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EFFICIENCY IN POLAND

IN YEARS 2003-2013

Warsaw, 2015

Preparation of the publication	*CSO, Production Department* *The Polish National Energy Conservation Agency*
supervisor	Grażyna Berent-Kowalska (CSO), Ryszard Wnuk (KAPE)
authors	Szymon Peryt (SCO), Bartłomiej Asztemborski (KAPE)
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FOREWORD

This publication is successive edition of the study "ENERGY EFFICIENCY" published by the Central Statistical Office (GUS) as part of the series entitled "Information and statistical papers".

The aim of this publication is to present global and sector energy efficiency indicators with their analysis.

The development of energy efficiency indicators adapting statistics to changing economy conditions and present needs (monitoring of energy economy and controlling its management towards "sustainable development") is realized on the level of European Union and International Energy Agency (IEA/OECD). Joined actions of Eurostat, IEA and Member States, aim at creation of statistical indicators system to assess trends in the field of energy efficiency.

The publication was elaborated by employees of the Polish National Energy Conservation Agency, Energy Market Agency and Central Statistical Office.

With passing this publication to the hands of the readers we would welcome any comments that will help to improve next editions of the publication.

Wanda Tkaczyk
Deputy Director of Production Department

Warsaw, June 2015

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1. Methodological remarks and definitions of basic concepts

The source of data for the publication are statistical surveys in the field of fuel and energy economy conducted by the Central Statistical Office in collaboration with the Ministry of Economy stored in the Odyssee database[1].

Currently used classification is the Polish Classification of Activities - PKD 2007 developed on the basis of the Statistical Classification of Economic Activities in the European Community (NACE Rev. 2). PKD 2007 was introduced with effect from 01.01.2008 by the Regulation of the Council of Ministers of 24 December 2007 (Journal of Laws No. 251, item. 1885) and replaced PKD 2004.

For the purposes of the publication industry activities are grouped as follows:

	NACE rev. 1.1	NACE rev. 2
Food	15-16	10-12
Textile	17-19	13-15
Wood	20	16
Paper	21-22	17-18
Chemical	24	20-21
Mineral	26	23
Primary metals	27	24
Machinery	28-32	25-28, 33
Transport equipment	34-35	29-30
Other	25, 33, 36-37	22, 31-32

The value-added of industrial branches is the sum of value added of the respective divisions.

Total primary energy consumption includes the consumption of primary energy sources, as well as recovery, trade balance, bunkers and stock changes of derived energy according to Eurostat methodology.

Final energy consumption means the final energy consumption for energy purpose calculated according to the methodology of Eurostat/IEA. Final consumption in the industry does not include the energy transformation sector. Since year 2010 heat includes only heat sold (before 2010 also heat from recovery used for heating purposes). Transformation in blast furnaces is calculated using real transformation efficiency.

[1] www.odyssee-mure.eu

Primary energy intensity of GDP is the ratio of total primary energy consumption to GDP. **Final energy intensity of GDP** is the ratio of final energy consumption to GDP. **Energy intensity of branches** is the ratio of the final energy consumption in these industries to their value added.

Energy consumption in constant structure is calculated using Divisia method in such a way that the product of the dynamic of energy intensity in constant structure and effect of the structural changes provides dynamics of the energy intensity. The effect of structural change was calculated as the weighted sum of the growth rates of the individual components. The growth rates are defined as the natural logarithm of the relative change in the value added of the total industry in the subsequent years, and the weights are the shares of average energy consumption in the industry in the total consumption in the subsequent years.

Climatic correction is based on the correlation between energy consumption and outdoor temperature. The consumption is proportional to the Heating Degree Days (SD). The constant heating share approach in calculating of final energy consumption with climatic correction ZEF^{kk} is based on the following formula:

$$ZFF^{kk} = \frac{ZFF}{1 - 0{,}9 \cdot \alpha \cdot \left(1 - \frac{Actual\ SD}{Long - term\ average\ SD}\right)}$$

where: ZEF - final energy consumption, SD - degree days number, α - heating share in total energy consumption in dwelling sector.

Heating Degree Days is introduced to enable control and comparison of energy consumption for heating. It expresses a product of number of heating days and difference between the average temperature of heated room and average outdoor temperature. Numbers of SD degrees in a given year according to Eurostat methodology is calculated as follows:

$$Sd = \sum_{n=1}^{N} \begin{cases} 18^{o}\mathrm{C} - t_{śr}(n) & dla \quad t_{śr}(n) \le 15^{o}\mathrm{C} \\ 0 & dla \quad t_{śr}(n) > 15^{o}\mathrm{C} \end{cases}, \text{[day} \cdot \text{deg/year]}$$

where: $t_{śr}(n) = \frac{t_{\min}(n) + t_{maks}(n)}{2}$ - mean outdoor temperature for *n* day, [°C]; $t_{\min}(n)$, $t_{maks}(n)$ - minimum and maximum temperature of the *n* day, [°C]; N - number of days per year.

According to formula and the Eurostat assumption, the mean outdoor temperature of the heating day should be less than 15°C.

Long-term average calculated for years 1980-2004 amounts to 3615.77.

An equivalent car is a measure used in the calculation of energy efficiency indicators. Stock of equivalent cars is calculated as follows: Se = 0.15 * M + So + 4 * Sc + 15 * A, where Se - equivalent stock of cars, M - the stock of motorcycles, So - the stock of cars, Sc - stock of trucks, A - the stock of buses. The coefficients are estimated relation of annual fuel consumption of a vehicle of a given type to the car.

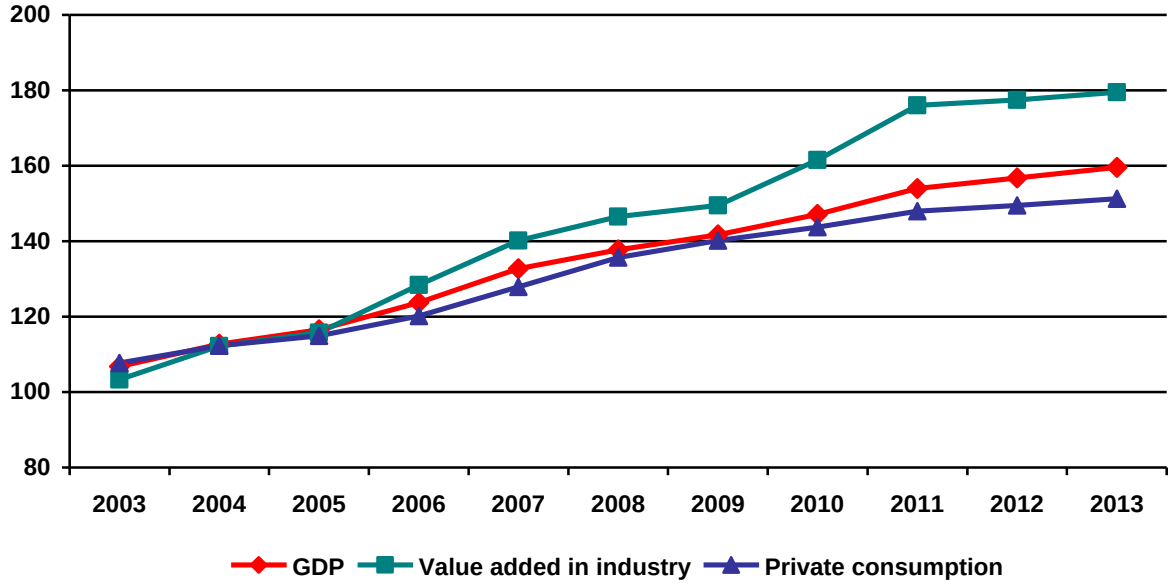
Energy efficiency index (ODEX) is calculated by aggregating the individual changes in energy consumption, observed on certain levels of end-use. ODEX indicator does not show the current level of energy intensity, but the improvement over the base year. ODEX is calculated for each year as the ratio of actual energy consumption in a given year and the theoretical energy consumption which does not take into account the individual effect (ie, assuming the previous level of energy intensity in the production processes). In order to reduce random fluctuations 3-year moving average is calculated. The decrease of indicator value represents an increase of energy efficiency.

2. Energy efficiency indicators for Polish economy and its sectors

2.1. Dynamic of development of the economy

Gross Domestic Product was constantly increasing in the presented period reaching in year 2013 value higher by 49% in comparison with year 2003. The fastest rate of growth of value added at constant prices was achieved in the given period in industry sector. Rate of growth[2] of private consumption was little smaller than rate of GDP growth.

Figure 1. Dynamics of basic macro-economic indicators (2000=100)



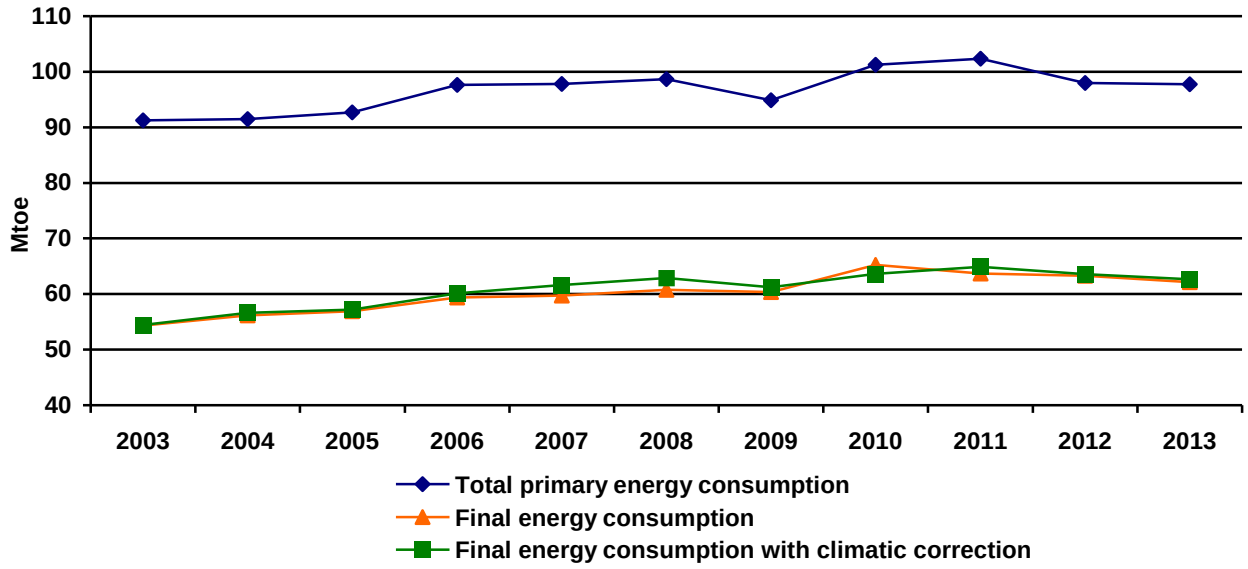
2.2 Energy consumption and prices of energy

Total primary energy consumption increased in years 2003-2013 from 91 Mtoe to almost 98 Mtoe (0.7%/year). Decrease in consumption was observed in years 2009, 2012 and 2013.

In case of final energy consumption average annual growth rate amounted to 1.4% during given period. In absolute terms, this represents an increase from 54 to over 62 Mtoe. In this case, the fall in consumption was observed, in years 2009 and 2011-2013. After taking into account different weather conditions, that is in case of final energy consumption with climatic correction consumption growth rate amounted to 1.4%/year in years 2004-2013. Energy consumption with climatic correction determines the theoretical value of consumption for a given year, if the weather conditions were in line with long-term average. That calculated final consumption in 2013 amounted to less than 63 Mtoe.

