

# Energy efficiency in the Republic of Macedonia

## Policy implementation and case study for barriers

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Energy Agency  
of the Republic of Macedonia





# POLICIES AND REGULATIONS ON ENERGY EFFICIENCY ARE BASED ON:

- **National Energy Strategy 2010 until 2030**

The objective of the Strategy is restructuring of the energy sector based on market economy principles and developing a modern energy policy.

- **EE Strategy 2010-2020**

Implementation of energy efficiency measures in the public, commercial, industrial and residential sector.

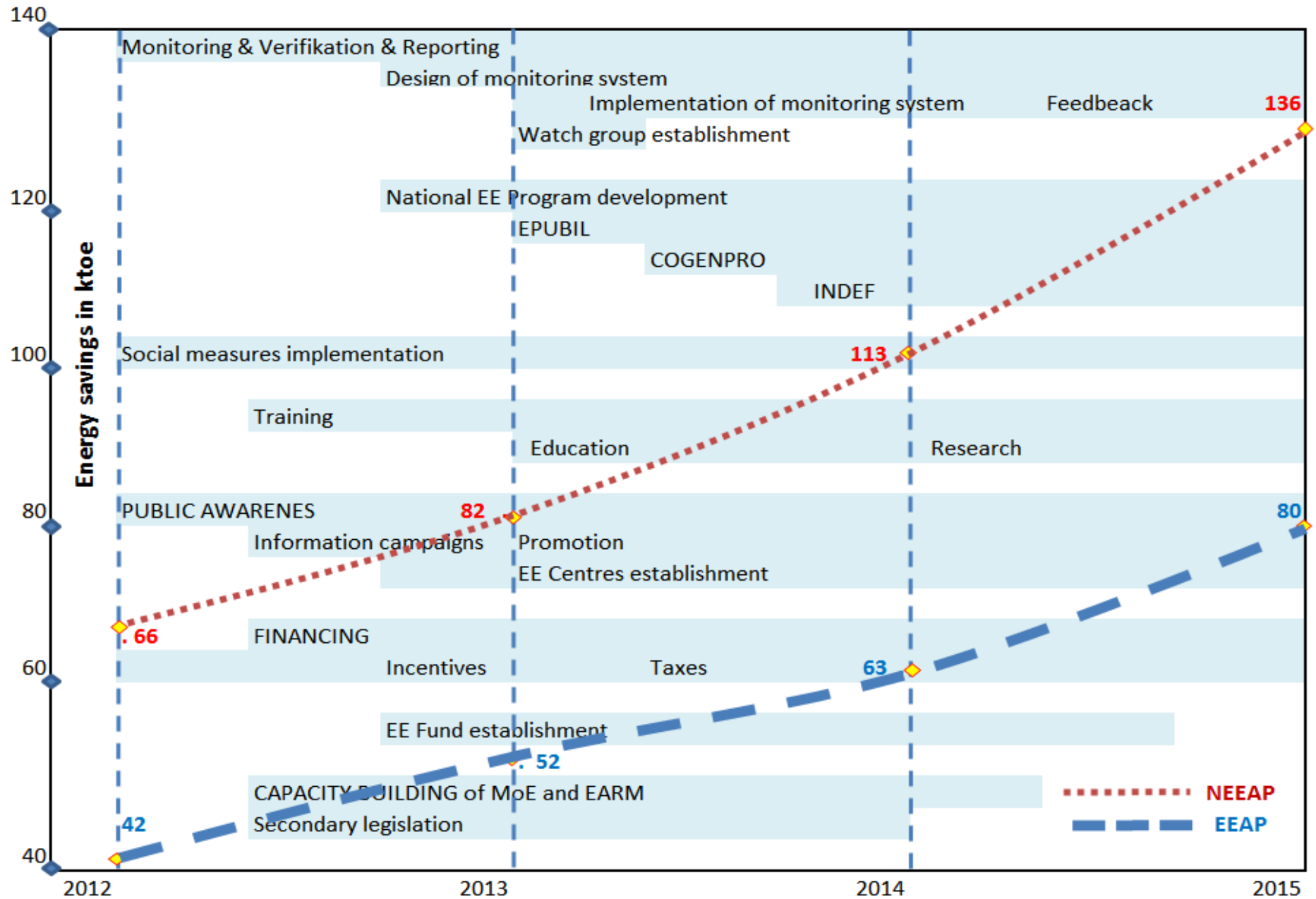
- **National Energy Action Plan 2010-2018**

The main goal of EE Action plan is achieving 9% savings in the final energy consumption until 2018.

