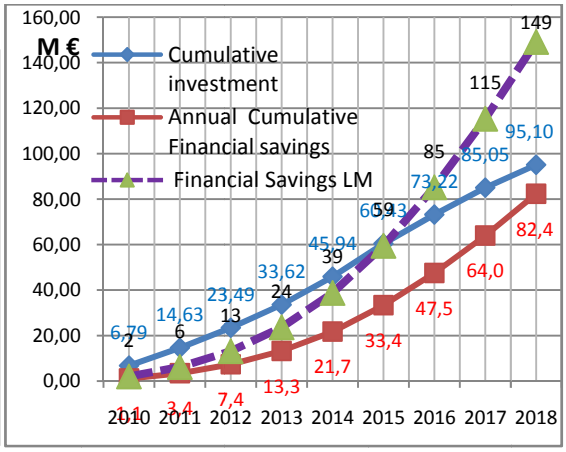


Figure 1.2.3.3. Cumulative financial investments and savings

With reduced investments in this sector, good financial results confirm their validity (**Figure 1.2.3.2**). Main investments are expected to come from private sector (Table 1.2.3.1).

Calculations show that with financial investment of 95M € it is possible to realize financial savings (mostly electrical energy) of 149 M € until 2018 (**Figure 1.2.3.3**).

Table 1.2.3.1. Investment responsibility (in million EUR)

No.	Measure	Budget of RM	Municipalities	Donors/IFIs	Private sector	Total
	Adoption and enforcement of Building Energy Codes	2,87	2,87	5,74	17,22	**28,70**
	Inspections of boilers/air conditioning systems	0,05	0,00	0,00	0,15	**0,20**
	EE refurbishments for buildings in the education sector	3,84	1,44	3,36	0,96	**9,6**
	Establishing information centers and municipal network and implementation of information campaigns on energy efficiency	1,08	0,81	0,81	0,00	**2,70**
	Energy management and auditing	0,12	0,12	0,00	0,96	**1,20**
	Street Lighting Projects	0,00	1,92	0,32	0,96	**3,20**
	Electrical appliance and equipment labelling and energy performance standards	1,33	1,33	0,00	6,23	**8,89**
	EE refurbishments for hospital buildings	11,27	0,00	6,06	0,00	**17,43**
	Application of solar collectors/GHP	3,48	3,48	0,00	16,24	**23,20**
	Sum	**24,14**	**11,97**	**16,29**	**42,72**	**95,11**

Pursuant to the requirements of the ESD, Macedonia will establish the system for monitoring and verification of energy savings. Contribution of different measures for energy savings is shown on **Figure 1.2.3.4,** and the data in the Table 1.2.3.2.

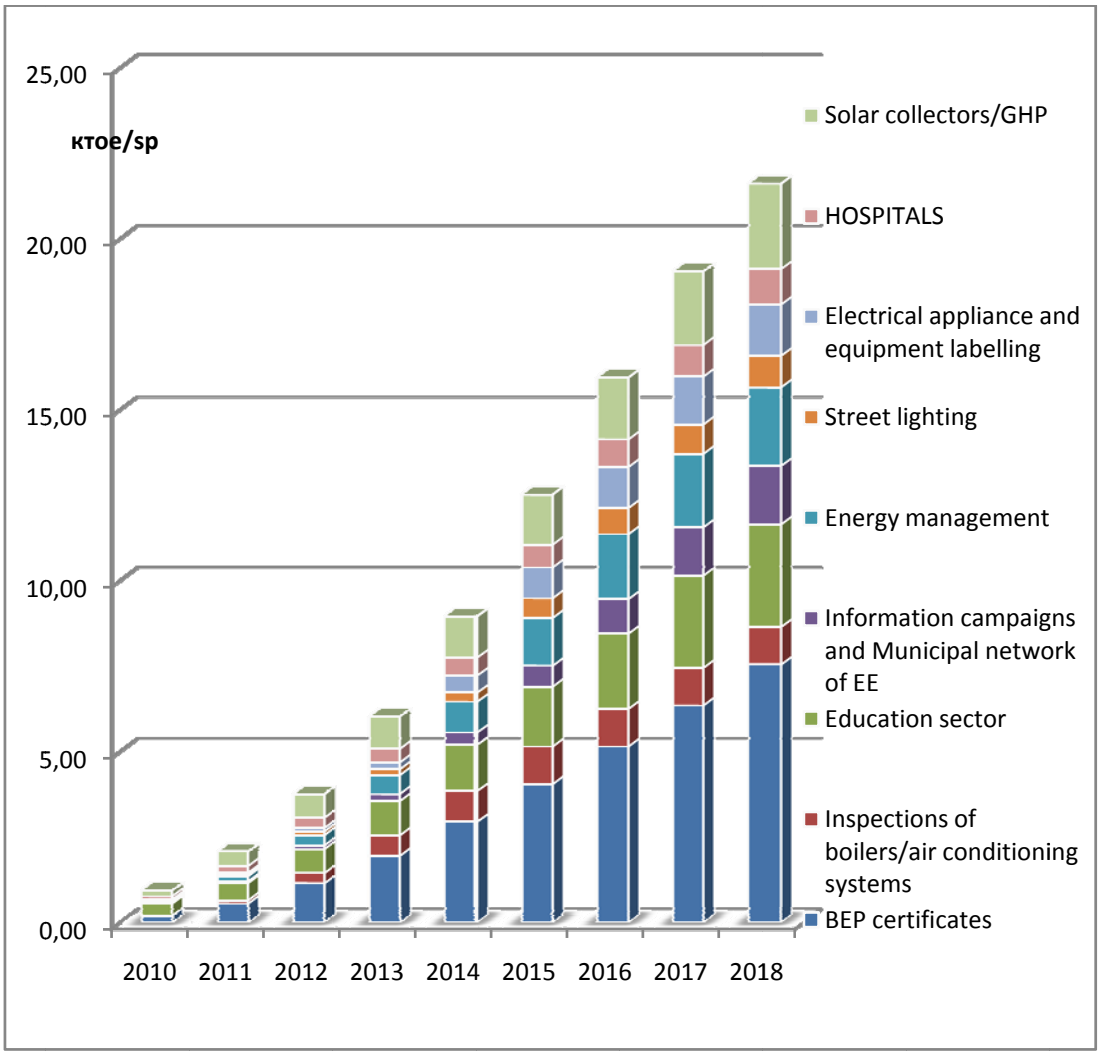


Figure 1.2.3.4 . Participation of individual energy savings measures in commercial and services sector

The data collection of final energy consumption in different industrial branches within the commercial and service sector will be established.

Improvements in monitoring energy consumption in the commercial and service sector must be made. Specifically, it is not currently possible to distinguish between energy consumption among commercial enterprises and in public services. Public service facilities will be obliged to deliver required data as prescribed in the Energy Law. Furthermore, the central data collection system must have data on the number of employees, value added, total useful area, etc. To avoid the burden of public reporting, a common internet portal for public reporting is expected to be established.

Table 1.2.3.2. Participation of assumed newmeasures in reaching energy efficiency savings targets (ktoe)

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Adoption and enforcement of Building Energy Codes	0,20	0,55	1,15	1,95	2,95	4,05	5,15	6,35	7,55
Inspections of boilers/air conditioning systems	0,00	0,10	0,30	0,60	0,90	1,10	1,10	1,10	1,10
EE refurbishments for buildings in the education sector	0,35	0,50	0,70	1,00	1,35	1,75	2,20	2,70	3,00
Establishment of information centers and municipal network and implementationof information campaigns on energy efficiency	0,02	0,05	0,11	0,21	0,36	0,61	1,01	1,41	1,71
Energy management and auditing	0,05	0,15	0,30	0,55	0,90	1,40	1,90	2,15	2,30
Street Lighting Projects	0,03	0,06	0,11	0,17	0,27	0,58	0,77	0,86	0,92
Electrical appliance and equipment labelling and energy performance standards	0,02	0,04	0,10	0,20	0,50	0,90	1,20	1,40	1,50
EE refurbishments for hospital buildings	0,60	1,10	1,50	1,90	2,40	3,00	3,30	3,50	3,61
Application of solar collectors/GHP	0,17	0,43	0,69	0,95	1,20	1,46	1,81	2,15	2,49
Sum	**1,44**	**2,98**	**4,96**	**7,53**	**10,83**	**14,85**	**18,44**	**21,62**	**24,18**

The specific price of adopted saving measures and the values of saved energy, depending to the existing prices of energy at Macedonian market are shown in the Table 1.2.3.3.

Table 1.2.3.3– Assumed average investment prices, values of saved energy and simple payback period for individual energy savings measures

	Measures	The price of investment M€/ktoe	Simple payback period years
1	Adoption and enforcement of Building Energy Codes	3,8	4,5
2	EE refurbishments for the buildings in the education sector	3,2	6,3
3	Street Lighting Projects	3,5	3,9
4	Electrical appliance and equipment labelling and energy performance standards	5,90	6,7
5	EE refurbishments for the hospital buildings	4,8	5,6
6	Application of solar collectors and GHP	9,30	10,5

Participation of assumed programs differs depending to the year of monitoring (Table 1.2.3.4).

Table 1.2.3.4Participation of assumed programs into Energy Savings in the Commercial and Public Services sector

Title of the program/measure	2012	2018	2020	2012	2018	2020
	ktoe/yr	ktoe/yr	ktoe/yr	%	%	%
Adoption and enforcement of Building Energy Codes	1,15	7,55	9,65	23,2%	31%	34%
Inspections of boilers/air conditioning systems	0,30	1,10	1,10	6,0%	5%	4%
EE refurbishment for the buildings in the education sector	0,7	3,0	3,5	14,2%	12%	12%
Establishment of information centres and municipal network and implementation of information campaigns on energy efficiency	0,11	1,71	2,16	2,2%	7%	8%
Energy management and auditing	0,30	2,30	2,50	6,0%	10%	9%
Street Lighting Projects	0,11	0,92	0,98	2,2%	4%	3%
Electrical appliance and equipment labelling and energy performance standards	0,10	1,50	1,54	2,0%	6%	5%
EE refurbishments for hospital budilings	1,50	3,61	3,81	30,2%	15%	13%
Application of solar collectors and GHP	0,69	2,49	3,35	13,9%	10%	12%
Sum	4,96	24,19	28,60	100,0 %	100 %	100 %

Interdependence between investments, energy savings as well as financial savings is presented on the Table 1.2.3.5.

Table 1.2.3.5 Energy and financial savings in correlation with investments for the particular energy savings program

Title of the program/measure	Energy savings ktoe/yr		Investments (M€)		Financial savings (M€)	
	2012	2018	2012	2018	2012	2018
Adoption and enforcement of Building Energy Codes	1,2	7,6	4,4	28,7	1,60	25,16
Inspections of boilers/air conditioning systems	0,3	1,1	0,2	0,2	0,33	5,24
EE refurbishments for the buildings in the education sector	0,7	3,0	2,25	9,6	0,79	6,91
Establishment of information centres and municipal network and implementation of information campaigns on energy efficiency	0,1	1,7	1,1	2,7	0,13	3,99
Energy management and auditing	0,3	2,3	0,9	1,2	0,36	7,05
Street Lighting Projects	0,1	0,9	0,4	3,2	0,10	0,82
Electrical appliance and equipment labelling and energy performance standards	0,1	1,5	0,6	8,89	0,14	5,20
EE refurbishments for the hospital buildingss	1,50	3,61	7,2	17,42	2,75	17,97

Application of solar collectors and GHP	0,7	2,5	6,4	23,2	1,14	10,07
Sum	**4,96**	**24,19**	**23,45**	**95,11**	**7,35**	**82,39**

The EE indicators used for monitoring the energy savings in the service sector include: energy intensity (total and climate-adjusted – energy consumption per unit value added), unit consumption (total, climate-adjusted, and by branch – energy per employee, useful area), CO_2 emissions (per employee, per unit of value added).

1.3. INDUSTRY

Until 1990 Macedonia had a growing industry, oriented mainly to fit the rather large enough Yugoslav market. When this market began to fall apart Macedonian industry was not prepared to restructure and find alternative markets. Therefore, reduction of industrial activities was inevitable. Production was cut to less than 50% and it has not recovered yet. The industry production indices in the period from 1982 to 2007 are shown in Figure 1.3.1.