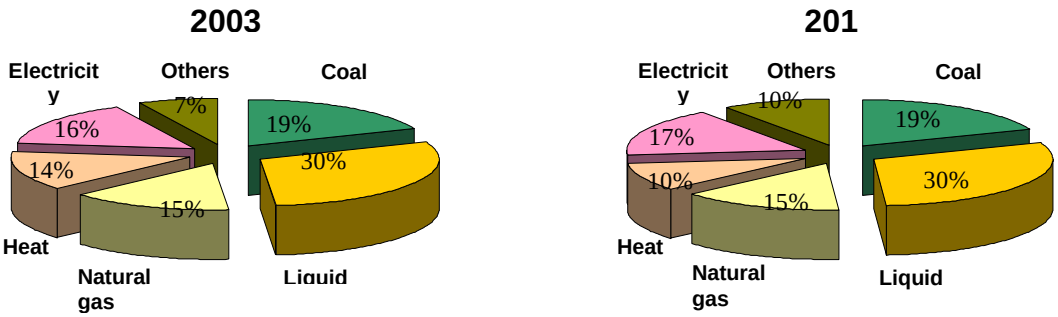
[2] Calculated as geometric mean

Figure 2. Total primary and final energy consumption



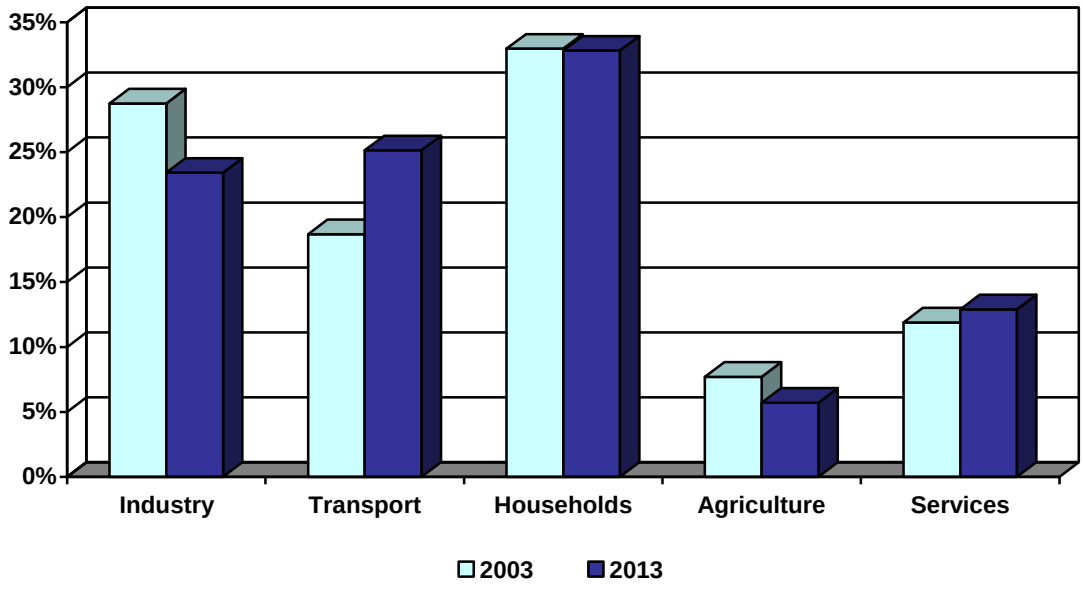
Polish energy sector has traditionally been focused on the use of country natural resources, which also had an impact on the types of energy consumed in other sectors of the economy. The main source of primary energy was and is hard coal and lignite. In case of final energy consumption, it is dominated by liquid fuels, whose share amounted in years 2003 and 2013 to 30% (Fig. 3). The share of coal in final energy consumption also unchanged and amounted to 19% in year 2003 and 2013. The same situation took place in case of gas – its share remained unchanged and amounted to 15% in 2013. A significant increase compared to year 2003 occurred in the use of other energy sources, which in 2013 reached level of 10% of the final energy consumption. The same share (10%) was achieved by heat, in that case significant drop has occurred. The share of electricity grew by 1 percentage point and amounted to 17% in 2013.

Figure 3. Final energy consumption by energy carrier



In years 2003-2013 the share of transport grew most - from 19 to 25%. Service sector has increased its share as well and accounted for 13% of final consumption. In case of industry, households and agriculture, there has been a decline in the share in total consumption. Households remained the largest consumer with a share of 33%. The growing importance of transport is associated with an increased role of both freight transport and passenger transport carried out in private cars.

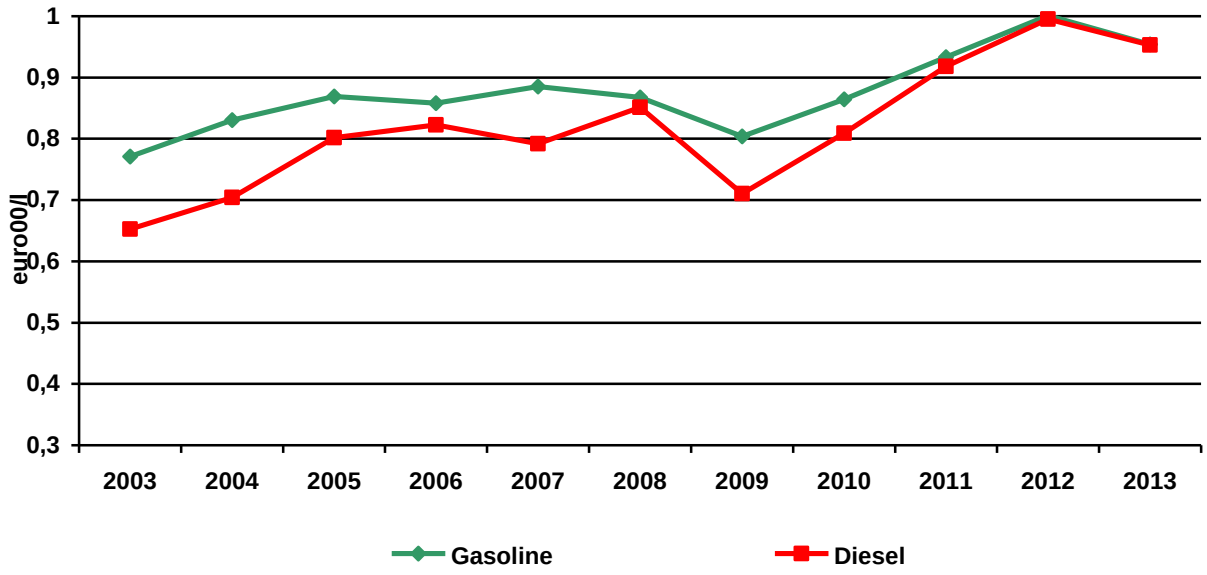
Figure 4. Final energy consumption by sectors



Prices of gasoline and diesel, expressed in constant prices of 2000 were subject to similar changes in years 2003-2013; increasing trend lasting until year 2008 can be observed. In 2009, there was a significant drop in prices, particularly diesel oil which plays greater role in

economic activity (Fig. 5). Afterwards prices began to grow reaching highest level in 2012. In 2013 prices of diesel oil and gasoline amounted to 0,95 euro00/l.

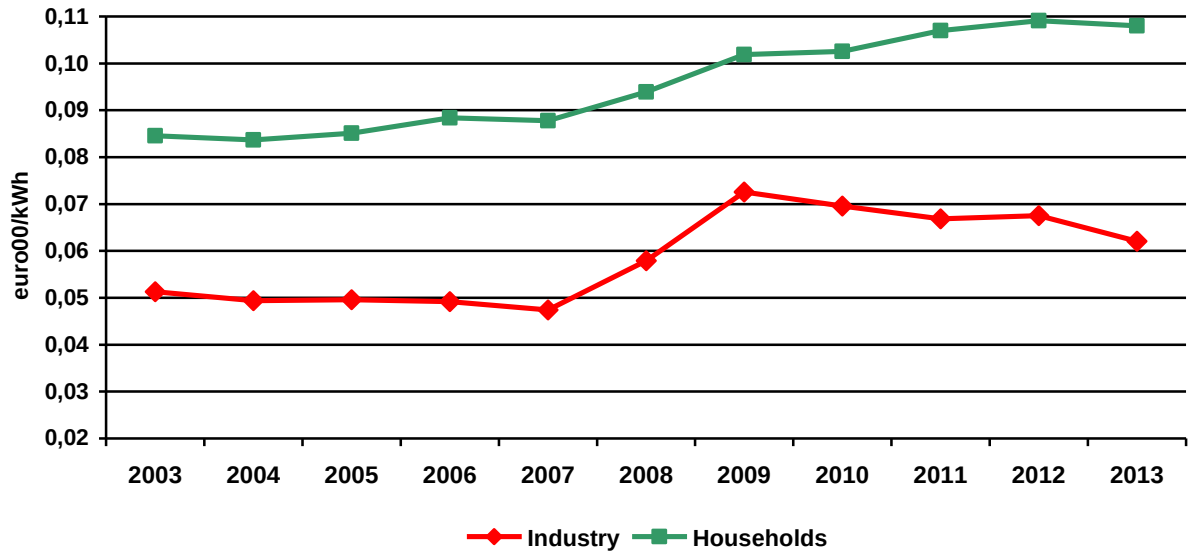
Figure 5. Gasoline and diesel oil prices



Electricity prices for households have increased during 2003-2013 period from above 0.08 in 2003 to 0.11 euro00/kWh in 2013, which means 2.5% average annual growth. The upward trend was clear in years 2003-2012, in 2013 there was a slight decrease of prices.

In case of electricity prices for industry their pace of growth was lower and amounted to less than 2%/year, the increase was much less even. The high average annual growth over this period was reached due to high price increase in years 2007-2009, when prices grew by more than 50%. In subsequent years electricity prices tended to decrease what resulted in prices slightly exceeding 0.06 euro00/kWh in comparison with highest level (0.07 euro00/kWh) reached in year 2009.

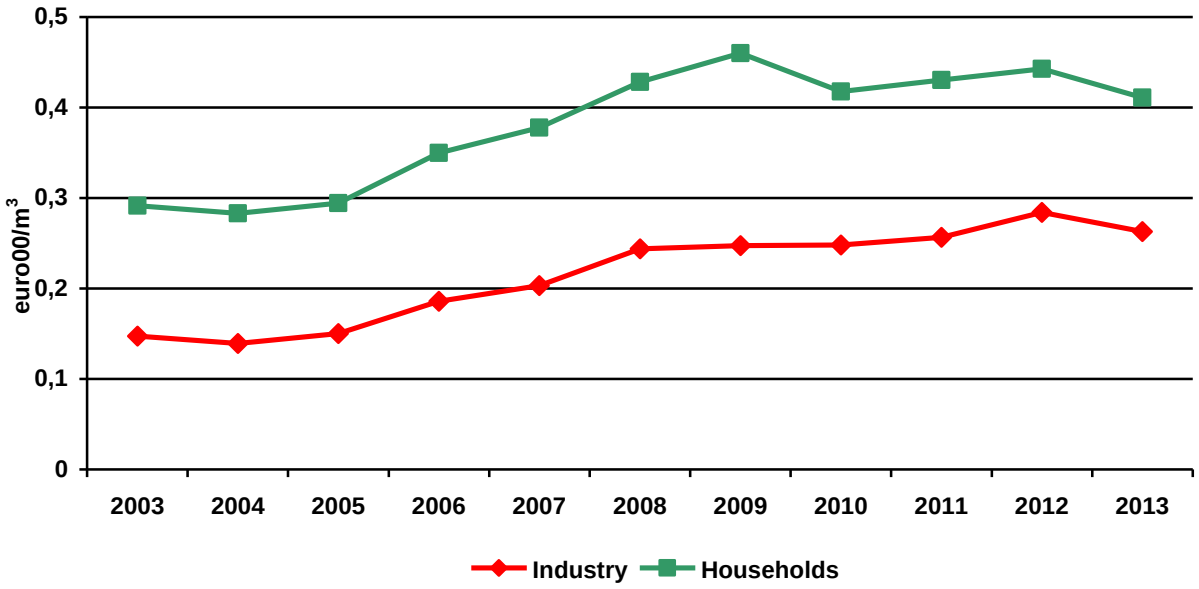
Figure 6. Electricity prices for households and industry



Natural gas prices for households were decreasing until year 2004,. Since then, prices have been steadily growing until year 2009. In subsequent years prices varied above 0.4 euro00/m^3. In total, during the given period average rate of increase of the price of natural gas for households amounted to 3.5%/year and price of natural gas for households amounted to 0.41 euro00/m^3 in year 2013.

Natural gas prices for industry had increased since year 2004 reaching highest level in year 2012. In 2013 prices decreased. Overall price of natural gas for the industry increased from 0.15 euro00/m^3 in 2003 to 0.26 euro00/m^3 in 2013.

Figure 7. Gas prices for households and industry



2.3. Macro-economic indicators

Growth of GDP faster than the growth in energy consumption resulted in observed decreasing, with the exception of year 2010, primary and final energy intensity of GDP (Figure 8-9, Table. 1). In years 2004-2006, energy intensity decreased by over 2% per year, in years 2007-2009 the rate of improvement exceeded 5% in case of primary intensity, and amounted to nearly 4% in case of final intensity. In years 2010-20113 the rate of improvement reached similar level as during 2004-2006 period.