- **Energy Law 2011**, amended 2012 and 2013.

- **Rulebooks on Energy Audit and Energy Performance of Buildings**, are adopted in 2013. Training for the first 250 auditors began in early 2014.

# FIRST AND SECOND EEAP IMPLEMENTATION TIMELINE



# END-USE MEASURES AND FINAL ENERGY SAVINGS

## Overview of individual measures

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

R.1	Retrofits in existing residential buildings	Existing residential buildings	2010 - 2015 (2018)	1.94	11.95	Implemented as planned	Targeted to multi apartment buildings
R.2	Electrical appliance and equipment labeling	Electrical appliances	2010 – 2015	0.26	0.66	Partially implemented	Horizontal measure
R.3	Promotional Program for wider application of thermal solar collectors and heating pumps	Residential sector (solar thermal, heat pumps, biomass)	2013 – 2015	1.46	2.37	Implemented as planned	Targeted to Association of building owners
R.4	Information campaigns and network of EE infocenters	Residential owners and tenants	2010 – 2015	0.99	5.12	Implemented as planned	Horizontal measure
<b>Sum of savings:</b>				<b>4.64</b>	<b>20.09</b>		

# END-USE MEASURES AND FINAL ENERGY SAVINGS

## Overview of individual measures

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

# END-USE MEASURES AND FINAL ENERGY SAVINGS

## Overview of individual measures

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

# END-USE MEASURES AND FINAL ENERGY SAVINGS

## Overview of individual measures in the industry sector

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

# END-USE MEASURES AND FINAL ENERGY SAVINGS

Overview of individual measures in the energy sector

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



# END-USE MEASURES AND FINAL ENERGY SAVINGS

## Overview of individual measures in the mobility sector

No	Title of the energy saving measure	End-use targeted	Duration	Achieved energy savings in 2012 ktoe	Energy savings expected in 2018 ktoe	Status in relation to 1 <sup>st</sup> EEAP	Additional comments
T.1.	Renewal of the national road vehicle fleet	Road vehicle fleet	2010 – 2015 (2018)	3.73	10.66	Implemented as planned	Financial Instruments
T.2.	Promotion of sustainable urban transport systems	Urban transport system, tramway	2013-2015 (2020)	3.76	12.51	Partially implemented	Information and mandatory information measures; Transport specific measures;
T.3.	Car free days	Road vehicles	2011 – 2015 (2020)	0.40	3.06	Partially implemented	Information and mandatory information measures; Transport specific measures
T.4.	Promotion of greater use of railway for intercity travel and transport	Macedonian Railway Company	2013 – 2015 (2018)	0.25	0.66	Partially implemented	Information and mandatory information measures; Transport specific measures
<b>TOTAL</b>				<b>8.14</b>	<b>26.90</b>		

# SUMMARY OF FINANCIAL INVESTMENT

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

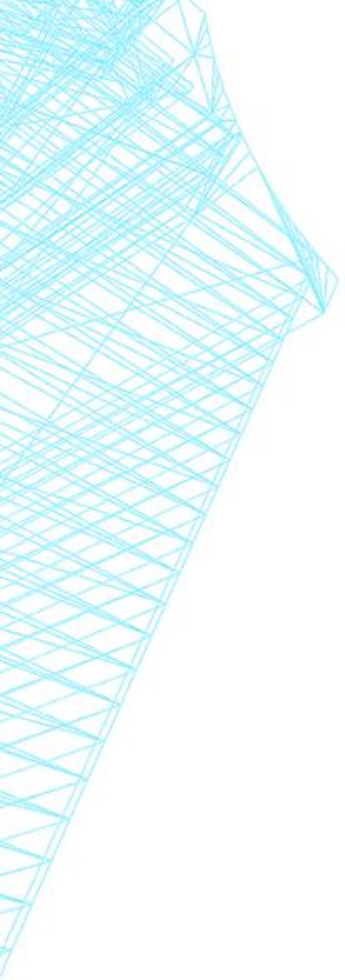
## Timing of investment responsibility (in Milion Denars)