After 1996 industrial production in Macedonia began to grow slightly to reach an index of 4.88% in the last five years.

Macedonian industry operates now in a business environment which is relatively open to international competition and is getting more and more stable in recent years in terms of GDP growth, inflation and employment.

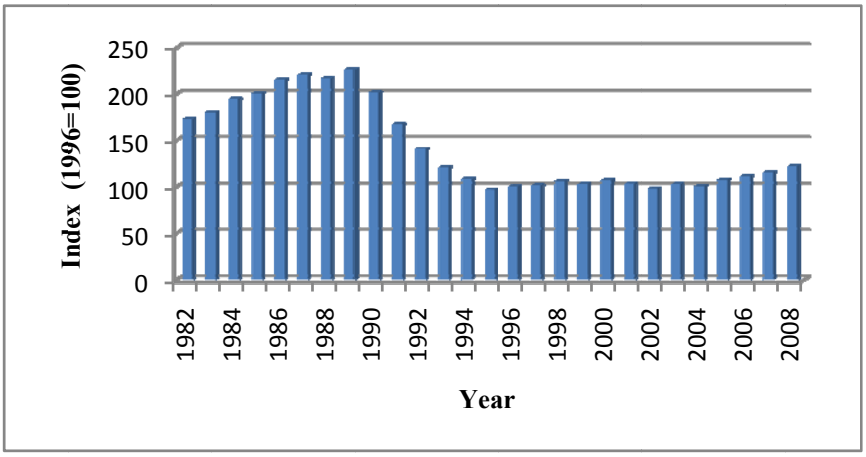


Figure 1.3.1 Macedonian industry production indices (1996=100)[19]

Industrial sector accounts for more than 28% of GDP (the contribution in MKD is shown in Figure 1.3.2.) and engages over 30% of total occupied labor force. Textiles, iron and steel, power generation, cement, food and tobacco are the important manufacturing industries of Macedonia.

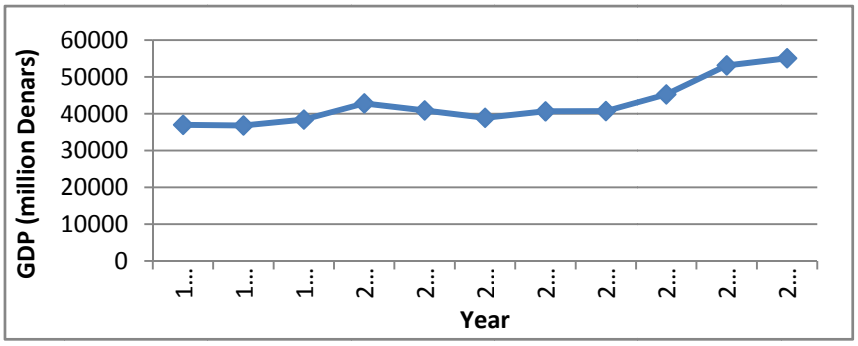


Figure 1.3.2 Contribution of Macedonian industry to GDP[20]

[19]Source: Energy Balances of Macedonia (Annual publications)
[20]Source: State Statistical Office Annual of the Republic of Macedonia - GDP Reports

The pro-active industrial policy will encourage the orientation of Macedonian industry towards higher value added products and services based on knowledge, innovation and collaboration.

The future of Macedonian industry will be built on the development of capabilities in applied research and manufacturing of sustainable, organic and specialized high-tech products and services serving the needs of international niche markets.

By 2020 Macedonia will develop the dynamic mix of sustainable and authentic industries like: organic wine and foods, eco-steel, eco-friendly construction, ITC, specialized electronic parts, renewable energy production, creative industries, medical equipment and services, authentic tourism and other industries.

Industrial policy will accelerate development of Macedonian industry in five areas of intervention with the following measures:

1. International cooperation and FDI enhancement.
2. Applicable research and development and innovation.
3. Eco- friendly products and services for sustainable development.
4. SME development and entrepreneurship.
5. Collaboration in clusters and networks.

Macedonia has a relatively high energy consumption in the industry sector even when the analysis is performed using the economic power of the country (Figure 1.3.3.). The absolute energy consumption figures for the industry sector have increased and so have the figures per unit of GDP, as a result of the increased production in the steel and ferroalloy industry, which is an energy intensive industry. The industry sector used mostly electricity and oil products with 33% and 32 % respectively in 2006, followed by coal with 19%, thermal energy with 10%, and natural gas with almost 6% and wood with less than 1%.

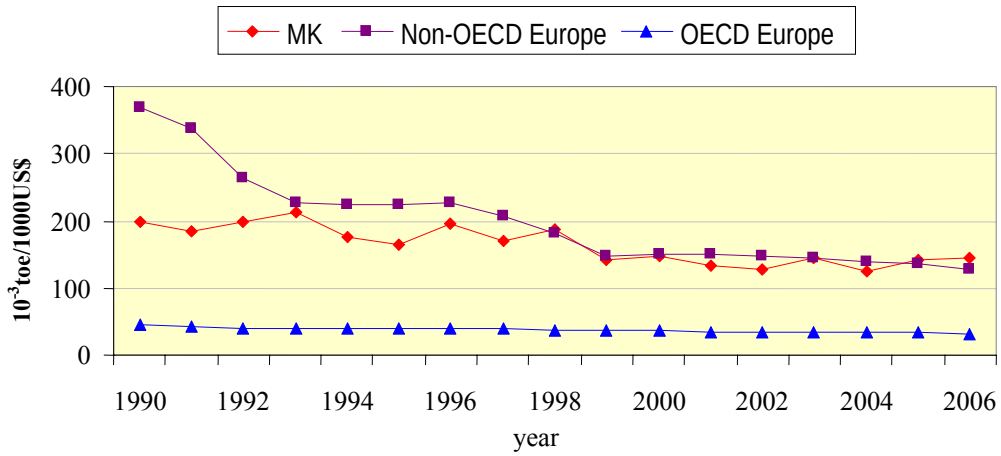


Figure 1.3.3 Energy consumption in the industry sector per unit of GDP[21]

[21] © OECD/IEA, [2008], IEA Online Database: Energy Balances of Non-OECD and OECD Countries and Energy Statistics of Non-OECD and OECD Countries

Energy consumption in the industry sector of Macedonia is dominated by the steel and ferro-alloys production sub-sector. Only two other sub-sectors (minerals and food and tobacco) report energy consumption comparable to that of steel and ferro-alloy sub-sector. **Figure 1.3.4**shows energy consumption in the industry sector during the last three years. This figure reveals that nonferrous metals, transport equipment, paper and printing, wood processing, construction and unspecified industries have no or a minor impact on the overall energy consumption in this sector.

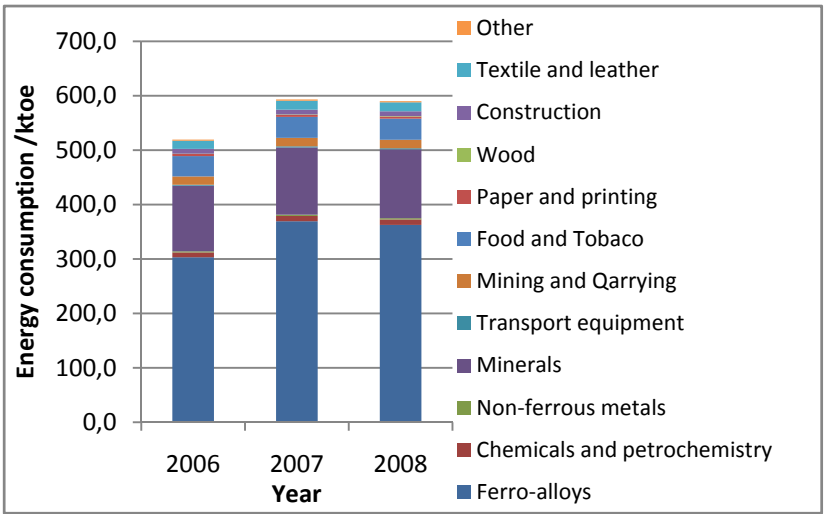


Figure 1.3.4 Consumption of energy in the Industry sector in Macedonia in the last three years[22]

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.

The Energy Efficiency Action Plan will follow the Strategy for improvement of the Energy Efficiency in the Republic of Macedonia according to which three types of actions are considered crucial for achieving a high degree of energy efficiency.

The steel and ferroalloy industry, with its specific characteristics, is very important from the point of view of energy consumption. It includes a relatively small number of companies, which are energy intensive and strongly dependant on the movements of the global steel and alloy markets. The steel and ferroalloy industry is by far the most intensive consumer of practically every kind of energy.

[22]Source: Strategy for Energy Development in the Republic of Macedonia until 2030, Skopje 2010.

1.3.1. Energy efficiency improvement measures in the Industry sector

Table 1.3.1 Overview table of all EEI programs and measures in Industry

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
-	-	note 1	National / regional / local	share in FEC	list	note 2	
1	2	3	4	5	6	7	8
1.	Improvement of process performances	Law enforcement	National	IPPC Installations	Implementation of the Law on Environment: – Permitting – Monitoring – Inspection	The implementation of the measure is on –going until 2014	6/5
2.	Energy Auditing	Legislation (IPPC Permits) + voluntary	National	All industrial installations	Subsidising, Permitting, Monitoring, inspection	New Measure 2010	0,3/0.65
3.	CHP	Voluntary agreements and cooperative	National	Whole industry sector	Financial support, Audits, Permitting	New measure 2009	25,1/38,6

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
		instruments					
4.	Energy performance of new non-residential buildings	Legislation	National	All new non-residential buildings	Permitting		0,15/0.35
5.	Improved performance of lightning systems	Voluntary	Local	Whole industry	Awareness raising campaigns on the benefits of sensor systems, improved bulbs etc.	The implementation of the measure is on-going, the status of implementation is to certain extent.	0,11/0.25
6.	Improved performance of HVAC systems	Mandatory for new systems/Regulation	National	Whole industry	Advising, Audits, financial intensives for existing installations and permitting for new ones	New measure The implementation period overlaps with the period of	0,3/0.4

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
						the present action plan	
7.	Fuel type change	Regulation	National	Boiler houses, and other non-process utilization of fuel	Regulate types of fuel that may be used upon plant capacity. Provision of soft loans for efficient use of energy	New EEI measure Under consideration	0,6/0.8
8	CDM	Voluntary	National	Installations big enough to be treated as CDM	Promote CDM investment and benefits	In initial stage	2,8/26
9	Waste heat utilization (not CDM)	Voluntary		Whole industry	Provision of soft loans for efficient use of energy	New EEI measure Under consideration	2,5/8
10	Variable speed drives	Voluntary	National	Industry/SMEs	– Promote saving opportunities offered by frequency inverters and other electronic systems designed to optimize electric motor operation – Provide soft loans for efficient use of electricity	The implementing period overlaps with the period of the present action plan 2018	1/3,9
11	Compressed air supply	Voluntary	National	Whole industry sector- mining &	Improved maintenance and substitution of old type	Not known	0,1/0.5

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018 (ktoe)
				quarrying in particular	compressors		
12	Good house keeping	Voluntary	National	Any energy consuming unit in industry	Promotion of cleaner production and energy efficiency as a business strategy, focused on both environment and economy	On going	2/6

1. IMPROVEMENT OF 9% in IPPC installations (2008 – 632.3 ktoe). 18% of the energy is consumed by IPPC installations
2. Substitution of coal by natural gas. (2008 – 188 ktoe). 12% savings, about 1/3 could be substituted
3. Silmak is the biggest CDM project about 140 GWh/year (the rest are other CDM projects until 2018)
4. Smaller installations attracted to energy efficiency

1.3.2. Description of individual EEI measures in the Industry sector

1.3.2.1 Improvement of process performances

IPPC installations have to operate under permits based on the application of BAT. Indeed, BATs are to be apprised taking into account the age and the condition of every installation. However, the operators are obliged to get as close to BAT as possible.

New installations will be designed, constructed and operated so that the energy will be used efficiently.