Table 1. An average annual rate of changes in GDP energy intensity indicators (%/year)

Growth rate	2004-2006	2007-2009	2010-2013	2004-2013
Primary intensity of GDP……..	-2,51	-5,29	-2,18	-3,22
Primary intensity of GDP with climatic correction…….	-2,29	-5,26	-2,26	-3,18
Final intensity of GDP……..	-1,85	-3,82	-2,20	-2,58
Final intensity of GDP with climatic correction……..	-1,48	-3,80	-2,32	-2,52

Figure 8. Energy intensity of GDP

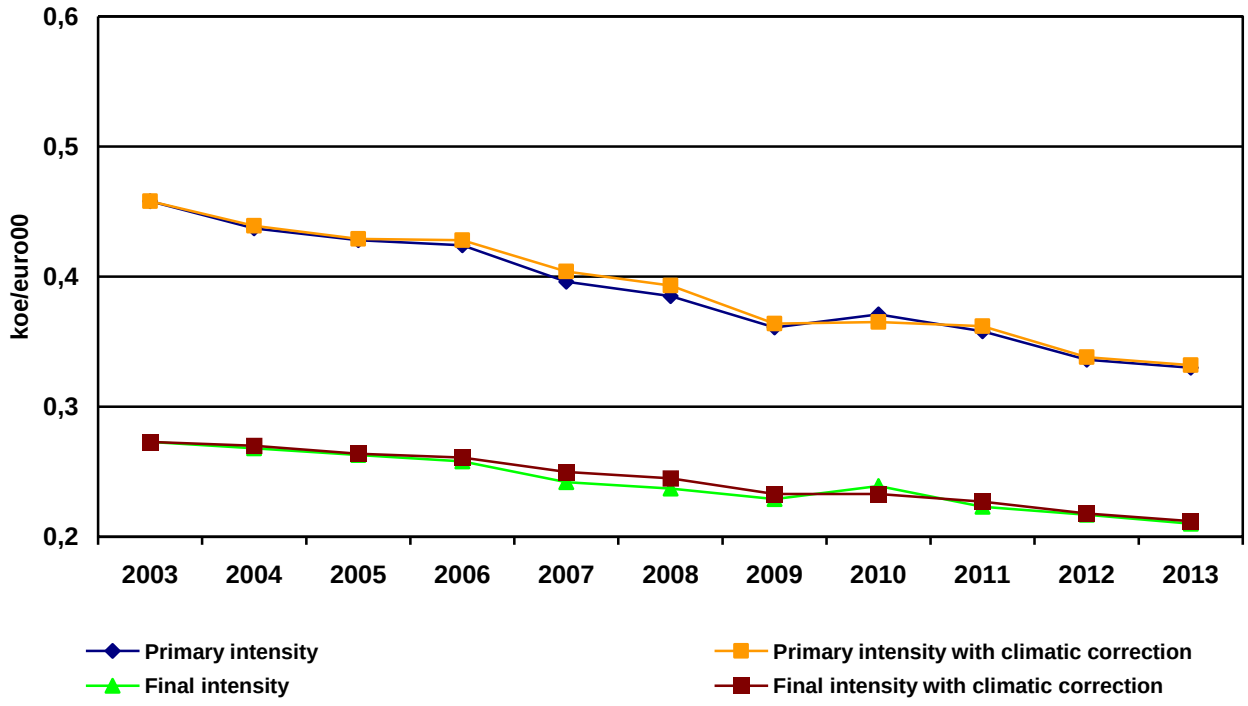
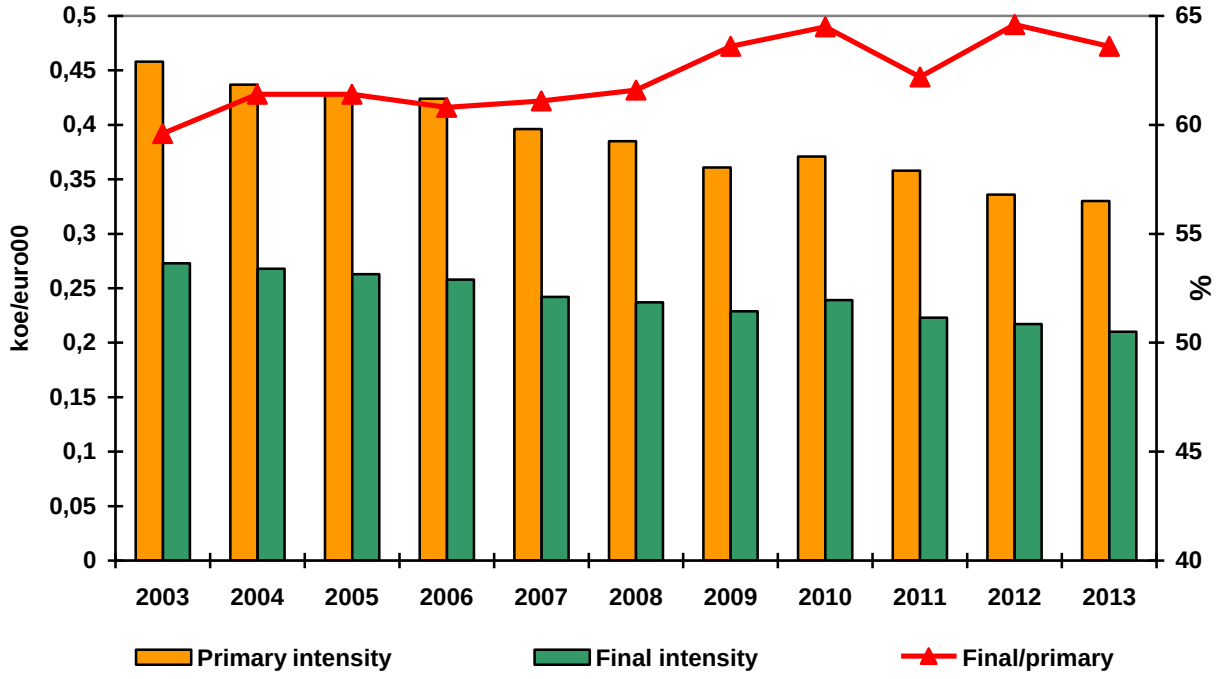


Figure 9. Ratio of final to primary intensity

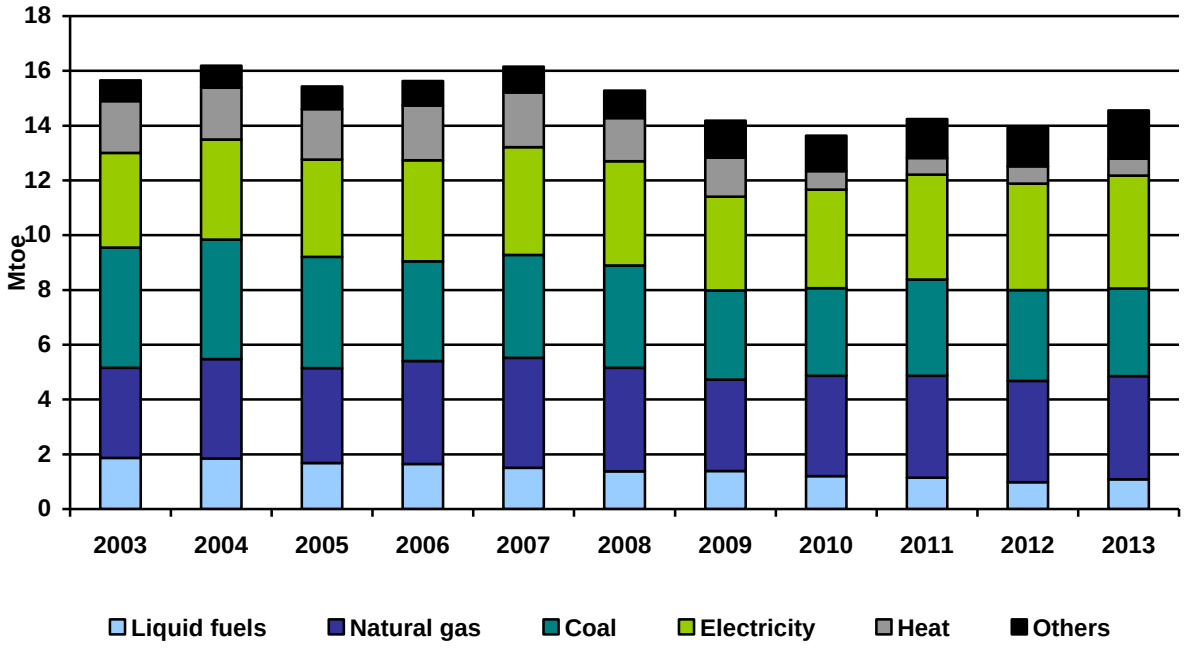


The ratio of final energy consumption to primary energy consumption reached values between 60% and almost 65%. The highest value was reached in 2012 and amounted to 64.6%, in 2013 it decreased to 63.6%. The level of this indicator is mainly affected by the energy transformation efficiency (the higher the efficiency the greater the value of the indicator) and the rate of growth of electricity consumption (the higher consumption the lower value of the indicator).

2.4. Industry

Final energy consumption in industry in the period 2003-2013 was subject to irregular fluctuations. The highest consumption was observed in 2007 and amounted to 16 Mtoe, then it declined below 14 Mtoe in 2010. Since then an irregular growing trend can be observed. (Notice: since year 2010 a new algorithm of heat compilation is used what caused a decline of energy consumption in industry by 0.8 Mtoe in comparison with previous methodology). In terms of energy carriers, a decrease of consumption of coal and liquid fuels can be seen while the use of natural gas, electricity and other energy carriers increased. Heat consumption decreased.

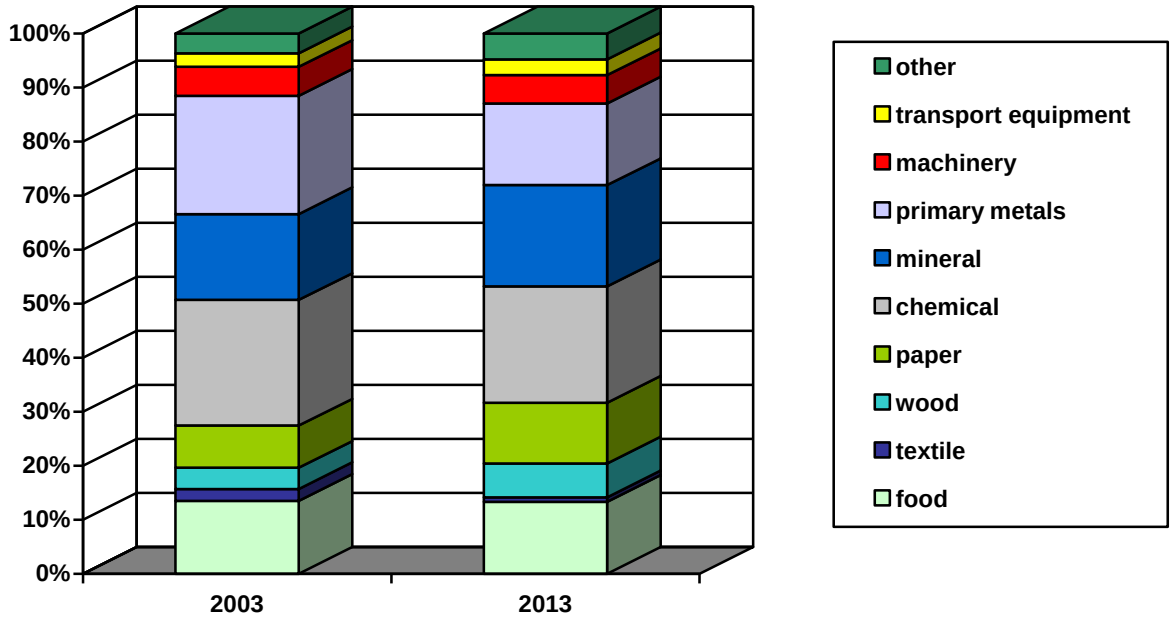
Figure 10. Final energy consumption in industry by energy carrier



Changes in shares of individual industries in total energy consumption in the manufacturing industry is shown in Fig 11. Approximately 55% of energy was consumed in 2013 by energy-intensive industries: primary metals, chemical and mineral (60% in 2003).

The largest decline in comparison with year 2003 which amounted to more than 6 percentage points was achieved by primary metals; food, textile, chemical and machinery industries also recorded a decrease in the share of energy consumption. The increase of share of energy consumption was recorded in case of wood, paper, mineral, transport equipment and other industries. Significant increase occurred in case of wood, paper and mineral industry. In other cases changes of shares in energy consumption are small.

Figure 11. Energy consumption in manufacturing by branch



Figures 12 and 13 present energy intensity (final energy consumption/value added) of selected industrial branches in years 2003-2013.