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

# SUMMARY OF FINANCIAL INVESTMENT

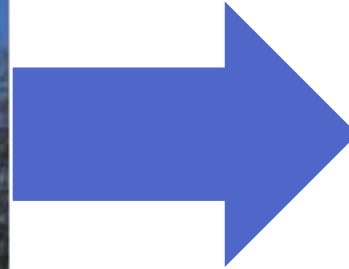
Investment responsibility (in Milion Denars)

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



# STORY

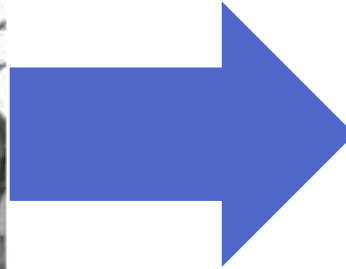
# PROJECT “RESIDENTIAL ENERGY EFFICIENCY FOR LOW-INCOME HOUSEHOLDS” - USAID



## **Blagoja Parovik 11, Skopje**

- 34 apartments, 6 stories, flat roof/terrace
- floor area of apartments 1738 m<sup>2</sup> (51 m<sup>2</sup>/flat)
- individual heating by electricity

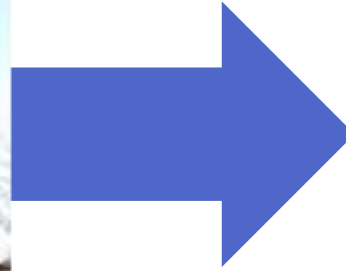
# PROJECT “RESIDENTIAL ENERGY EFFICIENCY FOR LOW-INCOME HOUSEHOLDS” - USAID



## **Lazar Poptrajkov 34, Skopje**

- 14 apartments, 2 stories, gable roof
- floor area of apartments 905 m<sup>2</sup> (65 m<sup>2</sup>/flat)
- district heating

# PROJECT “RESIDENTIAL ENERGY EFFICIENCY FOR LOW-INCOME HOUSEHOLDS” - USAID



## **Božidar Mickovik 5, Kumanovo**

- 9 apartments, 3 stories, gable roof
- floor area of apartments 449 m<sup>2</sup> (50 m<sup>2</sup>/flat)
- individual heating by electricity

# PROJECT “RESIDENTIAL ENERGY EFFICIENCY FOR LOW-INCOME HOUSEHOLDS” - USAID

Name of building and city	Baseline Energy Consumption (MWh/a)*	Projected Energy Savings (MWh/a)*	Actual Energy Savings (MWh/a)**	No. of flats	No. of inhabitants
B. Parovik 11, Skopje	416	198	158	34	102
B. Mickovik 5, Kumanov	120	60	55	9	27
L. Poptrajkov 34, Skopje	251	116	115	14	42
<b>Total</b>	<b>787</b>	<b>413</b>	<b>328</b>	<b>57</b>	<b>171</b>

\* Energy Audits (prior to construction), \*\*Monitoring Reports (after construction)