The aim of the energy efficiency requirements of IPPC is to ensure that gross energy inefficiencies areeliminated and that the most effective energy saving opportunities are identified and implemented.There are usually many options that can be considered for optimising energy efficiency in newinstallations, or improving energy efficiency within an existing installation. Techniques range fromsimple measures such as good housekeeping, insulation or motor controls, to more complex measuressuch as process integrated heat recovery. In addition, effective energy management procedures are avital component to inform cost–benefit appraisals and to ensure that continuous energy efficiencyimprovements are made.

No sufficient data are available to make a reliable assessment of energy savings because only few permits have been issued so far. In addition, as the implementation of this piece of legislation started recently, the applications for integrated permits are not consistent and in some of them energy efficiency is not treated properly.

In a number of cases simple improvements will not lead to satisfactory results and more radical changes in production processes and/or equipment will be required. Obsolete technologies applied in some companies in Macedonia cannot be brought closer to BAT regarding energy efficiency. These companies will face the choice of a significant investment in new and more effective technologies or a closure of their installations.

The largest potential for energy savings is within the metallurgical sector.Ferro-alloy production companies report much higher consumption of energy compared to modern production units. Indeed, energy consumption depends on the quality of raw materials but few open furnaces still in operation in addition to semi closed ones and absence of energy recovery indicate the main reason for the inefficient use of energy. Due to very high investment costs, energy recovery is planned to take place in 2014 and in the meantime other activities, mainly related to establishing energy efficiency management systems will be carried out such as definition of energy efficiency policies, improving maintenance, identifying opportunities, improving process control, training staff etc. [23]

It has been estimated that the measures mentioned above will result in energy savings equivalent to 59 ktoe until 2018.

In brick manufacturing industry due to bad sealing, damaged chariots and obsolete process control potential for annual savings of 1ktoe has been estimated. Total expected savings for mineral sector including mining and quarrying is about 7,9 ktoe until 2018.

[23] Applications for integrated permits (SILMAK, FENI, Makstil, MZT Foundry, FZC 11 Oktomvri), MoEPP

Table 1.3.2.1 shows the estimations for energy savings expected as a result of integrated permitting. The net results will be lower because in a number of installations gas cleaning systems and wastewater treatment utilities are to be installed.

Table 2.3.2.1 Estimated energy savings due to integrated permitting from 2010 to 2018[24]

Sector	Investment Mio€	Savings ktoe			
		Total	Electricity	Heavy Fuel Oil	Other
Metallurgy	1.5	5.40	3.24	1.08	1.08
Mineral Industry	1.3	1.30	0.30	0.75	0.25
Food and beverages	0.5	1.50	0.63	0.59	0.28
Textile and leather	0.3	0.70	0.28	0.34	0.08
Dairy	0.2	0.50	0.33	0.05	0.13
Total	**3.8**	**9.40**	**4.77**	**2.81**	**1.82**

1.3.2.2 Energy Auditing

Regular Energy efficiency auditing may reveal potentials of energy savings that could not be otherwise identified. Although mandatory for IPPC installations, energy auditing should be extended beyond these installations and subsidised for SMEs. Initial energy audits may reveal substantial energy saving potentials and in a long term they will be basically used to assure that energy is used efficiently.

Plant energy audits are comprehensive evaluations of the actual performance of a plant's energy using systems and equipment compared against the designed performance level or the industry best practice. The difference between observed performance and "best practice" is the potential for energy and cost savings.

An assessment has been made on possible savings as a direct result of energy audit such as slightly increased temperature of bearings, poor insulation, unnecessary high temperature (pressure) of steam etc.

For a number of Small and medium sized enterprises financial barriers for initiating energy efficiency are an important issue. Most often they are in a shortage of funds or consider their energy costs as a small portion of overall costs and therefore neglect it. In order to promote energy auditing as a suitable tool and opportunity indicator, a special fund for energy efficiency in small and medium sized enterprises should be established to over bridge both information and financial barriers. The European Bank for Reconstruction and Development (EBRD) is already present with such activities in Macedonia through the TAM/BAS (Turn Around Management/Business Advisory Services) program.

[24]Base for estimation: 82 Integrated permit applications submitted to the Ministry of

1.3.2.3 Co-generation

Co-generation may save up to 30% of energy, but there is always a question of potential to utilise the heat energy produced in such a system. Industry should be encouraged to use mini and micro CHP saving between 10 and 20% depending on heat demand.

A 30 MW CHP plant has been put in operation in Skopje (KOGEL SEVER) close to the steel, ferro-alloys and rolling mills complex. „Kogel Sever "has an installed capacity of 30.4 MW electric power, 7 MW thermal power in hot water and additional 19.5 t/h saturated low pressure steam, providing a total of 56.9 MW. As it is directly connected to the steel and ferro-alloys manufacturing companies, the percentage of heat utilisation is expected to be very high.

It is assumed that only 15 % of produced energy is accounted as energy savings in accordance with the Directive for CHP promotion and proposed methodology for calculation of primary energy savings (PES>10%). The same percent 15% of the total financial investment was accepted as investment for realization of calculated energy savings.

In 2010 a bigger CHP, owned by TOPLIFIKACIJA AD and a Russian company SINTEZ will start producing energy. It has installed capacity of 235 MWe, and 160 MWth. The heat is devoted for the DH system in Skopje. The same conditions as in the KOGEL SEVER are considered for calculation of energy savings and financial investments.

1.3.2.4 Energy performance of new non-residential buildings

Non-residential buildings, especially those in production facilities are significant consumers of energy for heating. In a number of cases such buildings are heated with steam leading to overheating, but also to substantial losses of heat due to losses of condensed steam and the overall efficiency of the steam plant. In addition, non residential buildings are generally poorly insulated relying on the availability of energy.

In addition to common energy efficiency measures for buildings such as proper roofing, fenestration, wall insulation, painting etc, non-residential buildings should pay more attention on the design, construction and operation of the HVAC.

1.3.2.5 Improved performance of lightning systems

Low and high pressure sodium lamps, or other improved light sources for outdoor lighting are rare used in Macedonia. Most of the lightning is still through mercury bulbs. Automatic light sensors are also rarely in use. New installations will have to be designed and constructed for energy efficient lighting.

Unlike residential buildings, existing industrial premises should be easier to convince to phase out incandescent bulbs and use fluorescent, or LED bulbs instead which can save up to 80% of electricity consumption.

The energy saving potential of improved lighting is much higher, but actual savings of about 0.25 ktoe are expected.

1.3.2.6 Improved performance of HVAC systems

Heating, ventilation and air conditioning systems in nonresidential buildings should be improved by:

- Upgrading fuel burning equipment
- improving thermostat controls
- Installing heat recovery ventilators that exchange at least 50% between the fresh air and the discharged conditioned air.

The energy saving potential of improved heating system is rather high, but the implementation of energy saving measures will go slow, reaching 0,4ktoe savings in 2018.

1.3.2.7 Fuel type change

Wherever possible more efficient fuel should be used. Natural gas is the most effective among the fossil fuels as it generates least gas volumes per unit of fuel burned, but alternative energy sources (renewable energy sources) are even more efficient. Natural gas is still not available in Macedonia outside its capital Skopje. Therefore, the savings until 2014 are expected due to the slow increase of use of alternative energy sources. Increased natural gas consumption is expected after 2014.

1.3.2.8 CDM

Most of the CDM projects under preparation as well as those about to be implemented are related to energy saving. The most characteristic is the SILMAK project aiming at use of waste heat to produce electricity. The saving potential is almost 1% of the national installed electricity capacity, and depends to the exploitation duration. Another big project is heating system of the preheating furnace in Makstil in Skopje. There is a huge potential for this kind of projects in other industrial plants in Macedonia such as Feni and Skopski Leguri.

1.3.2.9 Waste heat utilization (not CDM)

A number of small and medium size companies have been considering the utilisation of their waste heat. Water recirculation in tanneries and hot air use in brick firing plants are only examples. Usually these are small projects that do not fit requirements for CDM investment.

The total energy savings potential of waste heat utilisation is about 8 ktoe:

- Tanneries and textile 0.5 ktoe
- Brick firing 2.5
- Refractories 2.0

- Metallurgy 3.0

However, effective savings of only 2.04 ktoe are expected in the year 2018.

1.3.2.10 Variable speed drives

A soft start or fluid coupling device may be sufficient for some motors running at constant load provided they are appropriately rated. However those motors running at variable loads (fans, pumps, conveyers, crushers, grinders etc.) need more sophisticated control.

Intelligent motor controllers provide dynamic control of a motor across a wide range of applications and conditions.

They dynamically adjust power to a motor as its load changes. It constantly monitors the motor's load and calculates the exact amount of power required at any time - reducing the amount of electricity used, increasing the life-span of motors, reducing maintenance requirements and reducing the amount of Carbon Dioxide produced.

Energy savings by applying intelligent controllers may account for 20% and their payback period is usually less than 2 years. There is a great energy saving potential in intelligent controllers, but their application will slowly increase due to a substantial investment required. Therefore the target of saving 3,9ktoe in 2018is rather tight and can only be achieved if a suitable financial support will be provided.

1.3.2.11 Compressed air supply

It is achievable to reduce compressed air costs up to 30% by proper design of compressed air capacity, improved pipe work installation, implementing a maintenance program and finally purchasing high energy efficient compressor units.

A total savings of 0.5 ktoe has been assessed for 2018. This figure corresponds to improving about 30 compressor systems each year.

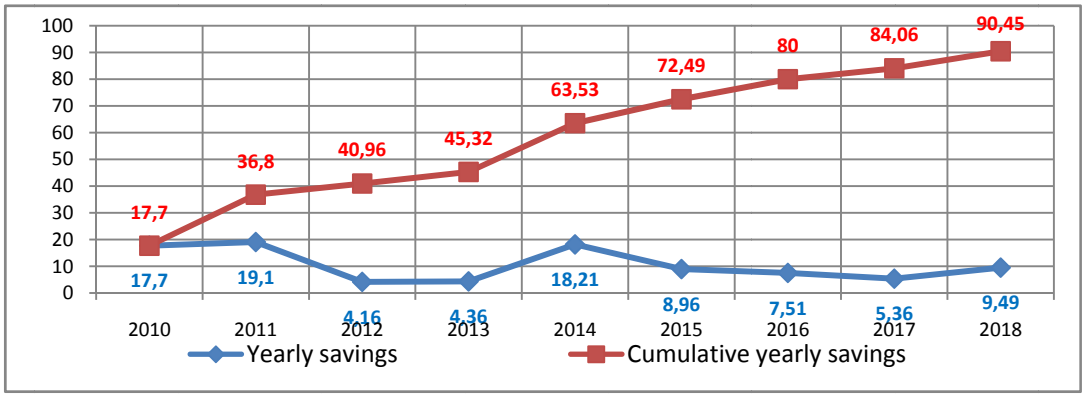
1.3.2.12 Good house keeping

The cleaner production projects undertaken so far revealed an appreciable potential for energy savings with minor or no investment at all.

Good housekeeping includes such activities 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. It has been assumed that about 6ktoe may be saved by implementing good housekeeping measures in the industry. Most of the savings are related to steam generation and distribution.

1.3.3. Assessment of total ESD energy savings in the Industry sector

The assessment of energy savings within the industry sector for the period 2010–2012 and 2010– 2018 is given in the tables above. It is based on the expert judgement and international experience collected through the study of EU Member States' EEAP. Graphical presentation of development of trends of energy efficiency savings (given in ktoe/year) in the Industry sector is shown on **Figure 1.3.3.1.**



1.3.3.1 Energy savings generated from the industry sector

With assumed private investments in this sector, good financial results justify validity of investments (**Figure 1.3.3.2)**. All investments belong to the private sector.