Figure 12. Energy intensity of energy intensive industry branches

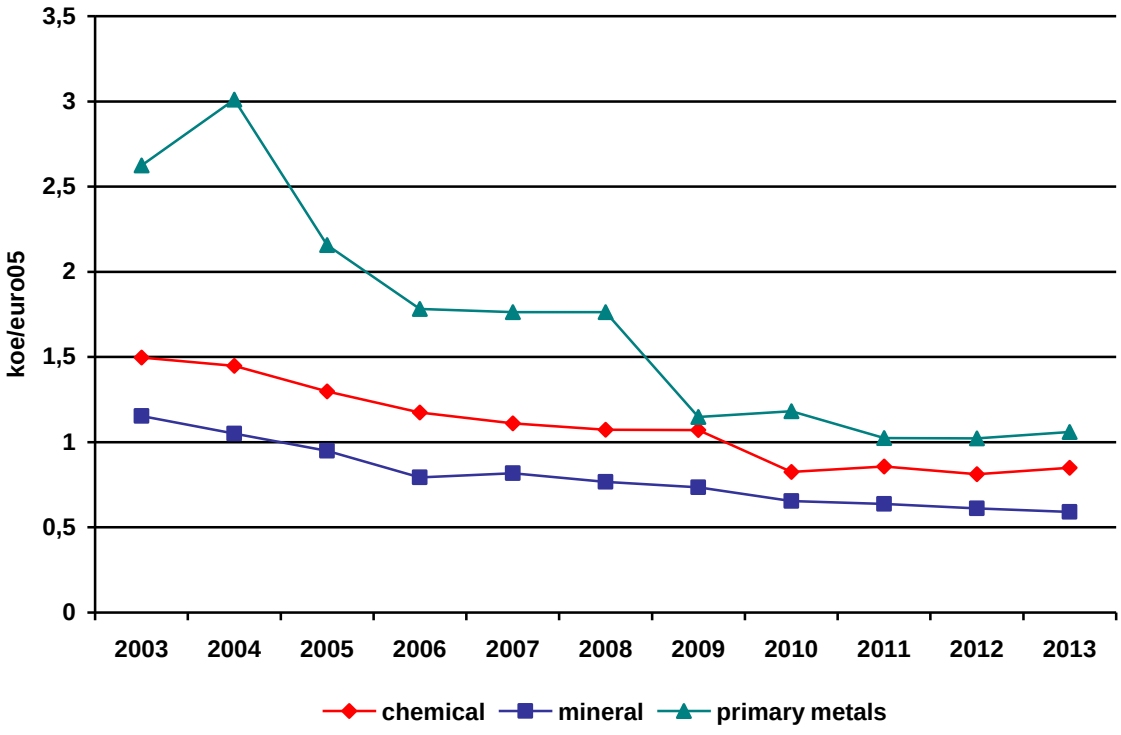
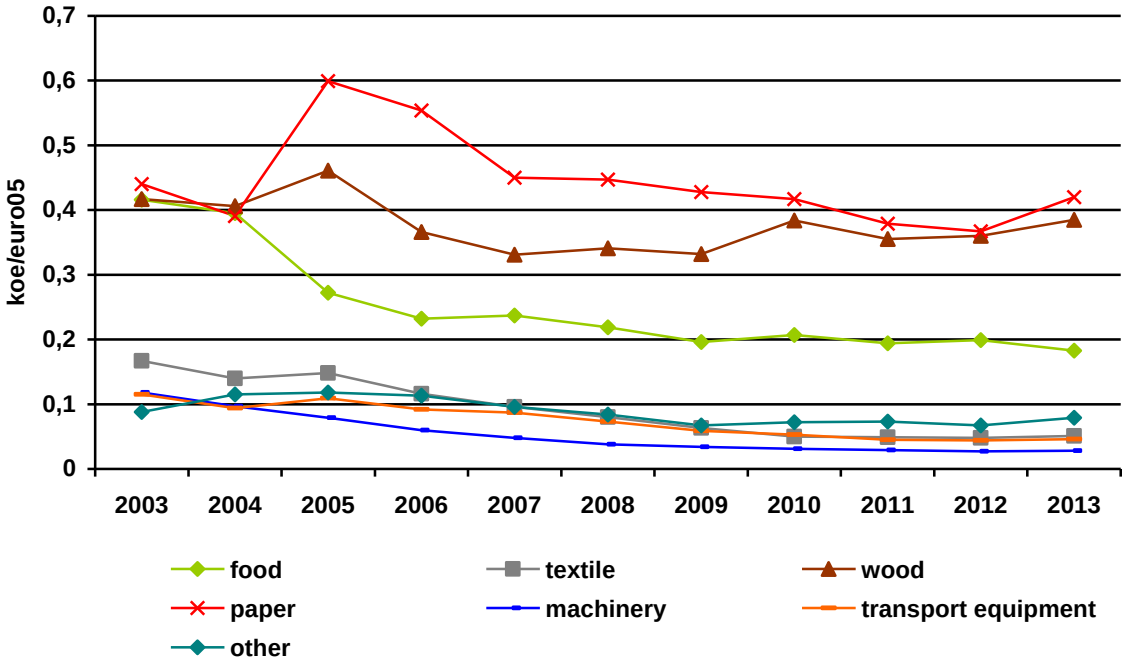


Figure 13. Energy intensity of low energy intensive industry branches



The most dynamic energy efficiency improvements were observed in machinery, as well as textile, primary metals and transport equipment industry. Slowest improvement occurred in wood, paper and other industry.

Changing shares of individual sectors of manufacturing in the final consumption of energy and value added in the section, that is the changing structure have affected the level of energy consumption in manufacturing.

The rate of improvement of energy intensity of manufacturing industry was high (Fig. 14 and table 2), in years 2004-2009 averaged to 9.9%/year. Impact of structural change was positive – it contributed to the decline in energy intensity by 0.7%/year. The situation changed in years 2010 - 2013 - energy intensity at constant structure decreased by 3.4%/year, while structural changes have lowered energy intensity of manufacturing by 2.3%/year. Actual intensity was decreasing by 5.6%/year.

Figure 14. Energy intensity of manufacturing - role of structural changes

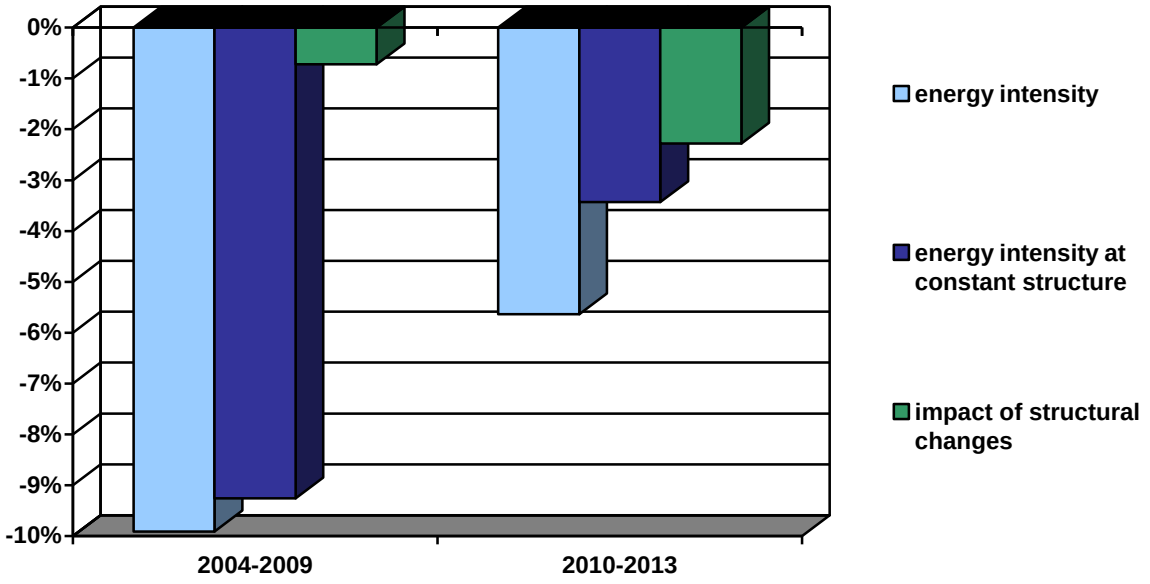


Table 2. Dynamics of energy intensity and impact of structural changes (%/year)

Specification	2004-2009	2010-2013
Energy intensity	-9,91	-5,64
Energy intensity at constant structure	-9,26	-3,43
Impact of structural changes	-0,72	-2,28

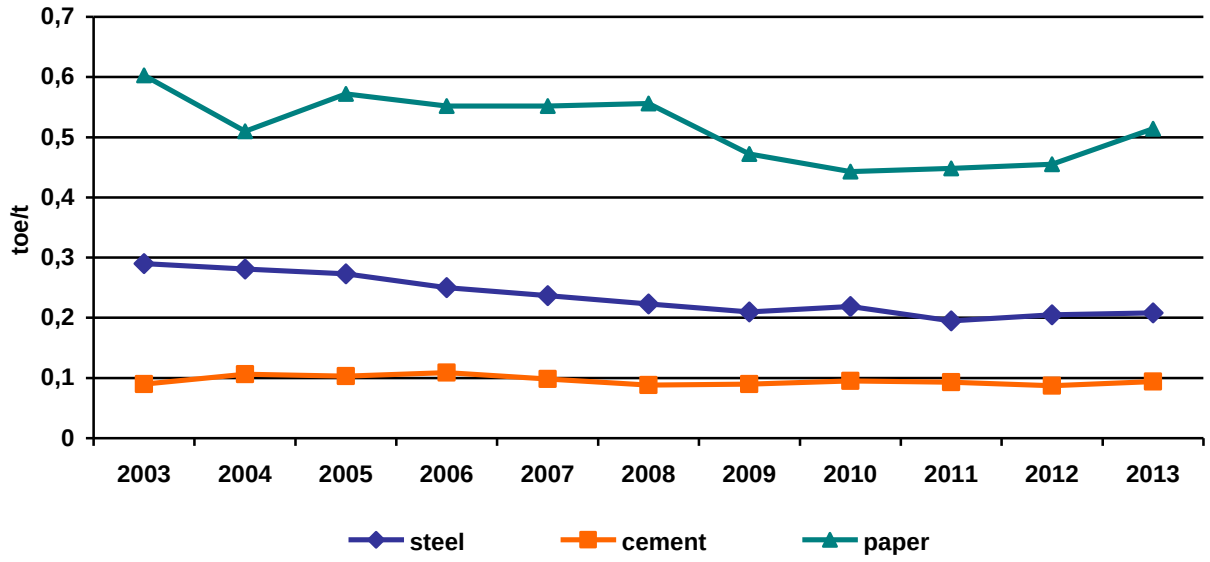
Figure 15 presents energy intensity of steel[3], cement[4] and paper[5] production in years 2003-2013. Energy used to produce these three products amounted to 32% of energy consumption in manufacturing in 2013.

The energy intensity of cement production remained in this period at a similar level of 0.1 toe/t. This value is close to the European average. In case of steel production energy intensity decreased steadily until 2009, and then stabilized. Energy consumption of paper industry showed a declining trend in the years 2003-2013, although in some years there has been an increase of energy consumption. In 2013, there was a significant increase in intensity to the level of 0.51 toe / ton.

[3] Calculated as final energy consumption in steel industry (since 2009 in groups 24.1, 24.2, 24.3 and classes 24.51 and 24.52 according to NACE Rev. 2) divided by steel production
[4] Calculated as final energy consumption in cement industry (since 2009 in group 23.5 according to NACE Rev. 2) divided by cement production
[5] Calculated as final energy consumption in paper industry (since 2009 in division 17 according to NACE Rev. 2) divided by paper production

In the years 2003-2013 energy consumption of crude steel production (per tonne) fell by 28.2% (3.3%/year), paper by 14.7% (1.6%/year) and cement increased by 3.6% (0.4%/year).

Figure 15. Unit consumption of selected industrial products



2.5. Households

The share of energy consumption in households in final energy consumption amounted to 33% in 2013. The structure of consumption by end-use, resulting from surveys carried out by the CSO in 1993, in 2002, in 2009 and in 2012 are shown in Figure 16 and Table 3.

The share of energy consumption for heating systematically decreased, which was associated with the installation of more efficient gas and electric appliances; the influence of thermal modernization and more stringent construction standards is also noticeable. Higher penetration of electrical equipment and behavioral changes (eg changes in the intensity of use of equipment - washing machines, dishwashers, TV, computers) have contributed to the doubling of the share of energy consumption for electrical equipment between 1993 and 2012.

Figure 16. Structure of energy consumption in households by end use

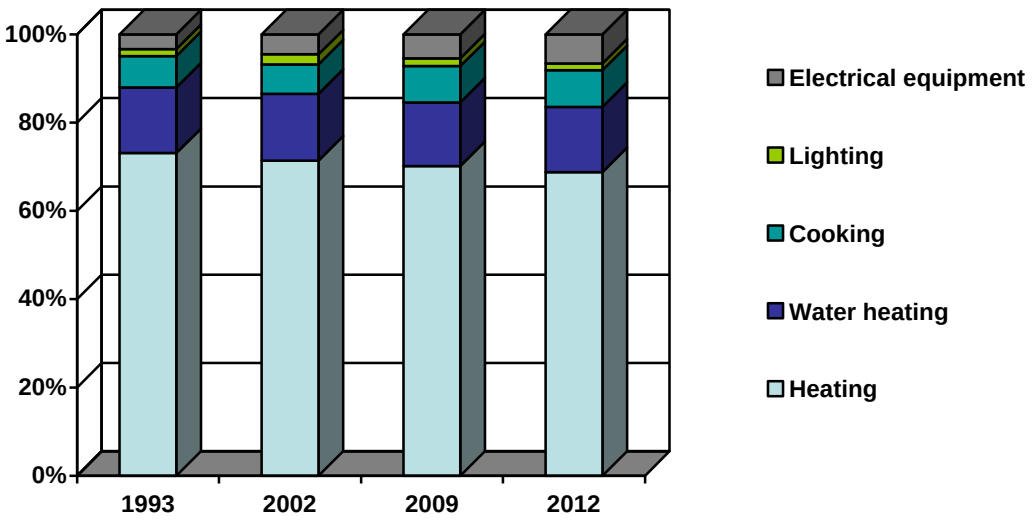


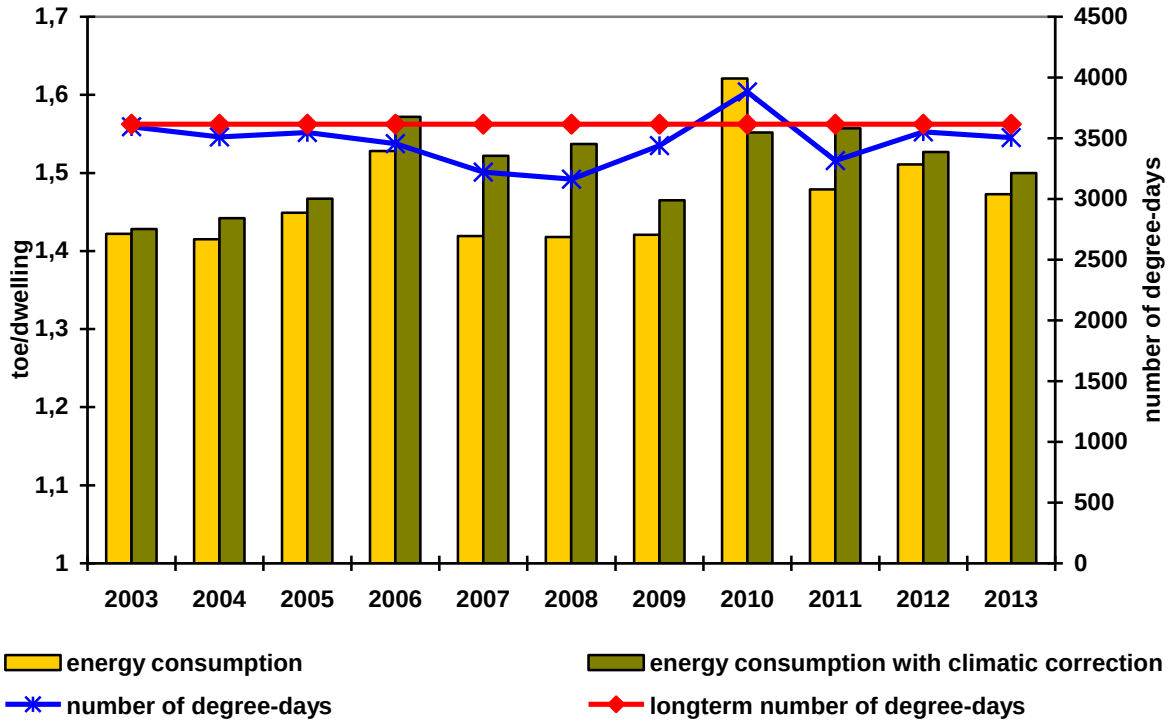
Table 3. Structure of energy consumption in households by end use (%)