# PROJECT "RESIDENTIAL ENERGY EFFICIENCY FOR LOW-INCOME HOUSEHOLDS" - USAID

Energy cost savings in a dynamic model – Blagoja Parovik 11

year		0	1	2	3	4	5	6	7	8	9	10	11
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
annual factor of energy prices				1,2	1,2	1,2	1,2	1,05	1,05	1,05	1,05	1,05	1,05
cumulative factor of energy prices			1,000	1,200	1,440	1,728	2,074	2,177	2,286	2,400	2,520	2,646	2,779
discount rate				5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
dicount factor			1,000	0,952	0,907	0,864	0,823	0,784	0,746	0,711	0,677	0,645	0,614
cumulative factor of energy prices discounted to present			1,000	1,143	1,306	1,493	1,706	1,706	1,706	1,706	1,706	1,706	1,706
savings (actual value in the given year)	k €/a		4,4	5,3	6,3	7,6	9,1	9,6	10,1	10,6	11,1	11,7	12,2
savings (actual value in the given year discounted to present)	k €/a		4,4	5,0	5,8	6,6	7,5	7,5	7,5	7,5	7,5	7,5	7,5
Capital costs	k €	65,3											
net present value over the first x years	k €	-65,3	-60,9	-55,9	-50,1	-43,6	-36,0	-28,5	-21,0	-13,5	-6,0	1,5	9,0

Energy cost savings in a dynamic model – Lazar Poptrajkov 34

year		0	1	2	3	4	5	6	7	8	9	10	11
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
annual factor of energy prices				1,1	1,1	1,1	1,1	1,05	1,05	1,05	1,05	1,05	1,05
cumulative factor of energy prices			1,000	1,100	1,210	1,331	1,464	1,537	1,614	1,695	1,780	1,869	1,962
discount rate				5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
dicount factor			1,000	0,952	0,907	0,864	0,823	0,784	0,746	0,711	0,677	0,645	0,614
cumulative factor of energy prices discounted to present			1,000	1,048	1,098	1,150	1,205	1,205	1,205	1,205	1,205	1,205	1,205
savings (actual value in the given year)	k €/a		4,4	4,8	5,3	5,8	6,4	6,8	7,1	7,4	7,8	8,2	8,6
savings (actual value in the given year discounted to present)	k €/a		4,4	4,6	4,8	5,0	5,3	5,3	5,3	5,3	5,3	5,3	5,3
Capital costs	k €	41,0											
net present value over the first x years	k €	-41,0	-36,6	-32,0	-27,2	-22,1	-16,8	-11,5	-6,2	-0,9	4,3	9,6	14,9

Energy cost savings in a dynamic model – Bozidar Mickovik 5

year		0	1	2	3	4	5	6	12	13	14	15	16
		2010	2011	2012	2013	2014	2015	2016	2022	2023	2024	2025	2026
annual factor of energy prices				1,2	1,2	1,2	1,2	1,05	1,05	1,05	1,05	1,05	1,05
cumulative factor of energy prices			1,000	1,200	1,440	1,728	2,074	2,177	2,918	3,064	3,217	3,378	3,547
discount rate				5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
dicount factor			1,000	0,952	0,907	0,864	0,823	0,784	0,585	0,557	0,530	0,505	0,481
cumulative factor of energy prices discounted to present			1,000	1,143	1,306	1,493	1,706	1,706	1,706	1,706	1,706	1,706	1,706
savings (actual value in the given year)	k €/a		1,5	1,8	2,1	2,6	3,1	3,2	4,3	4,5	4,8	5,0	5,3
savings (actual value in the given year discounted to present)	k €/a		1,5	1,7	1,9	2,2	2,5	2,5	2,5	2,5	2,5	2,5	2,5
Capital costs	k €	33,1											
net present value over the first x years	k €	-33,1	-31,6	-29,9	-27,9	-25,7	-23,2	-20,7	-5,5	-3,0	-0,4	2,1	4,6