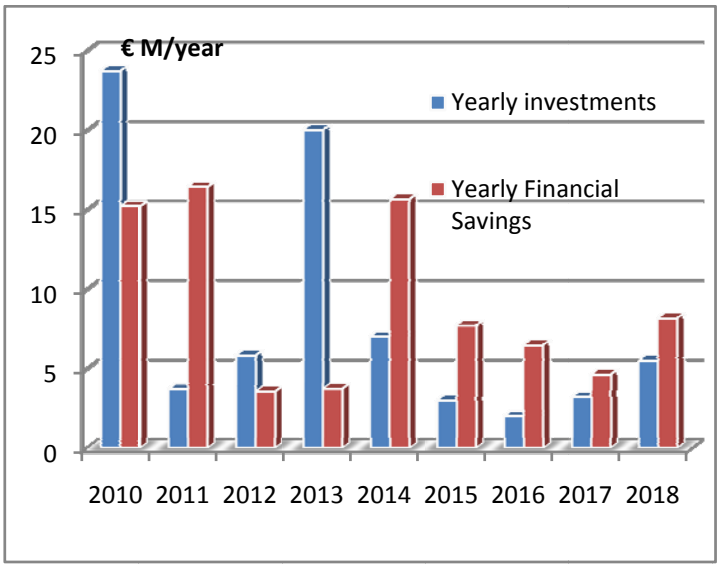


Figure 1.3.3.2 Assumed penetration of investments and realized financial effects

Financial investments of 73,9 M € till 2018 enable 457 M€ cumulative financial savings (**Figure 1.3.3.3)**.

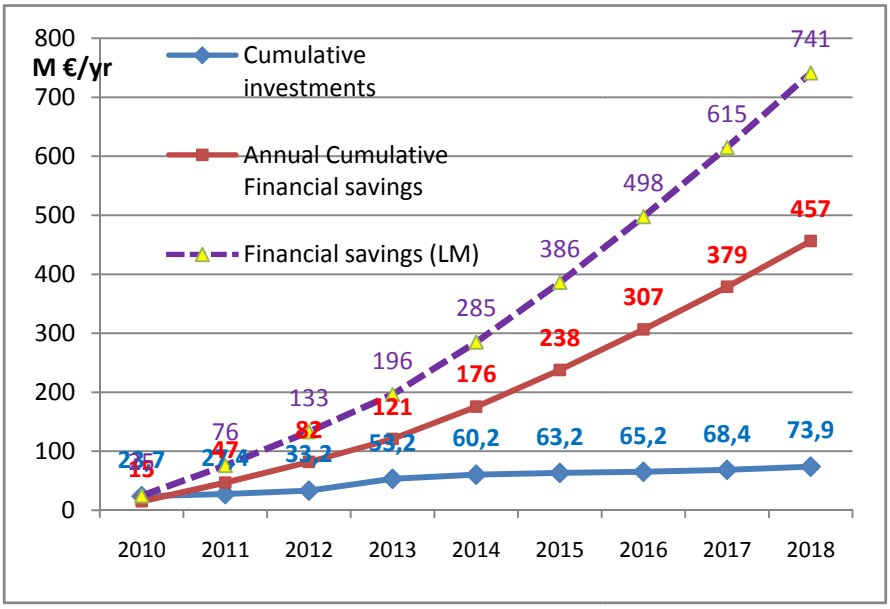


Figure 1.3.3.3 Break-down of financial results in the sector

Pursuant to the requirements of the ESD, Macedonia will establish the system for monitoring and verification of energy savings. Participation of different measures for energy savings is shown on **Figure 1.3.3.4,**

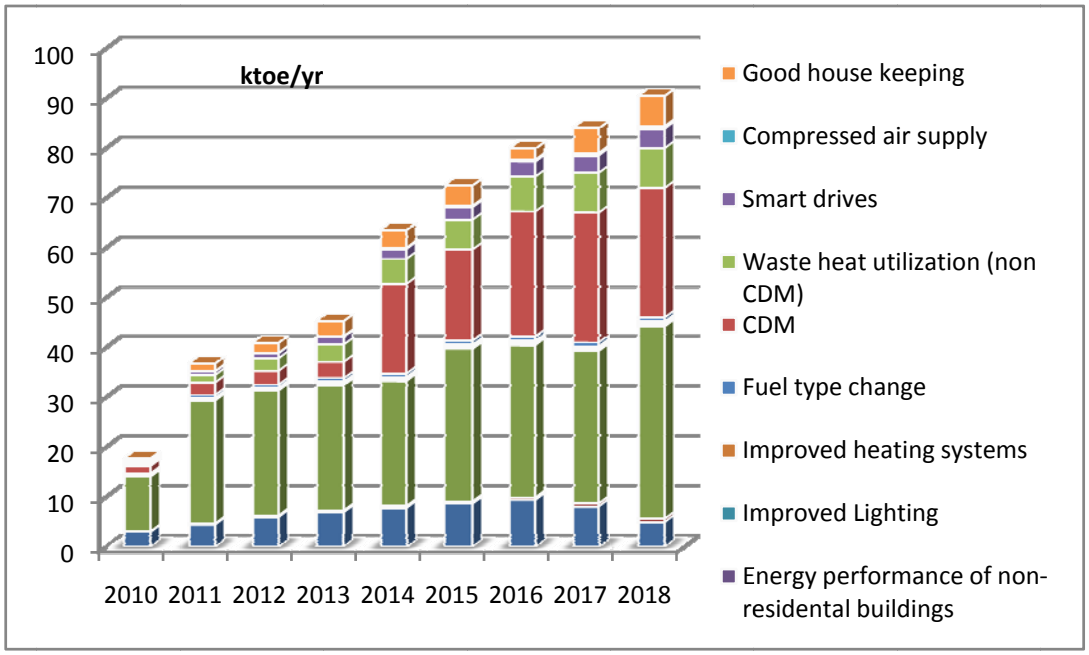


Figure 1.3.3.4Aggregated saving measures

Participation of assumed programs differs depending to the year of monitoring (Table 1.3.3.1).

Table 1.3.3.1Participation of assumed programs into Energy Savings in the Industry sector

	Title of the program/measure	Savings (ktoe)			Savings (%)		
		2012	2018	2020	2012	2018	2020
1	Improvement of process performances	6	5	5	14,6%	5,5%	5,5%
2	Energy Auditing	0,3	0,65	0,75	0,7%	0,7%	0,8%
3	Co-generation	25,1	38,6	38,6	61,3%	42,7%	42,4%
4	Energy performance of non-residental buildings	0,15	0,35	0,42	0,4%	0,4%	0,5%
5	Improved performance of lighting systems	0,11	0,25	0,32	0,3%	0,3%	0,4%
6	Improved performance of HVACsystems	0,3	0,4	0,4	0,7%	0,4%	0,4%
7	Fuel type change	0,6	0,8	0,8	1,5%	0,9%	0,9%
8	CDM	2,8	26	26	6,8%	28,7%	28,5%
9	Waste heat utilization (non CDM)	2,5	8	8	6,1%	8,8%	8,8%
10	Variable speed drives	1	3,9	4,3	2,4%	4,3%	4,7%
11	Compressed air supply	0,1	0,5	0,5	0,2%	0,6%	0,5%
12	Good house keeping	2	6	6	4,9%	6,6%	6,6%
	Sum	40,96	90,45	91,09	100,0%	100,0%	100,0%

The index of M€ 1,06 saved energy value, consists of three types of energy savings where the electricity takes up to 61,3 %, the heavy fuel oil 21,2% and others 17,5 %.

The investments depend on a fairly wide scope of elements such as producer and quality affecting the cost, the loan value, annual number of working hours producing energy savings, the cost of maintenance, the level of new technology introduction (keeping few old parts) etc., and it is within a ratio of 0,86-4,59 M€/ktoe.

The data collection of final energy consumption in different industrial branches within the industry sector will be established (consumption growth of different energy forms, consumption growth by purpose).

The EE indicators to be monitored for the industry sector will include: energy intensity (total and among different industrial branches – energy consumption per value added), adjusted energy, energy efficiency index, unit consumption (steel, aluminium, paper, cement, glass – per ton of product), and CO_2 intensity (by industrial branch).

1.4. TRANSPORT

The transportation sector is a significant consumer of energy. The energy consumption in the traffic sector in Macedonia in 2006 was 350 ktoe . This consumption (2002-2006) was 24-20,6% of the total final energy consumption in Macedonia.

In comparison to the member states of EU-27, the energy consumption per capita in the transportation sector is significantly smaller (**Figure 1.4.1).** The average for EU-27 is more than 710 ktoe/capita, and in Macedonia this value is 170 ktoe/capita. Furthermore, the data suggest that, while EU-27 countries demonstrate an upward trend of the energy consumption intensity, the energy consumption in the transportation sector in Macedonia per capita is relatively stable.

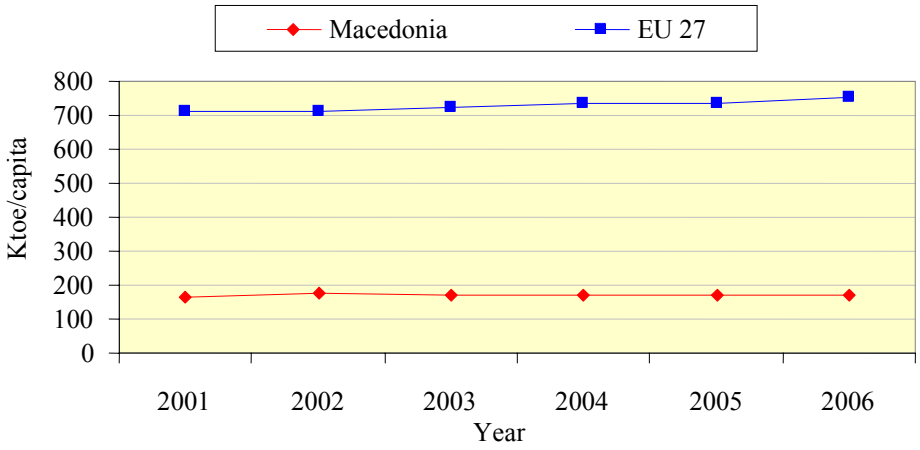


Figure 1.4.1. Intensity of the energy consumption in the transportation sector in the Republic of Macedonia and in EU-27[25]

Regarding the type of fuel used in the transportation sector, the fuels with the biggest share are oil products (petrol, diesel, kerosene, butane etc.). Electricity consumption of about 2 ktoe (24 GWh)[26] represents the share consumed by the railways for powering their electric engine locomotives.

Since the biggest part (more than 99%) of the energy consumption in the transportation sector is that of oil and oil products, it can be noted that the passenger traffic has the biggest share (passenger cars, truck transport, bus passenger transport). The dominance of the oil products consumption in the passenger sector is so large that, for example from 2002 to 2006, 97% of the entire consumption in the transportation sector is accounted for by the passenger transportation.

According to the number of vehicles, the biggest group are the vehicles using gasoline, although there is a clear increasing trend of the number of vehicles using a combination of

[25]Source: IEA Energy Statistics, Electronic Version 2008 and EUROSTAT - Energy - yearly statistics 2006 EUROPEAN COMISSION - 2008 edition

[26]TRANSPORT AND OTHER COMMUNICATIONS, Statistical reviews no. 289, 337, 393, 452, 485, 544, State Statistical Office, Skopje.

gasoline and LPG. In 2006, about 72% of the vehicles used gasoline, 24% used diesel fuels and about 4% used a combination of gasoline and LPG.

The disproportion of the different types of fuel consumed in the transportation sector relative to the number of registered vehicles by type of fuels can be attributed to the fact that diesel fuelled vehicles are being used more intensively, (this primarily applies to commercial vehicles – busses, cargo vehicles, tow vehicles), i.e. these vehicles drive more kilometres per vehicle and have higher unit fuel consumption.