Items	1993	2002	2009	2012
Total	100.0	100.0	100.0	100.0
Heating	73.1	71.3	70.2	68.8
Water heating	14.9	15.0	14.4	14.8
Cooking	7.1	7.1	8.2	8.3
Lighting	1.6	2.3	1.8	1.5
Electrical equipment	3.3	4.3	5.4	6.6

Figure 17 shows the changes of energy consumption per dwelling. Energy consumption per dwelling was increasing by 0.4% per year in years 2004-2013. In 2008 it reached the lowest value during given period. It partly resulted from good weather conditions this year. The highest consumption was observed in 2010, also partly caused by weather conditions. In year 2013 consumption per dwelling amounted to 1.47 toe/dwelling and was higher by 3.6% in comparison with 2003.

The value of indicator with climatic correction increased between 2003 and 2013 from 1.43 to 1.50 toe/dwelling, which means the average annual growth of 0.5%. The lowest value was achieved in 2003 followed by several years of growth. Since 2006, the downward trend of energy consumption with climatic correction can be observed.

Figure 17. Energy consumption in households per dwelling



source: Eurostat and Joint Research Center, GUS

Table 4. Heating degree-days in years 1999-2013

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sd - annual	3341	3092	3581	3337	3594	3510	3547	3454	3222	3164	3439	3881	3317	3552	3505

source: Eurostat and Joint Research Center

Figure 18 shows the energy consumption in households per m2. Trend of energy consumption per m^2 is similar, although the growth rate of improvement is higher, reflecting the gradual increase in the average size of the dwelling. In case of consumption per m^2 an improvement of 0.3%/year has been noticed; with climatic correction improvement amounted to 0.1%/year.

Electricity consumption in households showed an increasing trend until year 2010, while in subsequent years it decreased. In 2013 consumption per dwelling amounted to 2053 kWh/dwelling and was 4.1% higher in comparison with year 2003 (Fig. 19).

Figure 18. Energy consumption in households per m^2

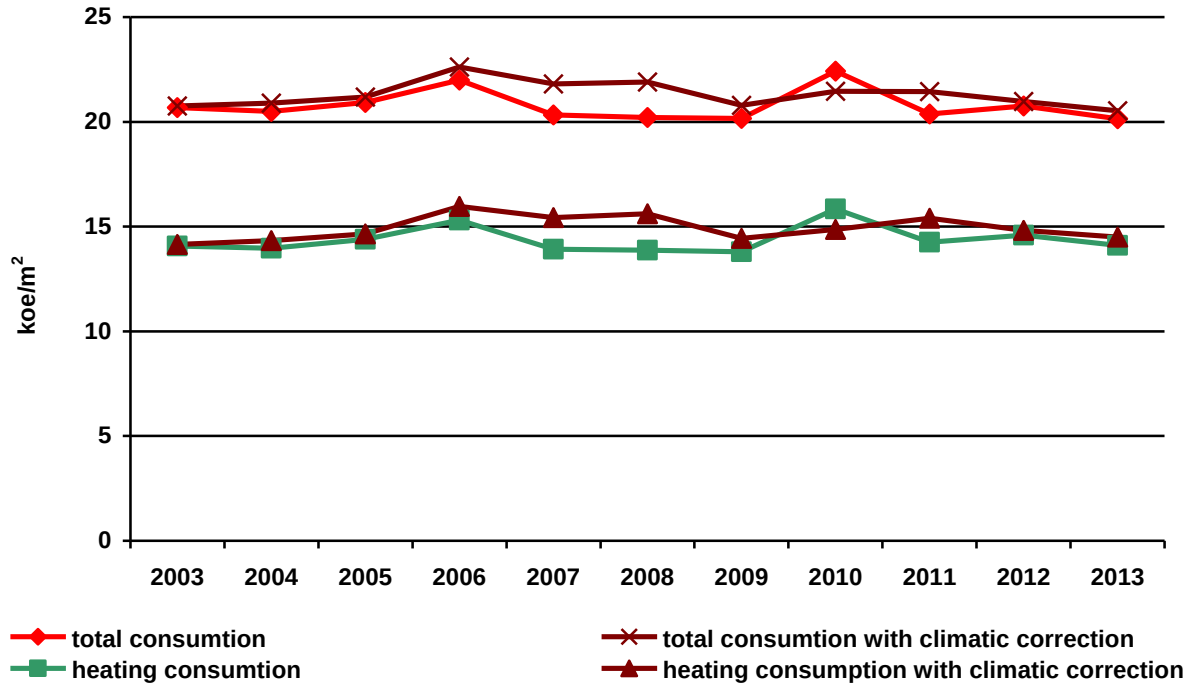
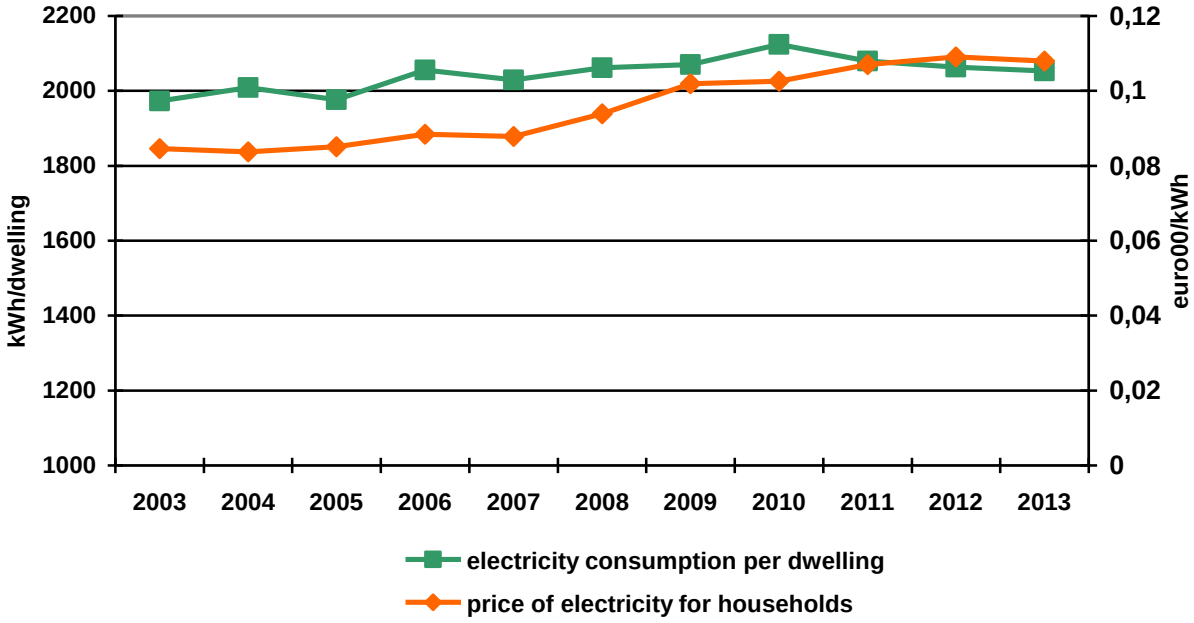


Figure 19. Electricity consumption and price in households per dwelling

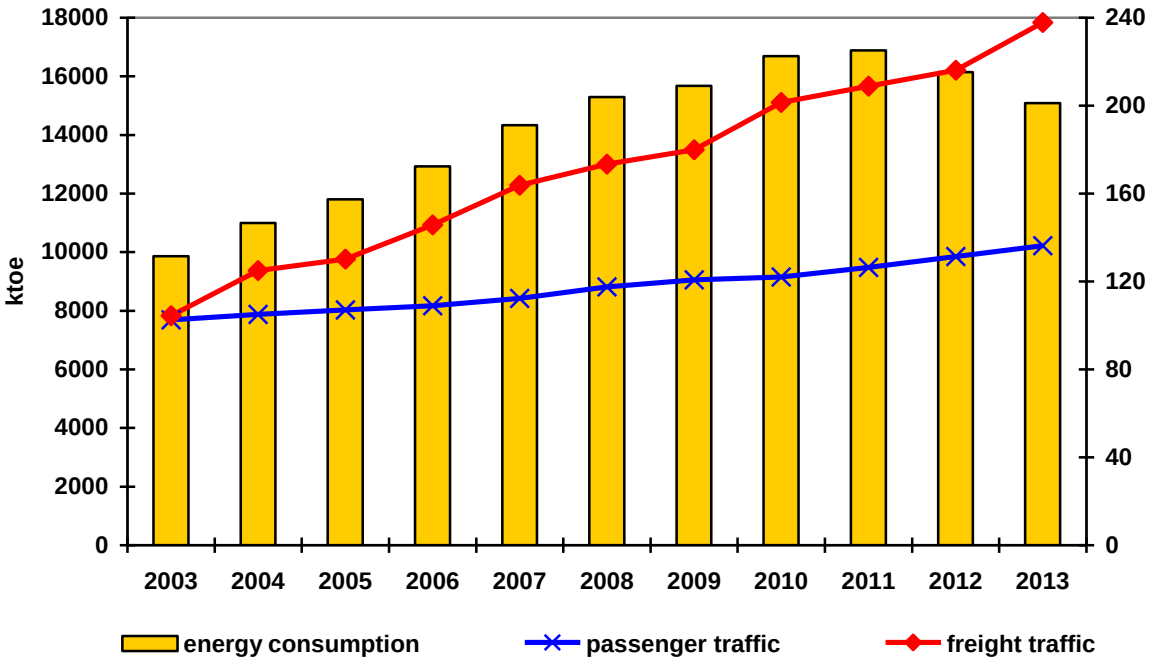


2.6. Transport

In Poland, over 94% of the energy consumed in transport sector is consumed by road transport, and more than 2% in rail transport. In addition, over 3% of energy is consumed by air transport and small amounts by the inland and coastal water transport.

In the years 2004-2013 fuel consumption in road transport grew by 53% (average annual growth rate of 4.7%), while energy consumption in rail transport decreased significantly (by 35%, 4.2%/year). Total average annual growth rate of fuel consumption in transport (excluding air transport) amounted to 4.3% in years 2004-2013.