**IS IT A SUCCESS STORY  
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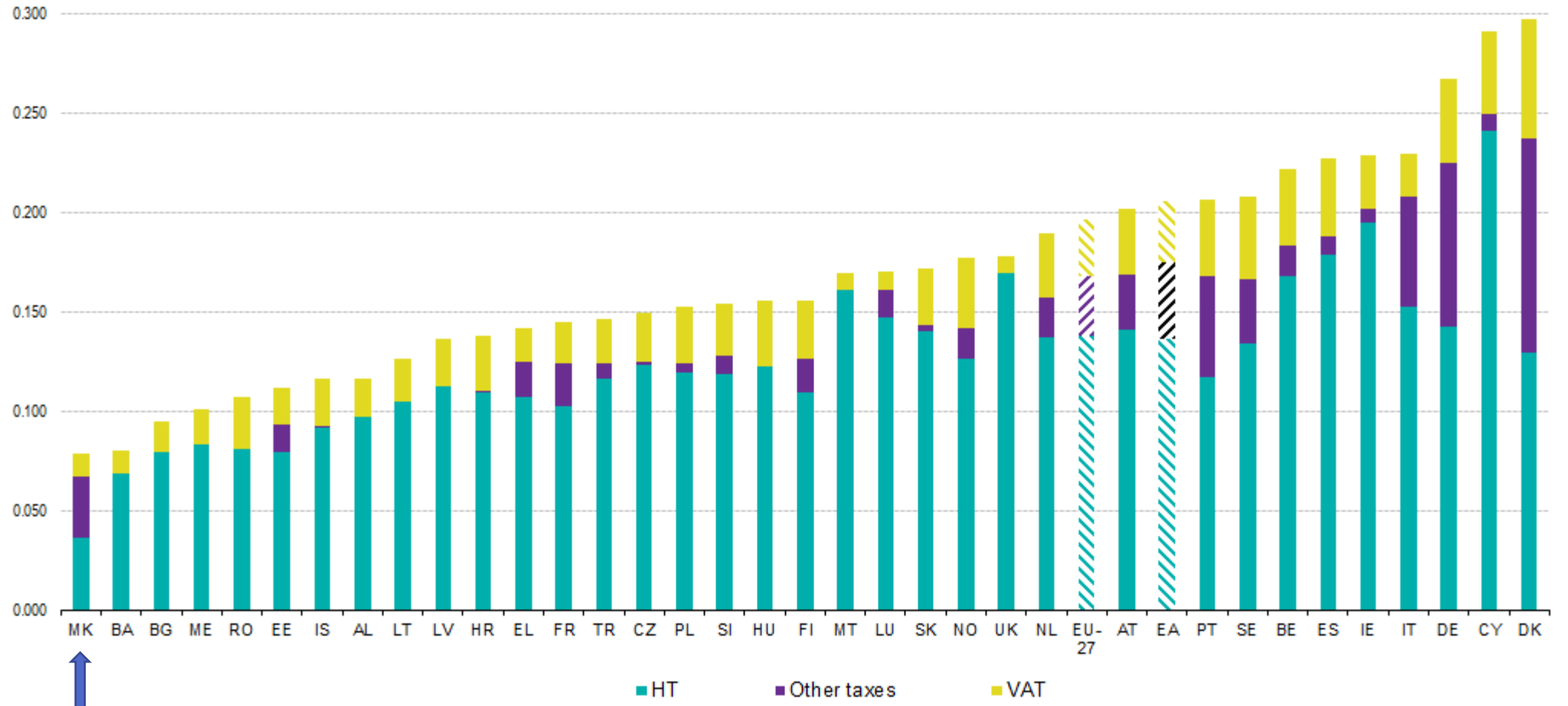
# ENERGY PRICE