1.4.1. Description of individual EEI measures in the Transport sector

Table 1.4.1.: Overview table of all EEI programs and measures in Transport

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018
-	-	note 1	National / regional / local	share in FEC	List	note 2	
1	**2**	3	4	5	6	7	8
1.	**Renewal of the national road vehicle fleet**	Financial instruments (subsidies, loans, lower taxes)	national	Citizens, transport companies/ Transport sector	Provision of financial incentives for faster renewal of vehicles with better fuel economy	New EEI measure Under consideration	2,18 /14,11ktoe
2.	**Promotion of sustainable urban transport systems**	Information and mandatory information measures	National with selected cities as pilot project	Transport agencies, urban planning agencies, central and local government bodies, and mass media.	Provision of more efficient urban transport. Promotion of efficient modes of transport: (public transport, bicycle) and discouraging use of cars (parking policy, restricted zones)	New EEI measure Under consideration	5,02/ 14,93ktoe
2.a	**Introduction of tramway in Skopje**	Information measures/ Financial instruments	Local	Citizens, transport companies/ Transport sector	Optimization of public transport speed, stops, connections.	New EEI measure Under consideration	Not included in calculations
2b	**Renewal of public transport bus fleet**	Financial instruments (subsidies)	Local	Citizens, transport companies/ Transport sector	Provision of more efficient urban transport. Promotion of efficient modes of transport:	The implementation of the measure is on-going and will last until 2013	Involved in value of measure 2.

№	Title of the program/measure	Category	Application	Target group/ sector	End-use EEI action targeted	Status of implementation and timeframe	Annual energy savings expected in 2012/ 2018
2c	**Introduction of integrated traffic management center**	Financial instruments (subsidies); mandatory measures	Local	Government, car users Citizens, transport companies/ Transport sector	Provision of more efficient urban transport.	New EEI measure Under consideration	Involved in value of measure 2.
2d	**Promotion of greater use of bicycle**	Information measures	National	Citizens	Public campaign	Ongoing measure. Started 2009	Involved in value of measure 2.
2e	**Parking policy**	Information and mandatory	Regional	Government, car users	Discouraging use of cars (parking policy, restricted zones)	Ongoing measure. Started 2009	Involved in value of measure 2.
3.	**Fuel quality and fuel economy standards**	Regulation	National	Relevant government bodies	Development of European fuel quality standard and standards for greater fuel efficiency	New EEI measure Under consideration	2,39/ 7,54ktoe
4	**Car free days**	Information and mandatory information measures	National/ local	Government, car users	Public campaign for car free days	New EEI measure Under consideration	0,39/ 1,05ktoe
5	**Promotion of greater use of railway for intercity travel**	Information and mandatory information measures	National/ local	Citizens	Public campaign for use of environmentally friendly modes	New EEI measure Under consideration	2,58/ 6,99ktoe/year

1.4.2. Description of individual EEI measures in the Transport sector

1.4.2.1 *Renewal of the national road vehicle fleet*

Republic of Macedonia has very old road vehicle fleet. According to the data from the State Statistical Office[27], the average age of a road vehicle in Macedonia was 13 years (as of 31.12.2005). 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 bad fuel efficiency and pollutes a lot. 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 from road transport sector.

In order to estimate the possible energy savings from this measure, the data and forecasts from the Strategy for Development of Energy of Republic of Macedonia[28] is being used. The forecast takes into account:

- The existing and future structure of road vehicles by type of fuel and average vehicle age
- The existing and future average number of kilometres travelled per year per type of vehicle
- The average fuel efficiency per type of vehicle and per type of fuel per year
- The type of fuels considered: Gasoline, Diesel (including biodiesel) and LPG

Table 1.4.2.1. – Correlation between number of vehicles and consumption

Year	Population (in 000)	Rate of vehicle ownership (vehicles per 1000 inhabitants)	Total number of road vehicles	Annual consumption (ktoe/year)			
				Gasoline	Diesel	LPG	**TOTAL**
2010	2041	154	314314	125	205	16	**346**
2011	2040	160	326065	129	218	18	**364**
2012	2039	170	346453	136	236	20	**392**
2013	2039	180	367396	142	256	23	**421**
2014	2038	191	388894	149	275	26	**450**
2015	2037	202	410944	156	296	28	**480**
2016	2035	213	433207	162	316	31	**510**
2017	2035	224	455588	169	336	34	**540**
2018	2035	235	477968	176	356	37	**570**

During the past decade, the number of new passenger cars bought per year in Macedonia, has been ranging from 7500 to 15000, which is about 2,5% to 5% of the total

[27] Computed by use of data from Statistical Review 575: Transport, tourism and other services, STATE STATISTICAL OFFICE, November 2006

[28] Strategy for Energy Development in the Republic of Macedonia, Skopje 2010.

number of vehicles. In comparison, Slovenia, a country with similar number of population, the rate of annual purchase of new cars has been around 50000 cars per year.

If the measure for faster renewal of the road vehicle fleet is successful, and a rate of 20000 to 25000 new vehicle purchase per year is achieved, then the application of the same model gives the estimates of the following energy savings by 2018:

Table 1.4.2.2. – Correlation between number of vehicles, consumption and savings

	Annual consumption (ktoe/year)				Annual consumption (ktoe/year) With application of measure				Savings per year ktoe/year
Year	Gasoline	Diesel	LPG	Total	Gasoline	Diesel	LPG	Total	
2010	125	205	16	346	124	204	16	345	1,5
2011	129	218	18	364	128	217	18	362	2,0
2012	136	236	20	392	134	235	20	389	2,8
2013	142	256	23	421	140	254	23	417	3,6
2014	149	275	26	450	147	274	25	446	4,6
2015	156	296	28	480	153	294	28	474	5,6
2016	162	316	31	510	159	314	31	503	6,8
2017	169	336	34	540	165	334	34	532	7,6
2018	176	356	37	570	171	354	34	558	11,6

Total cumulative:46,2ktoe/yearor around 13 % total savings by 2018.

1.4.2.2 *Promotion of sustainable urban transport systems*

This measure includes more actions aimed at promotion of more sustainable modes of transport and travel behaviour. 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.

1.4.2.2a: Introduction of tramway in Skopje

The experience from other countries in the world show that the urban railway systems has greater attractiveness compared to the bus systems. The main reason for this is the higher level of service (faster, more reliable, greater capacity) offered by this mode of transport.

Therefore, it is reasonable to assume that an introduction of tramway in Skopje will attract some of the existing car user. This will result in some energy savings, because of the reduced use of private car for urban travel.

According to the General Urban Plan of Skopje[29] the number of trips per year was around 940 000 in 1998. 28,4% or around 266241 of this trips were made by car. Unfortunately, there is no new data, but there indications that this number is greater than 350000 trips per year by car.

If 10% of these trips are made by tramway instead by car than a reduction of 35000 trips by car per year can be expected. Since the average round trip has a length of 7 km, this

[29] General Urban Plan of Skopje, Physical, urban, traffic, ecological, planning of Macedonia, November 1999

translates to annual reduction of car kilometres of about 245000 km/year or savings of about 200 t/year of fuel.

In case the tramway is introduced in 2011, than for a 7 year period until 2018, the total saving will be around 1,018ktoe of energy.

The estimate of the cost of the total tram system is around 150,000,000 Euros. However, investments in the tramway are not taken into account, as the savings which it can produce. In the next phase, if the City and State policy are accompanied with better economical circumstances, this opportunity have to be considered.

1.4.2.2b: Renewal of public transport bus fleet

Currently, in Skopje there are about 500 public transport buses in service. The average age of this bus fleet is about 25 years. Most of the engines of these buses do not comply with even EURO 1 standard. According to the data from the public transport company JSP Skopje, the average fuel consumption per bus is around 42 l/100 km.

Given the total annual kilometres of around 30000000 km/year, the annual fuel consumption in 2007 was around 12 600 t/year.

The renewal of the bus fleet will result to better fuel economy per bus of around 28 l/100 km. For a period of 9years (2010 – 2018) the amount of energy savings could reach 18ktoe.

For the implementation of this measure, the budget of the Ministry of Transport and Communication has allocated the following funds:

- for the year 2010 – 4,751 million EUR (290.000.000 MKD); and
- for the year 2011 – 16,260 million EUR (1.000.010.000 MKD);

whereas, in compliance with the adopted budget for 2011, the following indicative funds have been allocated:

- for the year 2012 – 11,382 million EUR (700.000.000 MKD); and
- for the year 2013 – 14,472 million EUR (890,000.000 MKD).

1.4.2.2c: Introduction of integrated traffic management center

The center city of Skopje suffers from traffic congestion that lasts not only during the peak hours but during the entire day. The introduction of traffic control center and integrated real time traffic management can contribute for seamless traffic and less loss of time and burning of fuel at traffic signals.

This activity will include three main routes trough center city that will be treated by traffic management measures.

Since, no quality traffic study has ever been made in Skopje, a rough estimate of potential energy savings will be based on the potential average fuel efficiency improvement per vehicle from 11/l l00 km to 9 l /100 km.

E1 = 2l/100 km * 365 days * 2.2 km * 50 000 vehicle/day*2 = 160 t/year

E2 = 2l/100 km * 365 days * 2.2 km * 60 000 vehicle/day *2= 200 t/year

E3 = 2l/100 km * 365 days * 2.2 km * 80 000 vehicle/day *2= 260 t/year

1.4.2.2d: Promotion of greater use of bicycle

Similar to the effect of introduction of tramway, the effect of greater use of the bicycle is to achieve replacement of some of the existing trips made by car and other motor vehicles with trips made by bicycle.

Given the results achieved in some countries (Netherland, Denmark, Belgium) an objective of 10% reduction of car trips and their replacement with bicycle trips seems to be reachable.

1.4.2.2e: Parking policy

The parking policy in the central area of Skopje can help to change the travel behaviour of the people. The parking pricing policy together with the parking time limitation, can make some of the existing car users to transfer to other more efficient modes – public transport or bicycle.

The restrictive parking policy has been known to be a very effective measure if it is strictly applied. Therefore is seems plausible to expect possible reduction of car trips of 20%. In this case if 20% of these trips are made by tramway instead by car than a reduction of 70000 trips by car per year can be expected. Since the average round trip has a length of 7 km, this translatesinto annual reduction of car kilometres of about 490000 km/year or savings of about 400 t/year of fuel.

1.4.2.3 *Fuel quality and fuel economy standards*

This measure is to be associated with the first measure for renewal of the vehicle fleet. The expected savings would be a result of the better fuel quality usage.

Therefore, the estimated energy savings in the year2018would be 7,54ktoe/year.

1.4.2.4 *Car free days*

A promotion of car free days, can help to reduce the number of vehicles in use during these actions. This measure should be applied on a national level and should be supported by nationwide promotion and marketing.

The energy saving from such measure is very difficult even to estimate, since no data exist on the number of trips, nor its structure, made by car per day on a national level.

A very rough estimate would be as follows:

The annual energy consumption in Macedonia is 335 ktoe/year in 2007 or 918 toe/day. This corresponds to around 9 000 000 km/day if an average consumption of 10 l/100 km is assumed.

In order to check the reasonability of this numbers the corresponding annual kilometres per vehicle is computed. 9 000 000 km/day for a vehicle fleet of 300 000 means around 30 km/day/vehicle or around 10950 km annually per vehicle (commercial included), which is a very reasonable number.

If in a car free day, 10% of the vehicles are not use then:

300 000 * 0.1 * 30 = 900 000 km/day reduction in entire country

Or savings of around 90 toe/day.

If three car free days are organized in one year, it becomes a saving of 270 toe or 0,27ktoe/year.

As a realistic value it is accounted that is possible to reach in 2018 energy savings equal to 1,05ktoe.

1.4.2.5*Promotion of greater use of railway for intercity travel*

The railway system in Republic of Macedonia needs great improvement. The infrastructure and the railway stock are very old. Recently, services have been cut, and a decrease of the number of passengers carried by railway has been recorded.

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 must be improved.

Here, also it is very difficult to estimate the possible savings due to the lack of data on the national number of intercity trips.

However, since most of the potential trips by railway are to and from Skopje, the traffic counts of cars entering Skopje can give an idea about the number of trips per day. According to the National Statistical Office, the average annual daily traffic on the east entrance of Skopje (from Veles, Kumanovo) was 13745 vehicles per day, while on the west entrance (from Tetovo) was 11141 vehicles per day or total of around 24 000 vehicles per day.

It can be achieved energy savings of 6,99ktoe, in 2018.

1.4.3. Assessment of total ESD energy savings in the Transport sector

The data collection of final energy consumption according to various forms of transportation will be established. Central monitoring systems must contain data on vehicle use such as the number of vehicles, types of vehicles in the fleet, the age of vehicles, fuel consumption, the number of passengers, the amount of goods transported, etc.