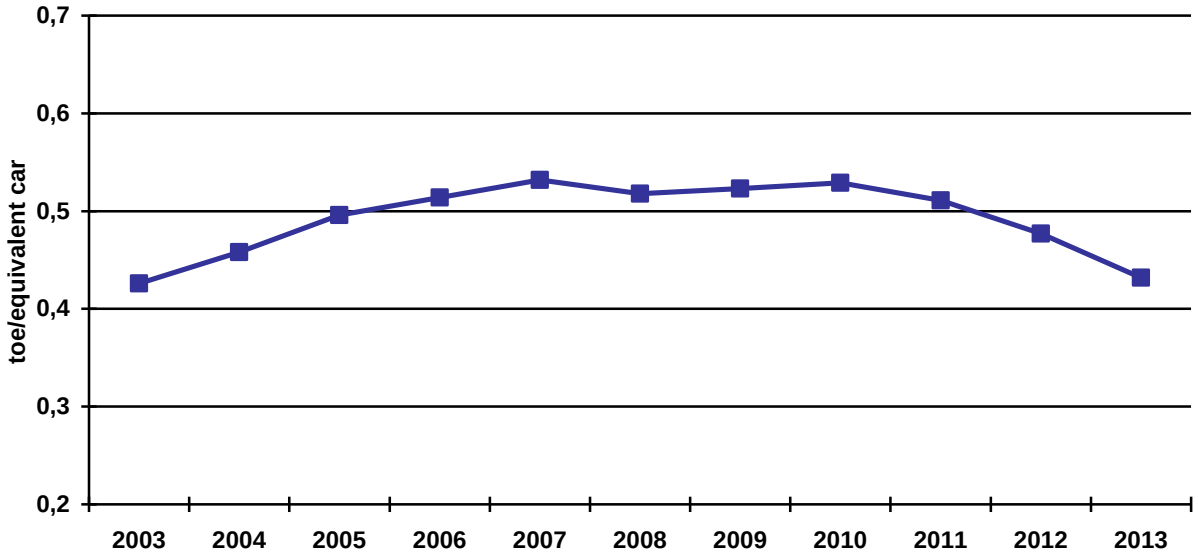
Figure 20. Passenger and freight traffic and energy consumption in transport*



** excluding air transport, source: DG TREN, GUS*

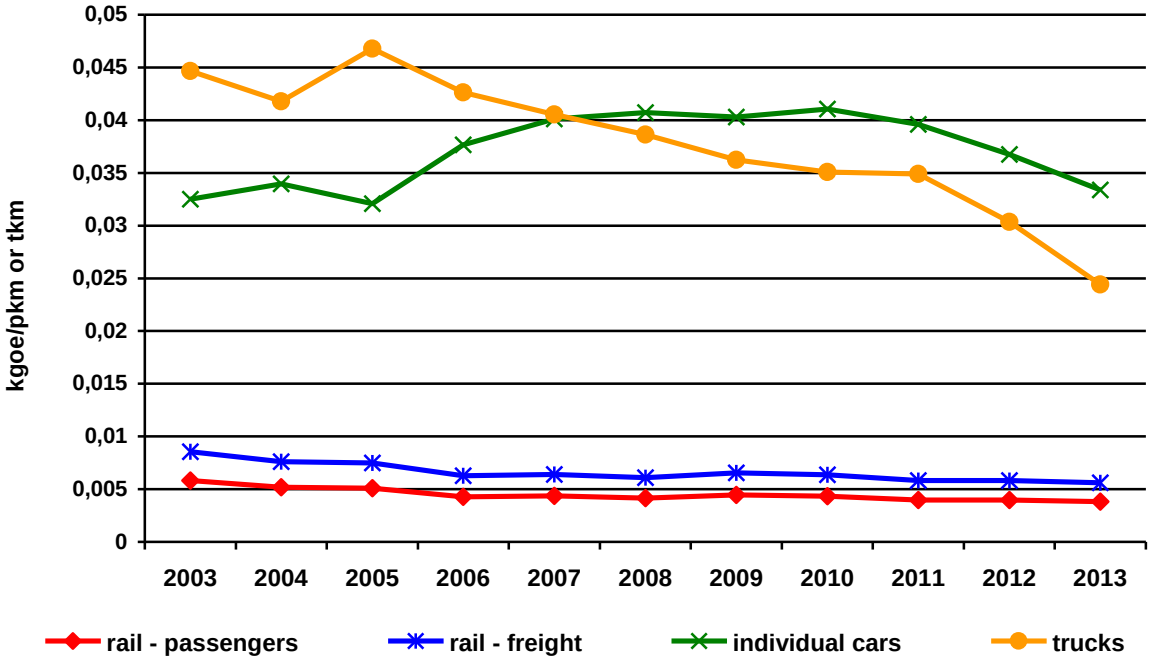
Figure 21 shows the evolution of specific fuel consumption per car equivalent. After growth lasting until year 2007 the value of indicator has varied at the level above 0.5 toe/ equivalent car. Since 2011 the decrease of consumption per equivalent car, which amounted to 0.432 toe in 2013 has been observed. The value of this indicator is influenced mainly by the economic situation of the country, variation of fuel prices and the growing efficiency of new cars.

Figure 21. Fuel consumption per equivalent car



Improvement by modes of transport is shown on Figure 22. During the given period, the fastest pace of improvement was recorded in freight carried by trucks; the pace of improvement amounted to 5.9%/year. In case of rail transport efficiency improvement rate stood at 4.1%/year.

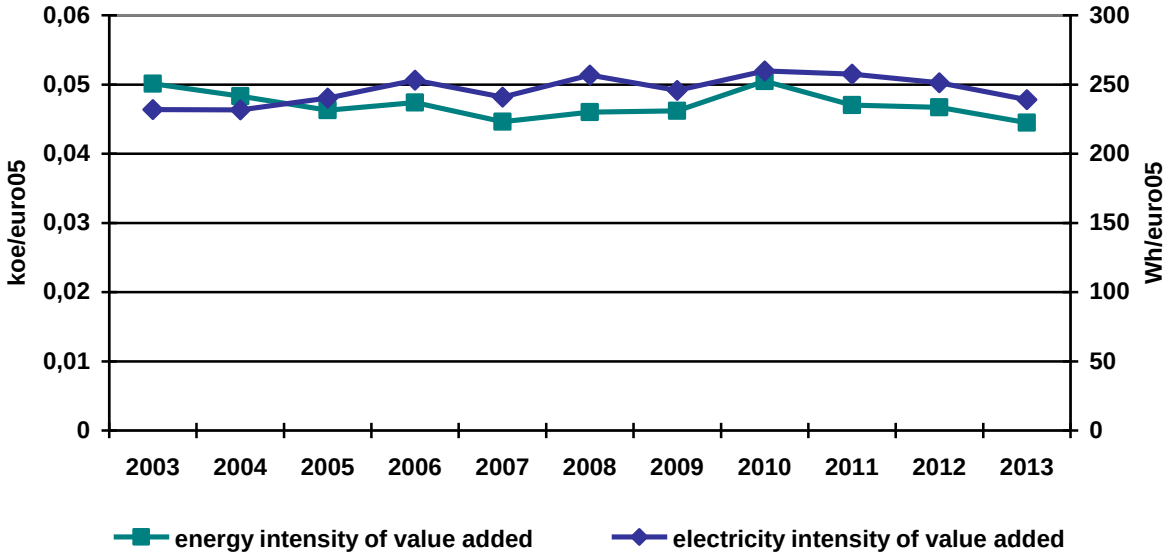
Figure 22. Energy intensity in transport



2.7. Service sector

The services sector is the most energy efficient sector. Energy intensity of value added[6] in the services sector was showing slight fluctuations in years 2003-2013. In 2013, energy intensity decreased and remained below 0.05 kgoe/euro05. The average annual rate of improvement amounted to 1.2%. Electricity intensity of value added in the period 2004-2013 was increasing by 0.3% per year on the average.

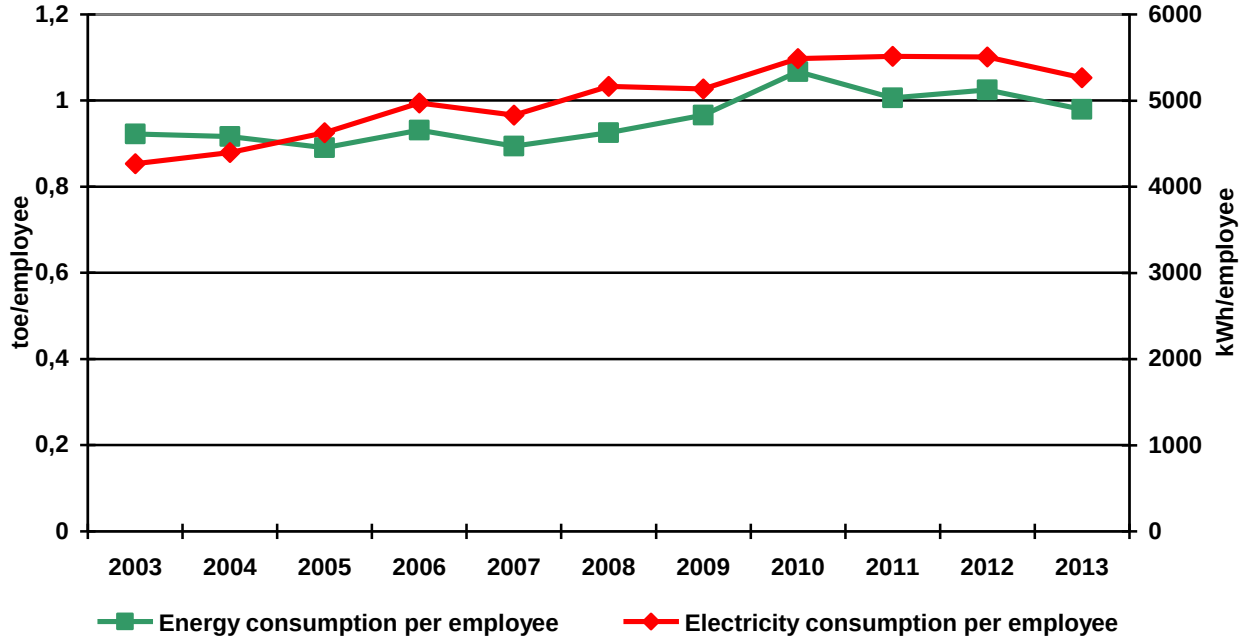
Figure 23. Energy intensity and electricity intensity in service sector



In case of energy and electricity consumption per employee an irregular upward trend can be seen in the period 2003-2013 (Fig. 24) with a period of strong growth of consumption in years 2008-2010. Since then energy consumption tended to decrease, in 2013 it fell below 1 toe/employee. The average rate of growth of this indicator amounted to 0.6% per year. In case of electricity consumption per 1 employee the growth rate amounted to 3.1% per year. Consumption was increasing irregularly, in years 2007, 2009 and 2012-2013 it decreased.

[6] Calculation of this indicator excludes energy consumption of transport but includes value addend of transport. The same procedure concerns electricity intensity indicator.

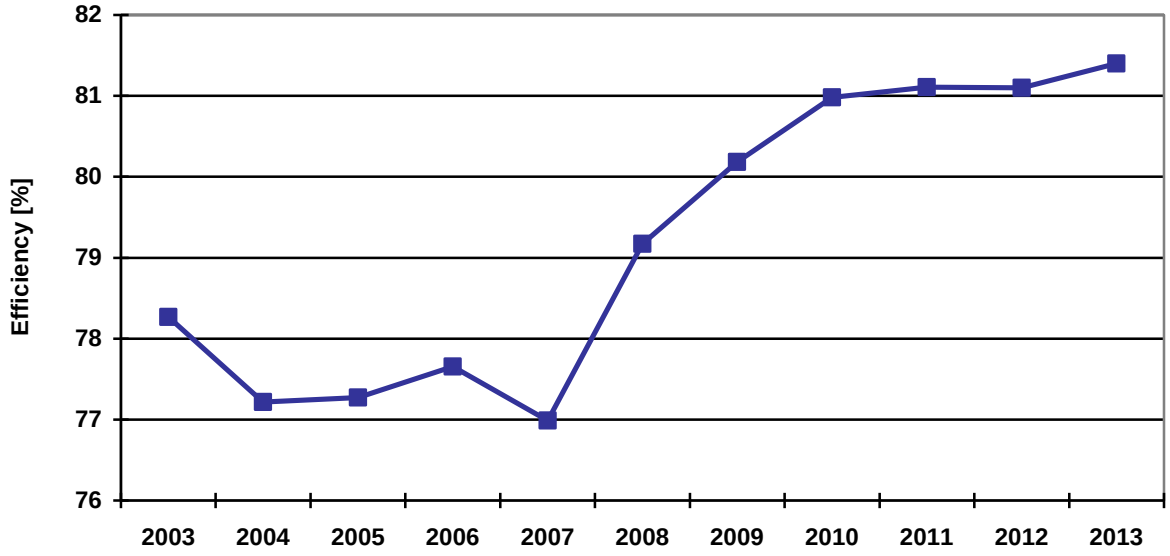
Figure 24. Energy consumption and electricity consumption per employee of the service sector



2.8. Heat plants

The efficiency of heat plants producing district heat decreased in year 2004. Since then, systematic growth, except for year 2007, can be observed. In 2013 efficiency of heat plants amounted to 81.4%.

Figure 25. Efficiency of heat plants



2.9. ODEX indicators and energy savings

ODEX indicator calculated on the basis 2000=100 declined in years 2003-2013 from 86.2 to 68.4 points. The average rate of improvement amounted to 2.3%/year. The fastest rate of improvement (5.0% annually) was achieved by manufacturing. The slowest improvement was achieved in household sector where little improvement was noticed after year 2003. Average annual improvement in the years 2004-2013 in this sector amounted to 0.3%. In the transport sector, the indicator increased in year 2004 and then began to decline. Overall in the years 2004-2013 the average rate of improvement amounted to 2.6%/year[7].