	Composition of the electricity prices for household consumers (in € per kWh)				Share in price without taxes and levies (in %)	
	Total price	Energy and supply	Network costs	Taxes and levies	Energy and supply	Network costs
Belgium	0.222	0.078	0.090	0.054	46.5%	53.5%
Bulgaria	0.096	0.047	0.033	0.016	59.2%	40.8%
Czech Republic	0.150	0.048	0.076	0.026	38.9%	61.1%
Denmark	0.297	0.053	0.077	0.168	40.7%	59.3%
Germany	0.268	0.085	0.059	0.124	59.0%	41.0%
Estonia	0.112	0.048	0.031	0.033	60.8%	39.2%
Ireland	0.229	0.129	0.067	0.034	65.8%	34.2%
Greece	0.142	0.079	0.028	0.035	73.9%	26.1%
Spain	0.228	0.082	0.097	0.049	46.0%	54.0%
France	0.145	:	:	:	:	:
Italy	0.230	0.111	0.042	0.077	72.5%	27.5%
Cyprus	0.291	0.204	0.037	0.050	84.5%	15.5%
Latvia	0.137	0.056	0.057	0.024	49.7%	50.3%
Lithuania	0.127	0.049	0.056	0.022	46.9%	53.1%
Luxembourg	0.171	c	c	c	c	c
Hungary	0.156	0.069	0.053	0.033	56.4%	43.6%
Malta	0.170	0.140	0.022	0.009	86.4%	13.6%
Netherlands	0.190	0.079	0.059	0.052	57.2%	42.8%
Austria	0.202	0.077	0.064	0.061	54.4%	45.6%
Poland	0.153	0.063	0.056	0.033	52.9%	47.1%
Portugal	0.206	0.074	0.043	0.089	63.0%	37.0%
Romania	0.108	0.032	0.049	0.026	39.8%	60.2%
Slovenia	0.154	0.062	0.057	0.035	52.3%	47.7%
Slovakia	0.172	0.069	0.072	0.032	48.9%	51.1%
Finland	0.156	0.061	0.049	0.046	55.8%	44.2%
Sweden	0.208	0.060	0.074	0.074	44.8%	55.2%
United Kingdom	0.179	0.134	0.036	0.009	79.0%	21.0%
Iceland	0.116	0.031	0.061	0.025	33.4%	66.6%
Norway	0.178	0.044	0.083	0.051	34.4%	65.6%
Montenegro	0.101	0.042	0.042	0.018	49.7%	50.3%
Croatia	0.138	0.067	0.044	0.028	60.5%	39.5%
FYROM	0.079	:	:	:	:	:
Turkey	0.147	0.083	0.034	0.030	70.8%	29.2%
Albania	0.117	:	:	:	:	:
Bosnia and Herzegovina	0.080	0.036	0.033	0.012	52.1%	47.9%

	Basic price	Other taxes and levies (excl. VAT)	VAT	All taxes and levies
	in EUR per kWh			%
BE	0.168	0.015	0.039	24.25%
BG	0.080	0.000	0.016	16.65%
CZ	0.124	0.001	0.025	17.52%
DK	0.130	0.108	0.059	56.39%
DE	0.143	0.082	0.043	46.49%
EE	0.079	0.014	0.019	29.30%
IE	0.195	0.006	0.027	14.64%
EL	0.107	0.018	0.016	24.40%
ES	0.179	0.009	0.040	21.36%
FR	0.103	0.022	0.021	29.24%
IT	0.153	0.056	0.021	33.61%
CY	0.241	0.008	0.042	17.02%
LV	0.113	0.000	0.024	17.31%
LT	0.105	0.000	0.022	17.35%
LU	0.148	0.013	0.010	13.42%
HU	0.123	0.000	0.033	21.26%
MT	0.162	0.000	0.009	5.00%
NL	0.138	0.020	0.032	27.34%
AT	0.141	0.027	0.034	30.24%
PL	0.120	0.005	0.029	21.84%
PT	0.117	0.051	0.038	43.09%
RO	0.081	0.000	0.026	24.47%
SI	0.119	0.009	0.026	22.70%
SK	0.140	0.003	0.029	18.47%
FI	0.110	0.017	0.029	29.63%
SE	0.135	0.032	0.042	35.43%
UK	0.170	0.000	0.008	4.71%
IS	0.092	0.001	0.024	20.96%
NO	0.127	0.015	0.036	28.68%
ME	0.084	0.000	0.018	17.41%
HR	0.110	0.001	0.028	20.52%
MK	0.037	0.030	0.012	53.35%
TR	0.117	0.008	0.023	20.48%
AL	0.097	0.000	0.019	16.62%
BA	0.069	0.000	0.012	14.55%

c - confidential data

# ENERGY PRICE





# THANK YOU

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