Investments in this sector are intensive (Figure **1.4.3.1).** Financial revenues generated by fuel savings from new bus fleet (investments of around 50 M €), are not sufficient to ensure short, financially justified, pay-back period. It is a public need, service for the citizens, in the same time protecting the environment, even subsiding ticket expenses. In some EU cities, public transport tickets are free of charge (Freiburg, Germany; 3 tram station from the city centre in Zagreb, Croatia, etc).

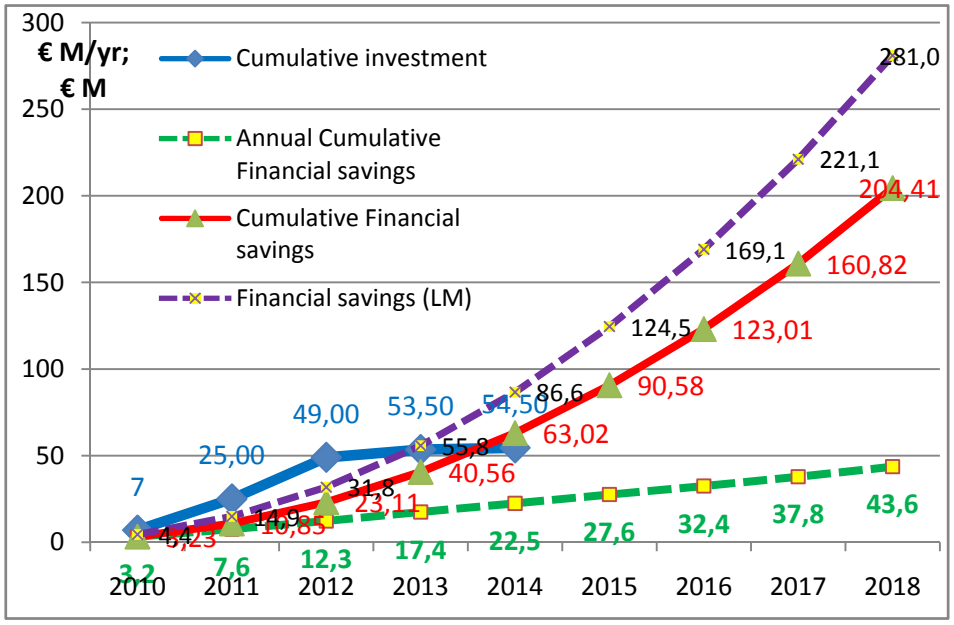


Figure 1.4.3.1 Break-down of financial results in the sector of transport

Energy savings are in the frame of expectations (**1.4.3.2**). If all measures and presumes will be fulfilled, energy savings can be 3 times higher.

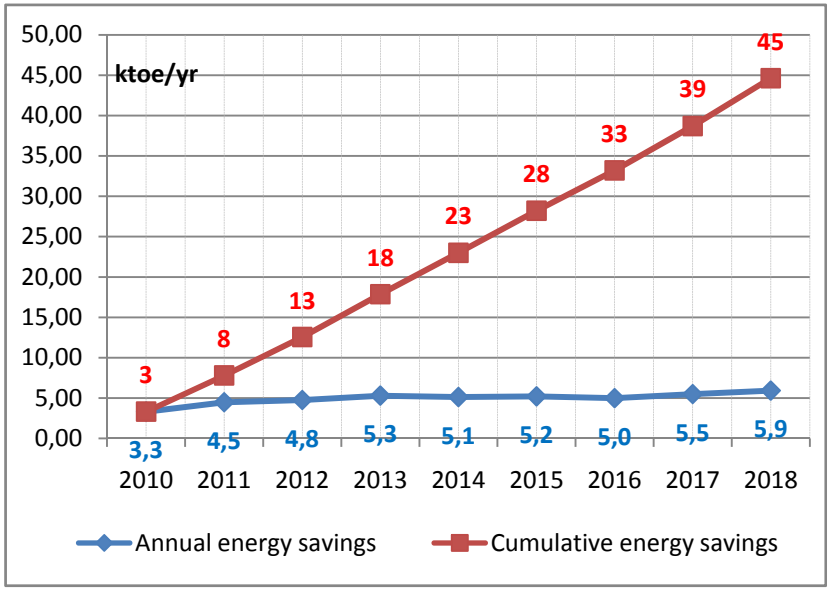


Figure 1.4.3.2 Energy savings generated from the sector of transport

The uncertainty of average price for the newly added cars to the fleet, absence of available modelling tools for appropriate simulations (MARKAL model for Macedonia does not cover transportation sector), lack of statistics in the sector make estimates of investment costs unrealistic and unreliable. Given the Government commitment to individual measures proposed, the investment costs, returns and performance will need to be calculated individually.

Participation of assumed programs into Energy Savings in the Transport sector are shown in the Table 1.4.3.1, depending to the monitoring years.

Table 1.4.3.1 Participation of assumed programs into Energy Savings in the Transport sector

Title of the program/measure	Savings ktoe			Participation in savings		
	2012	2018	2020	2012	2018	2020
Renewal of the national road vehicle fleet	2,18	14,11	21,31	17,35%	31,62%	35,24%
Promotion of sustainable urban transport systems	5,02	14,93	18,83	39,95%	33,46%	31,13%
Fuel quality	2,39	7,54	10,22	19,05%	16,90%	16,89%
Car free days	0,39	1,05	1,32	3,09%	2,35%	2,18%
Promotion of greater use of railway for intercity travel	2,58	6,99	8,80	20,57%	15,67%	14,55%
Sum	12,56	44,62	60,48	100,00%	100,00%	100,00%

The investments in the Transport sector were determined according to the investments into the new bus fleet. In that case the price of investment is very high 15,43 M€/ktoe, once again emphasizing that public transport investments enable other public merits.

Assumed investments will be ensured by Government.

The saved energy value is in a strong correlation with the prices of gasoline and diesel fuel and is equal to 0,98 M€/ktoe.

The EE indicators used for the transport sector include: intensity (total), energy efficiency index, unit consumption (by mode and fuel, in equivalent cars), specific consumption (including fuel use by both trucks and cars – overall average of the fleet and of new cars), CO_2 emissions by mode (cars – overall average of the fleet and of new cars - trucks, bus, air and rail).

2. OVERALL NATIONAL TARGET

2.1. Determination of the overall national target

In pursuance of the ESD, the Republic of Macedonia has adopted a national indicative energy savings target of not less than 9 % of the final inland energy consumption for 9 years by 2018 (a quite high rate for the existing conditions an average 1 % annually), which means that the country should ensure energy savings to the amount of not less than **147,2ktoe**.

The calculation of the national indicative target has been carried out according to the methodology provided in Annex I of ESD 2006/32/EC. The national target has been calculated on the basis of the average final consumption of energy for the last five years (**Figure 2.1.1**) for which data are available and are in harmony with Strategy for Energy Development in the Republic of Macedonia until 2030. In the case of the Republic of Macedonia, this period is 2002-2006. The target is expressed in the absolute amount of ktoe to be consistent with Strategy for Energy Development. The calculation is given in the Table 2.1.1.

Table 2.1.1 Calculation of the national saving target

	Total final energy consumption Macedonia				
	2002	**2003**	**2004**	**2005**	**2006**
	Unit ktoe				
Final inland energy consumption within the scope of ESD	1504	1653	1624	1691	1708
Industry (ESD scope)	438	508	464	549	577
Transport	356	340	346	348	350
Households	449	490	487	483	498
Commercial and services	192	252	225	239	224
Agriculture/ Non-energy use	69	63	102	72	59

Average over 5-year period	1636
Indicative value of9% energy saving target in 2018	147,24
Energy saving target in 2018adopted (12,21%)	199,78
Intermediate energy saving target in 2012 (4%)	66,1

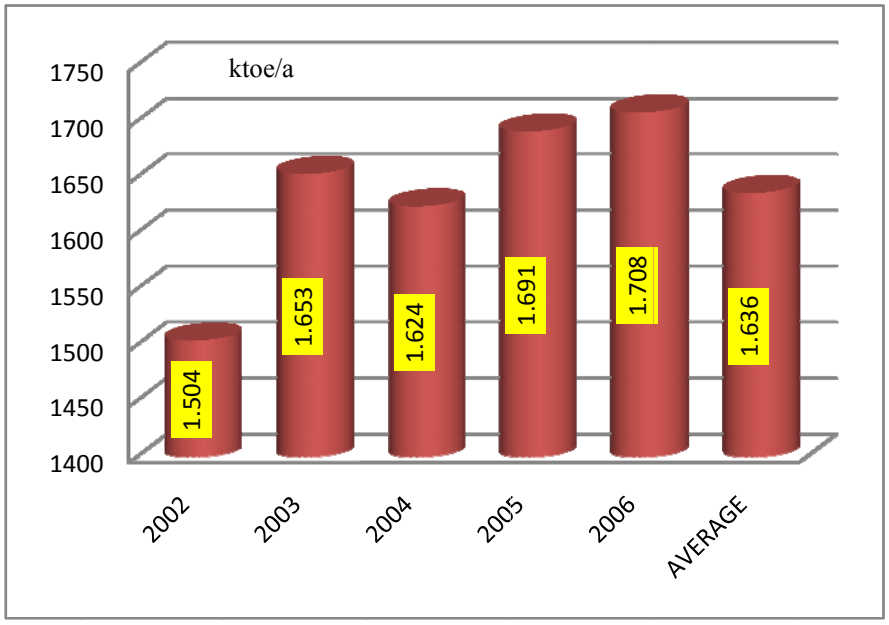


Figure 2.1.1 Total final energy consumption historical data

2.2. Determination of the national intermediate target

Republic of Macedonia has taken a tentative approach to the setting of the intermediate target in the first three-year Action Plan to amounts 66,1ktoe of saved energy by the end of 2012, which represents 4 %*(≥ 2%)* of the average amount of final inland energy consumption within the scope of the ESD.

Table 2.2.1 FEC in scope of ESD, used for determination of the national indicative target, ktoe

	year	2006		
		Other fuels and energy	Electricity	Total consumption
	1	**2**	**3**	**4**
	FEC[30] covered by the ESD	**1153**	**554**	**1708**
1	Households	236	262	498
2	Commercial and Public Services	126	98	224
3	Industry	385	192	577
4	Transport	349	-	349
5	Agriculture	28	2	30
6	Non-energy use	29	-	29

[30] There are no installations with emissions quotas (excluded by the ETD); air transport and armed forces consumption is negligible.

RESULT	
FEC in scope of ESD	**1708**
Average FEC in scope of ESD (2002-2006)	**1636**
Energy saving target in 2018 (12,21 %)	**199,78**
Intermediate energysaving target in 2012 (4%)	**66,1**

2.3. Specific conditions for estimation of the national target

2.3.1 Macro economic indicators

Notwithstanding the relatively high energy intensity of the Macedonian economy and the fact that the country has a significant potential for implementation of cost-effective energy efficiency improvement measures, following a period of stabilization, the final inland energy consumption, and with it the primary consumption too, begins to increase (Figure 2.3.1).

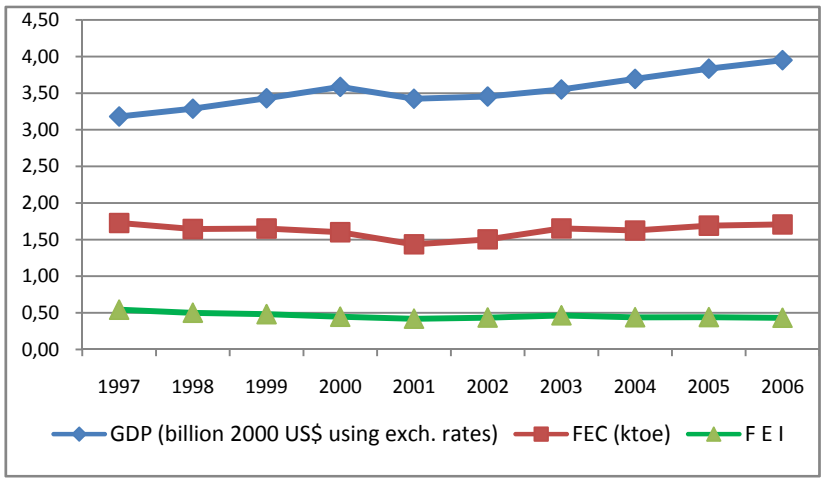


Figure 2.3.1 Final energy intensity - historical development

The growth of energy consumption in the country is attributable to:

- **The GDP rate growth** and the increasing quantities of energy resources needed to ensure it;
- **The obsolete technologies and equipment in the energy-consuming sectors** of the Macedonian industry: a symptom of insufficient investments and inadequate level of energy management;
- **The growing consumption in the transport sector:** slow renovation of the MVs for transportation of goods and those for transportation of passengers in the public transport sector, a natural tendency of increased use of private cars towards the normal European levels;
- **The growing consumption in the residential sector:** a tendency of increased residential comfort towards the standardized European levels.