Figure 26. ODEX indicator

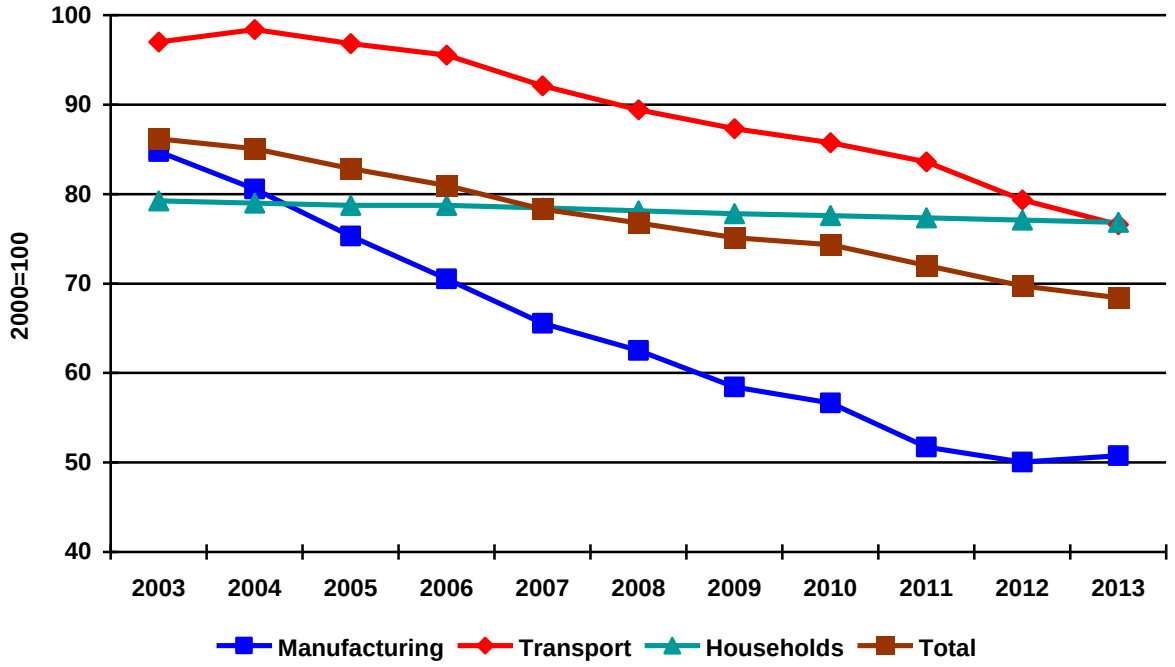
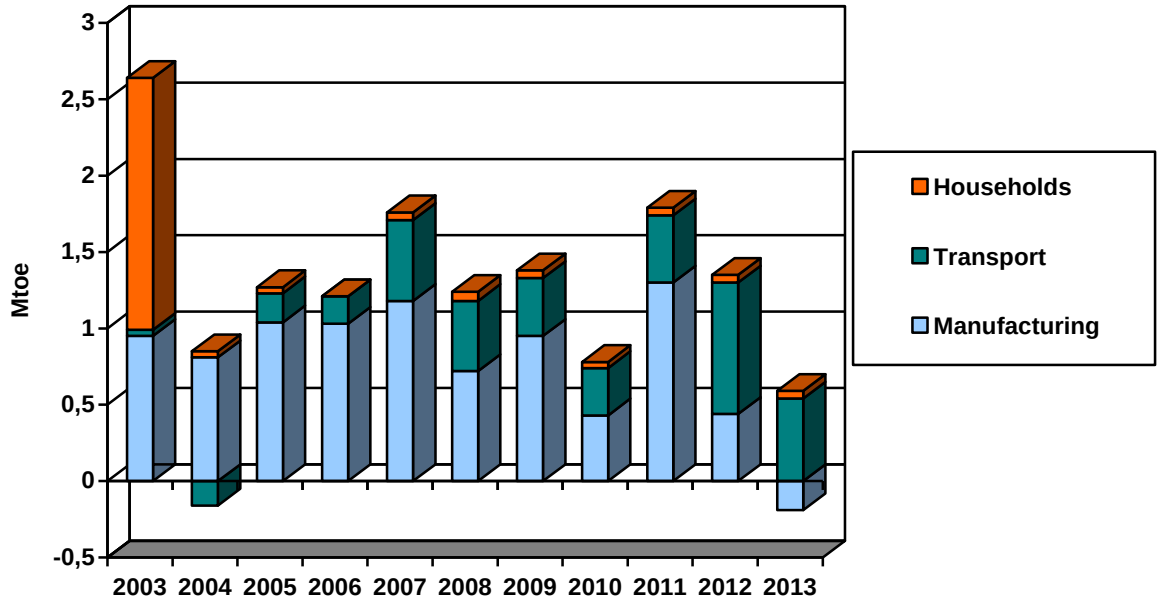


Figure 27 shows energy savings achieved in subsequent years in manufacturing, households and transport sector after 2000 calculated using ODEX indicators. Energy savings were achieved in all three sectors each year except for transport sector in 2004 and manufacturing in 2013. The sum of energy savings amounted usually around 1 Mtoe, with small tendency to decrease.

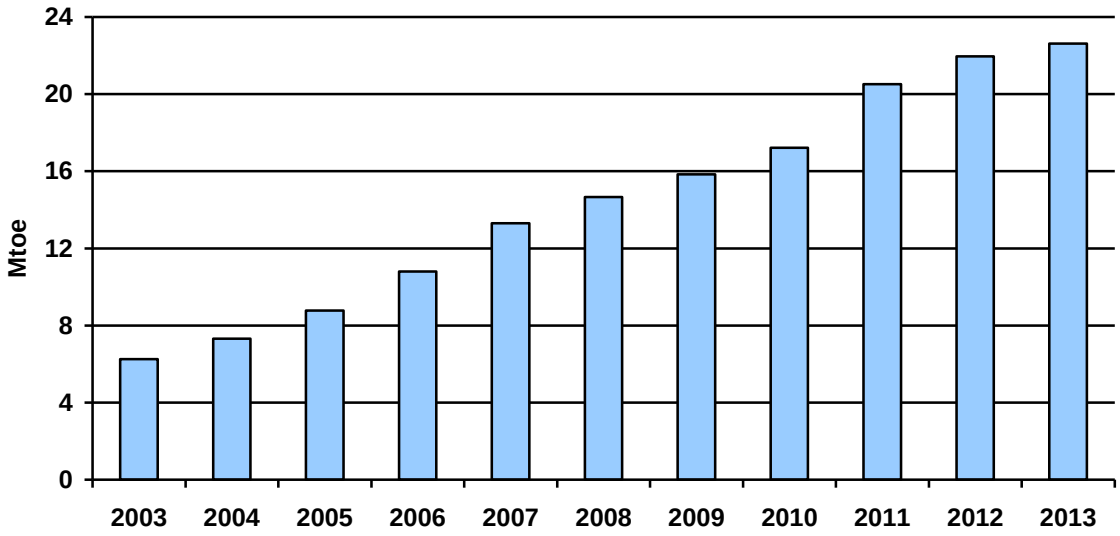
[7] Because of lack of official data on specific consumption of different types of transport, calculation of indicator for transport is based on estimated and constant parameters and therefore can be burdened with an error.

Figure 27. Annual energy savings



The cumulative energy savings since 2000, showing as far as energy consumption would be higher in a given year if improvements in scope of energy efficiency had not been introduced after 2000, amounted in 2013 to 22.6 Mtoe. This result takes into account also the savings achieved by the sectors covered by the European Emissions Trading Scheme (ETS).

Figure 28. Energy savings since year 2000

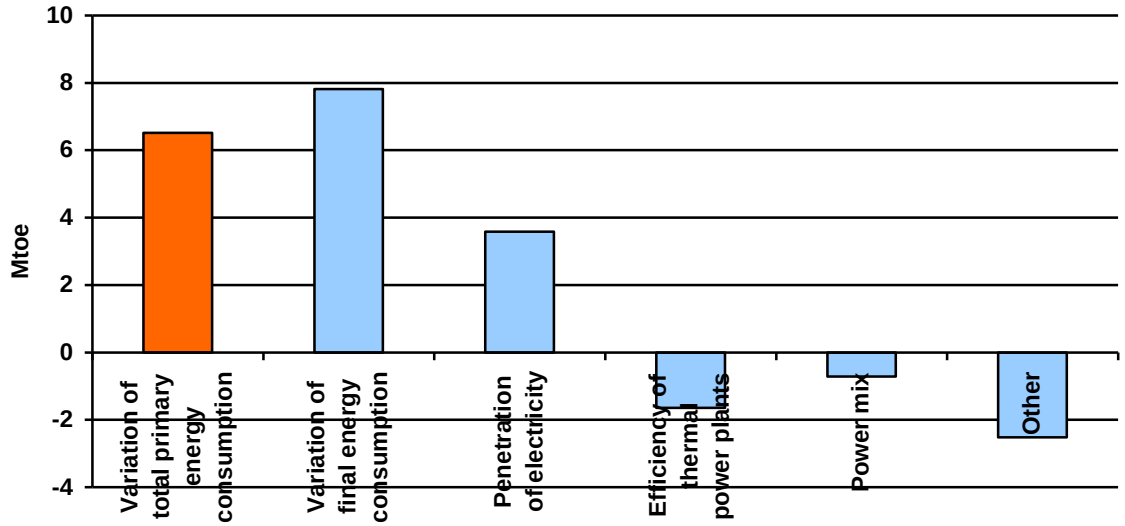


2.10. Decomposition

The most important factors affecting the size of primary energy consumption are: final energy consumption, penetration of electricity (electricity consumption growth also affects the demand for primary energy due to transformation losses), the efficiency of thermal power plants (increased efficiency reduces the demand for primary energy), power mix (renewable energy sources operating at 100% efficiency cause a decrease in demand) and other transformations including the non-energy use.

The figure below shows the decomposition of primary energy consumption driving forces, on the basis of the above mentioned factors.

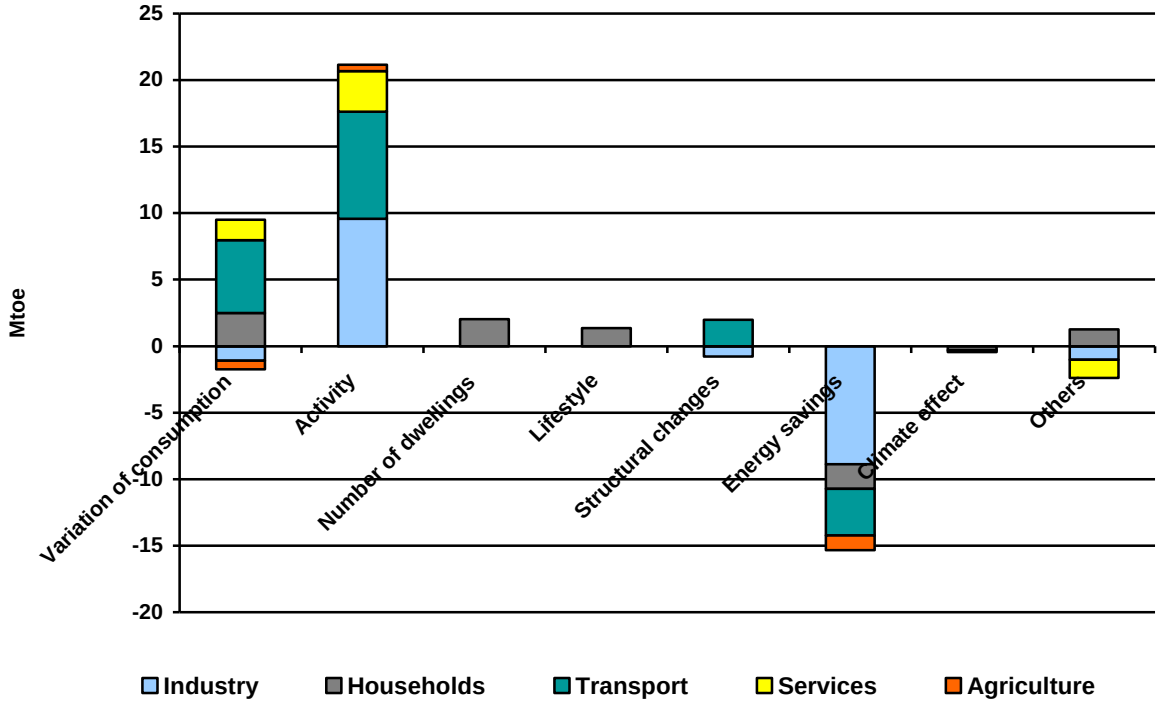
Figure 29. Impact of selected factors on total primary energy consumption in years 2003-2013



In years 2003-2013 the total primary energy consumption has increased by 6.5 Mtoe. This growth was influenced by the demand for final energy, which increased by 8 Mtoe and growth of electricity production by 8.6%. The reduction of the demand for primary energy was achieved by improvement of the efficiency of thermal power plants, increase of the use of renewable energy and other factors including growth of efficiency of other transformations.

In case of final consumption, the factors that have an impact on consumption in different sectors were selected. These are: activity, housing resources, lifestyle, structural changes, energy savings resulting from efficiency improvement of end-users, weather conditions and other factors. Pooled results illustrate the impact on final consumption, as shown on the figure 30.

Figure 30. Impact of selected factors on final energy consumption in years 2003-2013



Energy consumption in industry decreased slightly between 2003 and 2013. Activity of industry significantly increased, but its impact on the consumption was offset by improving energy efficiency. Structural changes and other factors (mainly the difference between activity measured by value added or production index) also resulted in decrease of energy consumption.

In households sector energy consumption grew in years 2003-2013 by 2.5 Mtoe. The increase of consumption was the effect of the growing number of dwellings and changing lifestyle (bigger dwellings). Weather conditions (year 2013 was warmer than 2003) had decreasing impact on energy consumption as well as improving energy efficiency and other factors.

The highest increase of energy consumption was observed in transport sector. This was fueled by increase of activity and structural changes (increase in the share of road transport). Energy savings have reduced consumption by nearly 3 Mtoe.

In service sector it was increased activity that contributed to increase of energy consumption. There was no improvement in energy efficiency. Weather conditions and increase of productivity (value added per capita) of working staff in this sector reduced energy consumption.