Characteristic of the past few years is the increased use of liquid fuels, reaching 40% of the final energy consumption, and electricity reaching 32% of the final energy consumption (**Figure 2.3.2)**. The main user of liquid fuels is the motor transport sector, as well as hospitals, schools and other public-sector buildings using this type of fuel for heating purposes. The main user of electricity is public-sector buildings and private residential buildings which are using electricity for heating purposes.

In defining priority energy efficiency improvement measures, account should be taken of the growing use of liquid fuels and electricity.

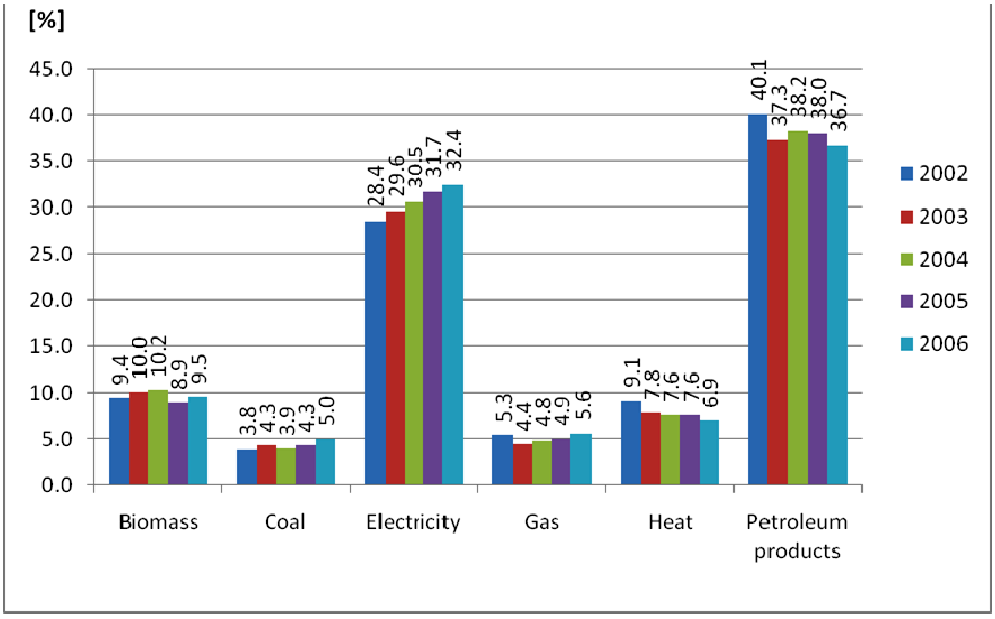


Figure 2.3.2 Final energy consumption in the period 2002-2006.

2.3.2 FEC per sector and fuel in the scope of ESD

Table 2.3.2.1.FEC per sector and fuel in the period 2002-2006 (ktoe)

	Coal	**Electricity**	**Liquid fuels**	**Hot water**	**Fire wood**	**Natural gas**	**Geo-ther-mal**	**Total**
	Year 2002							
Final inland energy consumption within the scope of the ESD	**69**	**428**	**686**	**136**	**141**	**32**	**1**	**1504**
Industry (ESD scope)	63	115	148	79	1	32	0	**438**
Transport	0	2	354	0	0	0	0	**356**
Households	3	231	35	40	140	0	0	**449**

Commercial and Services	3	78	92	17	0	0	1	**192**
Agriculture	0	2	19	0	1	0	11	**32**
Non-energy use	0	0	38	0	0	0	0	**38**
	Year 2003							
Final inland energy consumption within the scope of the ESD	**138**	**490**	**689**	**127**	**165**	**30**	**12**	**1651**
Industry (ESD scope)	131	152	132	62	1	30	0	**508**
Transport	0	2	339	0	0	0	0	**341**
Households	3	249	38	44	156	0	0	**490**
Commercial and Services	4	85	132	21	7	0	2	**251**
Agriculture	0	2	15	0	1	0	10	**28**
Non-energy use	0	0	33	0	0	0	0	**33**
	Year 2004							
Final inland energy consumption within the scope of the ESD	**90**	**494**	**707**	**123**	**166**	**32**	**10**	**1624**
Industry (ESD scope)	78	157	134	61	2	32	0	**464**
Transport	0	2	344	0	0	0	0	**346**
Households	3	250	39	40	155	0	0	**487**
Commercial and Services	9	85	99	22	8	0	2	**225**
Agriculture	0	2	48	0	1	0	8	**59**
Non-energy use	0	0	43	0	0	0	0	**43**
	Year 2005							
Final inland energy consumption within the scope of the ESD	**109**	**535**	**725**	**127**	**152**	**33**	**9**	**1691**
Industry (ESD scope)	102	184	163	63	5	32	0	**549**
Transport	0	2	346	0	0	0	0	**348**
Households	3	257	40	43	140	0	0	**483**
Commercial and Services	4	90	117	21	5	1	1	**239**
Agriculture	0	2	24	0	2	0	8	**36**
Non-energy use	0	0	35	0	0	0	0	**35**
	Year 2006							

Final inland energy consumption within the scope of the ESD	**117**	**553**	**712**	**119**	**162**	**34**	**9**	**1708**
Industry (ESD scope)	110	191	183	57	3	33	0	**577**
Transport	0	2	347	0	0	0	0	**349**
Households	3	262	41	42	150	0	0	**498**
Commercial and Services	4	96	93	20	8	1	1	**223**
Agriculture	0	2	19	0	1	0	8	**31**
Non-energy use	0	0	29	0	0	0	0	**29**

2.3.3 Distribution of the indicative target by sectors and by different kinds of fuels and energy

Table 2.2: Distribution of the indicative target by sectors

Sectors – final energy users	Distribution of the target until 2012	Shares of the target, index	Notes
	ktoe	%	
Households	7,63	11,54	Objective need of increase of households' energy consumption.
Commercial and Services	4,96	7,50	Additional effect of implementation of EEI measures with financial means from SB and MB
Industry	40,96	61,97	BAT implementation
Transport	12,55	18,99	Need of reduction of the country dependence of liquid fuels (petrol) import.
Total	66,10	100	

2.3.4 Investments and financial savings from the implementation of measures and activities

Table 2.3.4.1 Investment responsibility per sector

	Investment responsibility				
Sector	**Budget of RM (mill. €)**	**Municipalities (mill. €)**	**Donors/IFIs (mill. €)**	**Private sector (mill. €)**	**Total investments until 2018 (mill. €)**
Residential	4	0,7	28,1	150,5	183,3
Commercial	24,14	11,97	16,29	42,71	95,11
Industry	0	0	0	73,9	73,9
Transport	54,5	0	0		54,5
Total	82,64	12,67	44,39	267,11	406,81

Table 2.3.4.2 Penetration of financial investments per sector, expressed in million EUR (mill.€/annually)

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Residential sector	11,1	11,6	12,4	17,2	18,9	19,6	26,2	31,8	34,5
Commercial and Public Services	6,79	7,84	8,86	10,13	12,32	14,49	12,79	11,83	10,06
Industrial sector	23,7	3,7	5,8	20	7	3	2	3,2	5,5
Transport sector	7	18	24	4,5	1	0	0	0	0
Total	48,59	41,14	51,06	51,83	39,22	37,09	40,99	46,83	50,06
Cumulative investments for the relevant year	48,59	89,73	140,79	192,62	231,84	268,93	309,92	356,75	406,81

Table 2.3.4.3 Distribution of investment responsibility per year

	Investment responsibility				
Year	**Budget of RM[31] (mill. €)**	**Municipalities (mill. €)**	**Donors/IFIs (mill. €)**	**Private sector (mill. €)**	**Total per year (mill. €):**
2010	6,70	0,90	5,23	35,76	48,59
2011	20,64	1,03	5,50	13,97	41,14
2012	14,31	1,20	9,68	25,87	51,06
2013	18,60	1,34	13,97	17,92	51,83
2014	6,00	1,70	3,00	28,52	39,22
2015	5,00	1,70	3,00	27,39	37,09
2016	4,00	1,60	1,50	33,89	40,99
2017	3,94	1,60	1,50	39,79	46,83
2018	3,45	1,60	1,01	44,00	50,06
Total per investor:	**82,64**	**12,67**	**44,39**	**267,11**	**406,81**

[31]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, the Energy Agency of the Republic of Macedonia. Funds allocated in the Budget of the Republic of Macedonia, among others, include the implementation of following measures: social housing projects, renewal of public transportation bus fleet, implementation of information campaigns on energy efficiency, EE refurbishments of buildings in the education sector, EE refurbishments of hospital buildings, etc.

Table 2.3.4.4 Distribution of financial savings

Sector	Financial savings under current energy prices (mill. €)	Financial savings under liberalized market energy prices (mill. €)
Residential	91	189
Commercial and Public Services	82,41	149,5
Industry	457	741
Transport	204,41	281
Total o	**834,82**	**1360,5**

2.4. Assessment and monitoring of the energy savings, according to ESD in the period 2010-2012

The assessment of energy savings in 2012 (including by sectors and by energy) will be carried out using the standard methodology recommended by the European Commission in connection to the list of recommended EEI measures. It includes combination of two approaches, by „top-down" and "bottom-up" and has to be made on the base of the official statistical data. The harmonized methodology has to be adopted at national level.

Monitoring in the frame of this Plan will be done every year on the base of data from national statistical energy balances. The responsible body for the measurement and verification of the energy savings will be the EA and MoE. Progress will be reported and published annually.

3. HORIZONTAL AND CROSS-SECTORAL MEASURES

3.1. List and description of horizontal and cross-sectoral EEI measures

	Measure	Residential	Commercial and public	Industrial	Transport
1	Adoption and enforcement of Building Energy Codes	✓	✓		
2	Appliance and equipment labelling and energy performance standards	✓	✓	✓	
3	Energy metering and informative billing	✓	✓		
4	Energy auditing programmes	✓	✓	✓	
5	EE and RES credit line; Fund for Energy Efficiency (new)	✓	✓	✓	✓
6	Feed-in tariffs for RES and high-efficiency cogeneration[32]		✓	✓	
7	Strengthening energy efficiency in education; training	✓	✓	✓	
8	Energy management and auditing in the commercial and services sector	✓	✓	✓	
9	Hot water boilers and air conditioners labelling and energy performance standards control		✓	✓	
10	Production of the energy efficiency indicators on the macro-economic level and per sectors	✓	✓	✓	✓
11	Establishment of information centres and municipal network and implementation of information campaigns on energy efficiency	✓	✓	✓	✓

3.2. Assessment of horizontal measures

Until now a significant number of EU normative documents in the Republic of Macedonia have been introduced. They contain variety of activities and measures including measures introducing different EE standard and norms. Their effect can hardly be estimated due to lack of available methodologies and statistical information. The effects of the measures and activities could be estimated after development of the corresponding standards and methodologies.

Actually observed increase of FEC has to go slower due to the implementation of EEI measures. In short-term and middle-term conditions this dependence could be accepted as constant: The rate of FEC increase will be slower that the rate of GDP growth, at least for

[32] Note that the use of high efficiency cogeneration in end-use sectors, especially industry is considered an EEI measure.

1,5%, taking in account effect of national economy restructuring, effect of preceded introducing of the part of EU legislation and effect of autonomous EE increase.

Independently of the high value of EI at this moment it is not realistic to expect that in the next several years EI will decrease faster. This statement is based on the fact, that some of the sectors in FEC do not produce VA (for example: households and private cars). These sectors may increase their shares in FEC simultaneously with increase of the private incomes and significantly to decrease the effect of EEI measures implementation in other sectors.

At this point it is very difficult to assess the potential impact in terms of energy savings for horizontal and cross-sectoral measures.

For this purpose energy efficiency indicators on the macro-economic level will be utilised. These include: primary energy intensity (total and total with climatic corrections), final energy intensity (total and total with climatic corrections), adjusted final intensity (at constant structure, adjusted according to the economy, climate and structure), energy intensity index, and CO_2 index (CO_2 intensity, CO_2 per capita).

4. MEASURES SPECIALLY REQUIRED BY THE DIRECTIVE ON ENERGY END-USE EFFICIENCY AND ENERGY SERVICES

Provisions of the ESD's Article 5 require the public sector to play an exemplary role in meeting the national energy saving target.

The ESD specifically requires that at least two out of six measures listed in Annex VI be applied in the context of the public sector's exemplary role. Based on the initiatives already undertaken, the possibilities provided through the Energy Law and Rulebooks, as well as additional legislation which is in the phase of preparation the most appropriate measures to be applied in the Republic of Macedonia are:

4.1. Article 5 on EEI measures in public sector

Public sector has to implement cost-effective measures which generate the largest energy savings in the shortest span of time.

Title	Article 5 and Annex 6 (f) of ESD for changes in legislation in area of end-use efficiency in public sector and public procurement measures.
Relevant EEI measures	*Requirements on purchase or renting of energy efficient buildings or parts thereof or requirements on the replacements or reconstruction of purchasedor rented buildings or parts thereof in order to become energy efficient (Building Energy Codes and Enforcement)*
Title of legislation or regulation	1. Energy Law ("Official Gazette of the Republic of Macedonia" no.16/11), Article 134 2. According to the Energy Law, Article 136 stipulates the adoption of the Rulebook for Energy Efficiency of Buildings
Data of entry into force	The Rulebook for Energy Efficiency of Buildings is anticipated for adoption by 01.10.2011.

Title	Article 5 and Annex 6-a of ESD for changes in legislation in area of end-use efficiency in public sector and public procurement measures.
Relevant EEI measures	*Requirements, concerning the use of financial instruments for energy savings, including energy performance contracting, that stipulate the delivery of measurable and pre-determined energy savings (including whenever public administrations have outsourced responsibilities);*
Title of legislation or regulation	1. Energy Law ("Official Gazette of the Republic of Macedonia" no. 16/11) Article 139
Data of entry into force	The Energy Law is in force from 18 February 2011.

Title	Article 5 and Annex 6(b) of ESD for changes in legislation in area of end-use efficiency in public sector and public procurement measures.
Relevant EEI measures	*Requirements to purchase equipment based on lists of energy-efficient product specifications of different categories of equipment.*
Title of legislation or regulation	Rulebook for efficiency requirements of new hot water boilers combusting liquid or gaseous fuel
Data of entry into force	05.02. 2007

Title	Article 5 of ESD on EEI measures in the public sector in connection with article 12.1of the EPBD
Relevant EEI measures	*Introduced mandatory certificates for buildings or building units which are constructed, sold or rented out and buildings where a total useful floor area over 500 m^2 is occupied by a public authority and frequently visited by the public, preceded by energy audits prescribing energy savings measures.*
Title of legislation or regulation	1. Energy Law ("Official Gazette of the Republic of Macedonia" no.16/11), Article 134 2. In compliance with Article 135, paragraph 5 of the Energy Law, the Rulebook on Energy Audits will be adopted; 3. In compliance with Article 136, paragraph 8 of the Energy Law, the Rulebook on Energy Performance of Buildings will be adopted.
Data of entry into force	1. Energy Law: 18.02.2011; 2. Rulebook on Energy Audits: 31.12.2011; 3. Rulebook on Energy Performance of Buildings: 01.10.2011

4.2. Article 6 about the obligations of energy or natural gas suppliers and relevant distribution system operators

Title	Article 6.1 of ESD for ensuring the key role of EDs for implementation of the indicative target.
Relevant EEI measures	*Obligations of the energy or natural gas suppliers and the relevant distribution system operators:* *- to provide statistical information of their final customers to the authorities;* *- to ensure the offers to their final customers, and the promotion, of competitively priced energy services;* *- to ensure the availability to their final customers, and the promotion, of competitively-priced energy audits conducted in an independent manner and/ or energy efficiency improvement measures;* *- to contribute to the funds and funding mechanisms.*

Title of legislation or regulation	Energy Law ("Official Gazette of the Republic of Macedonia" no. 16/11) Article 133, Article 135, Article 137, Article 141, paragraph 5.
Data of entry into power	The Energy Law is in force from 18 February 2011.

4.3. Article 7 on availability of information

Title	Article 7 of the ESD on transparency and wide dissemination to the relevant market actors of information on EEI mechanisms and adopted financial and legal frameworks with the aim of reaching the national indicative energy savings target.
Relevant EEI measures	*1. Promotion of EEI measures* 2. *Enlargement of existing activities and a possibly structure of the existing authorities and organizations.*
Title of legislation or regulation	Energy Law ("Official Gazette of the Republic of Macedonia" no. 16/11) Article 140 and Article 141
Data of entry into power	The Energy Law is in force from 18 February 2011.

Article 7 prescribes that information related to energy efficiency mechanisms and financial/ legal frameworks are transparent and widely disseminated to relevant market actors when those mechanisms are adopted with the aim of reaching the national indicative energy savings target. Greater efforts should be made to promote energy end-use efficiency.

4.4. Article 12 on energy audits

Title	Article 12(1) of ESD, Energy audits
Relevant EEI measures	*Ensuring the availability of efficient, high-quality energy audit schemes which are designed to identify potential energy efficiency improvement measures and which are carried out in an independent manner, to all final consumers, including smaller domestic, commercial and small and medium-sized industrial customers.*
Title of legislation or regulation	1. Energy Law ("Official Gazette of the Republic of Macedonia" no.16/11). Article 135, Article 137 and Article 138 2. In compliance with the Energy Law, Article 135, paragraph 5 it is necessary to adopt the Rulebook for Energy Audits, in order to establish energy audit schemes to assess the EEI measures and to determine the terms and conditions and the procedure on authorizing energy auditors.
Data of entry into power	1. The Energy Law is in force from 18 February 2011. 2. Rulebook for Energy Audits will be adopted by 31.12.2011.

5. LEGISLATIVE CHANGES RELATED TO THE TRANSPOSITION OF THE DIRECTIVE ON ENERGY END-USE EFFICIENCY AND ENERGY SERVICES

Energy Efficiency already plays an important role in the Macedonian energy policy. One of the goals of energy policy, defined in the "Strategy on Energy Development in the Republic of Macedonia until 2030" and in the "Strategy for improvement of Energy Efficiency in the Republic of Macedonia until 2020", is to improve the overall energy efficiency of energy production and energy end-use.

In order to implement the ESD a number of changes are required to be made in effective normative documents.

Title	1. Article 10 of the ESD. Energy efficient tariffs and other regulations for net-bound energy; 2. Article 6, paragraph 2 of the Energy Law ("Official Gazette of the Republic of Macedonia" no.16/11)
Required changes	Additional regulation of the activities in the electricity and natural gas sectors is needed, in compliance with Article 10 of the ESD on energy efficient tariffs, where in compliance with the Energy Law, Article 22, paragraph 1, item 2 and item 3, the following rulebooks will be adopted: • Rulebook on setting prices for regulated energy activities in the field of natural gas; • Rulebook on setting electricity prices for the supplier of last resort; • Rulebook on setting natural gas prices for the supplier of last resort.
Description	The adoption of these secondary legislative acts will additionally ensure the removal of those incentives in transmission and distribution tariffs that unnecessarily increase the volume of distributed or transmitted energy.

Title	1. Chapter XI of the Energy Law – Energy Efficiency; 2. Article 6, item 3 of the ESD: to ensure sufficient incentives, equal competition and level playing fields for market actors, such as ESCOs, installers, energy advisors and energy consultants, to independently offer and implement the energy services, energy audits and energy efficiency improvement measures
Required changes	In compliance with the Energy Law, Article 135, paragraph 5, the Rulebook on Energy Audits will be adopted..
Description	To attract ESCO, installers, energy advisors and energy consultants to get involved in the implementation of EEI activities and measures anticipated under the ESD.

Title	1. Chapter XI of the Energy Law –Energy Efficiency, Article 130, paragraph 6; 2.Article 11 of the ESD, Establishment of the Fund for Energy Efficiency
Required changes	In compliance with Article 130, paragraph 6 of the Energy Law, a **Fund for Energy Efficiency** can be established by means of a law, which will support the public and private sector in the implementation of their obligations for EEI.
Description	The establishment of the Fund for Energy Efficiency will enable funding for the energy efficiency projects (including market studies, project development, energy audits), support for ESCOs and energy service contracting, energy management on municipal level, implementation of measures to subsidize EEI measures, implement programs on public awareness, i.e., promotion of energy efficiency in different fields etc., under terms and conditions that correspond with the techno-economic characteristics of different energy efficiency projects.

Title	Article 12 of the ESD: Measures to ensure the availability of efficient, high-quality **energy audit schemes**
Required changes	In compliance with the Energy Law, Article 135, paragraph 5, the Rulebook on Energy Audits needs to be adopted.
Description	There is need to ensure availability of efficient energy audit schemes of high quality, which are designed to determine EEI measures and that are independently offered and implemented for all end users, including the households, commercial and small and medium industrial consumers. More specifically, the following should be guaranteed: - measures that ensure there are sufficient incentives, equal competition and level playing fields for market actors other than the energy distributors, retail energy suppliers, etc., such as ESCOs, energy advisors and energy consultants to independently offer and implement the energy services, energy audits and EEI measures. - availability of simple checklists on energy efficiency, guidelines, consumer software with non-complex buildings (for example, in the residential sector), where energy audits have disproportionate high costs; - possible subsidizing programs or free-of-charge energy audits for small consumers.

No. _____	President of the Government of the Republic of Macedonia
_____ 2011 Skopje	Nikola Gruevski, M.A *(handwritten signature)*

Annex I - Energy content of selected fuels for end use — conversion table

Energy commodity	kJ (NCV)		kgoe (NCV)		kWh (NCV)	
1 kg coke	28 500		0,676		7,917	
1 kg hard coal	17 200	30 700	0,411	0,733	4,778	8,528
1 kg brown coal briquettes	20 000		0,478		5,556	
1 kg black lignite	10 500	21 000	0,251	0,502	2,917	5,833
1 kg brown coal	5 600	10 500	0,134	0,251	1,556	2,917
1 kg oil shale	8 000	9 000	0,191	0,215	2,222	2,500
1 kg peat	7 800	13 800	0,186	0,330	2,167	3,833
1 kg peat briquettes	16 000	16 800	0,382	0,401	4,444	4,667
1 kg residual fuel oil (heavy oil)	40 000		0,955		11,111	
1 kg light fuel oil	42 300		1,010		11,750	
1 kg motor spirit (petrol)	44 000		1,051		12,222	
1 kg paraffin	40 000		0,955		11,111	
1 kg liquefied petroleum gas	46 000		1,099		12,778	
1 kg natural gas (1)	47 200		1,126		13,10	
1 kg liquefied natural gas	45 190		1,079		12,553	
1 kg wood (25 % humidity) (2)	13 800		0,330		3,833	
1 kg pellets/wood bricks	16 800		0,401		4,667	
1 kg waste	7 400	10 700	0,177	0,256	2,056	2,972
1 MJ derived heat	1 000		0,024		0,278	
1 kWh electrical energy	3 600		0,086		1 (3)	

Source: Eurostat.
(1) 93 % methane.
(2) Member States may apply other values depending on the type of wood most used in the respective Member State.
(3) For savings in kWh electricity Member States may apply a default co-efficient of 2,5 reflecting the estimated 40 % average EU generation efficiency during the target period. Member States may apply a different co-efficient provided they can justify it.