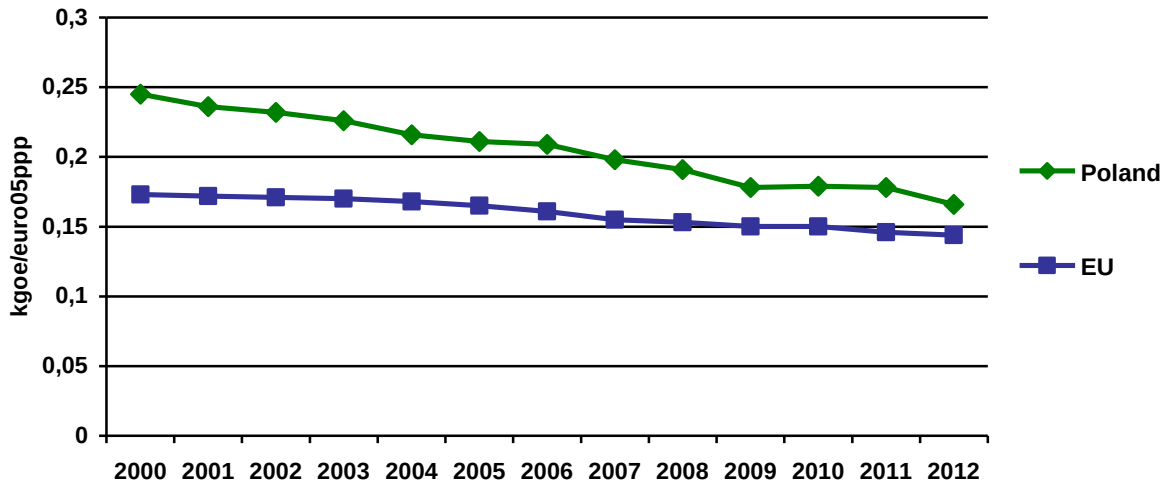
In the agricultural sector, a decrease of consumption resulted from energy savings, an increase in activity increased consumption by 0.5 Mtoe.

Summary data are presented in tabular part.

2.11. Poland against a background of other EU countries

Primary intensity of GDP at constant prices and purchasing power parity (base year 2005) amounted in Poland in 2012 to 0.166 koe/euro05ppp and was 15% higher than European average. This difference fell by 27 percentage points. compared to the year 2000. The rate of improvement of energy intensity was in Poland in years 2000-2012 more than twice higher than in the European Union.

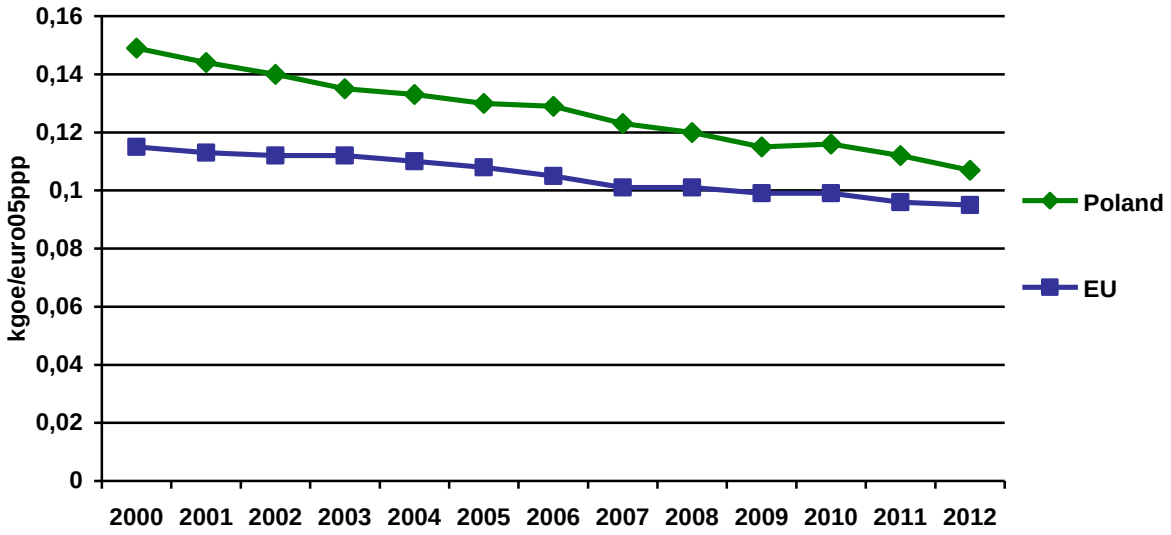
Figure 31. Primary intensity of GDP with climatic correction (euro05, ppp)



Source: Odyssee database, www.odyssee-mure.eu

In case of final energy intensity difference is smaller and amounted in 2012 to 13% between Poland (0.107) and EU average (0.095). The difference between rate of improvement which amounted in year 2000-2012 to 2.7%/year for Poland and 1.6%/year for European average is also smaller in comparison with primary intensity achievements.

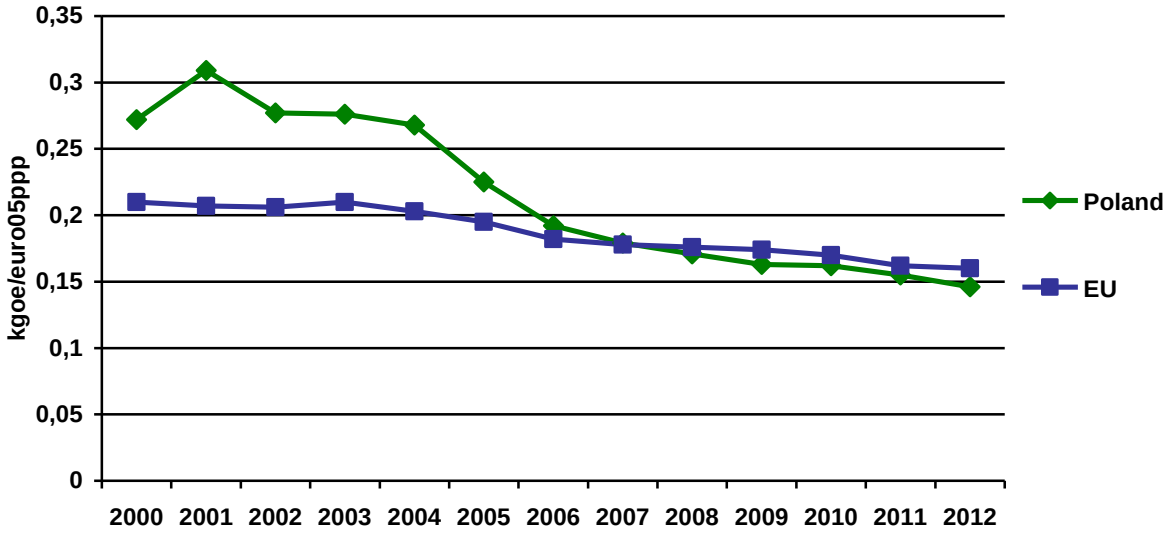
Figure 32. Final intensity of GDP with climatic correction (euro05, ppp)



Source: Odyssee database, www.odyssee-mure.eu

The rate of improvement of energy intensity in manufacturing in Poland also exceeded the European average and amounted to 5.1%/year, compared with 2.2%/year achieved by the whole EU (calculated at the average structure in Europe; indicator eliminates most of the differences resulting from different industrial structure among the countries). Since 2006, the pace of improvement has decreased to a level slightly exceeding the European average.

Figure 33. Energy intensity of manufacturing at average European structure (euro05, ppp)

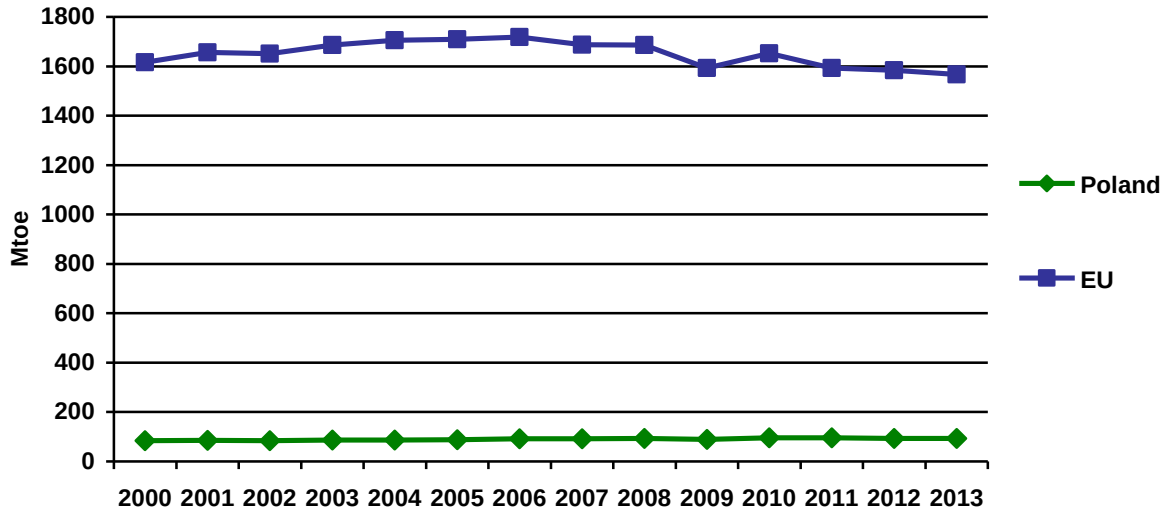


Source: Odyssee database, www.odyssee-mure.eu

For the purpose of monitoring of the Strategy 2020 currently is used indicator of "Primary energy consumption". It is defined according do Directive 2012/27/EU as gross inland

consumption excluding all non-energy use of energy carriers. Values for the Poland in year 2013 amounted to 93.2 Mtoe.

Figure 34. Primary energy consumption



Source: Eurostat

3. Energy efficiency policy and measures towards its improvement

3.1. Energy efficiency policy of the European Union

The European Union is consistently achieving the objectives of the **energy and climate package** published in January 2008, according to which the Member States are required to:

- reduce CO_2 emissions in 2020 by 20% compared to 1990;
- increase the EU's consumption of energy from renewable energy sources by 20% by the year 2020; the target for Poland is set at 15%;
- increase energy efficiency in 2020 by 20% compared to 2005.

Priority of increasing energy efficiency express subsequent messages and EU directives, and above all, last Directive 2012/27/EU of The European Parliament and of The Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. Article 3, paragraph 1 of Directive 2012/27/EU provides that Each Member State shall set an indicative national energy efficiency target, based on either primary or final energy consumption, primary or final energy savings, or energy intensity. When doing so, they shall also express those targets in terms of an absolute level of primary energy consumption and final energy consumption in 2020.

Article 7 of the Directive 2012/27/EU requires each Member State to set up an energy efficiency obligation scheme. That scheme shall ensure that energy distributors and/or retail energy sales companies that are designated as obligated parties operating in each Member State's territory, achieve a cumulative end-use energy savings target by 31 December 2020.

That target is at least equivalent to achieving by all distributors or all enterprises which provides retail sale of energy new energy savings every year since 1 January 2014 to 31 December 2020 by 1,5% annual energy sales to end-users volume averaged in last 3 year time before 1 January 2013. Sale volume of energy consumed in transport can be partially or completely off that calculation.

Pursuant to Article 7 paragraph 9 of Directive 2012/27/EU, as an alternative to setting up an energy efficiency obligation scheme, Member States may opt to take other policy measures (e.g. taxes, standards, regulations, labelling schemes or voluntary agreements) to achieve

energy savings among final customers, provided those policy measures meet applicable criteria and generate the required new energy savings.

3.2. Energy Efficiency Policy in Poland

The key documents that define energy efficiency policy in Poland are:

- Energy Policy of Poland until 2030;
- National Energy Efficiency Action Plans (the plans nos. 1, 2 and 3, drawn up respectively in 2007, 2012 and 2014); the drawing up of the plans is required by Directive 2006/32/EC.

According to regulations, was adopted in 2011 Act on Energy Efficiency (Law Gazette No. 94, pos. 551) 2011, which target was development of mechanisms stimulating improvement of energy efficiency. The law primarily introduced obligation of obtaining an appropriate amount of energy efficiency certificates, so called white certificates, by energy enterprise selling electricity, heat or natural gas to end-users attached to the system on territory of the Republic of Poland.

On the other hand adopted in 2014 3 NEEAP, summarizes archived target of energy efficiency improvement, presents target on 2020 and actualizes measures planned to their achievement. Measures presented in document (listed in section 3.7) largely were already listed in 2 NEEAP, and were described in previous publication “Energy Efficiency in Poland in Years 2002-2012”.

3.3. National energy efficiency targets and energy savings achieved

1) National energy efficiency targets to 2020[8]

Pursuant to Article 3 paragraph 1 of Directive 2012/27/EU, a national energy efficiency target for 2020 was set, as presented in Table 5. The target is understood as the achievement in the years 2010-2020 of primary energy consumption reduction by 13.6 Mtoe, which in the conditions of economic growth also means an improvement of energy efficiency of the country’s economy. The target was also expressed in terms of an absolute level of primary energy consumption and final energy consumption in 2020. The energy efficiency target for 2020 was set up based on data developed as a result of the analyses and forecasts carried out for the needs of the governmental document "Energy Policy of Poland until 2030". The

[8] According to the 3 NEEAP.

analyses indicate that the reduction of primary energy consumption will result from a number of already implemented projects as well as the implementation of energy efficiency improvement measures provided for under the country's energy policy.

Table 5. Energy efficiency targets for 2020, pursuant to Directive 2012/27/EU

Energy efficiency target	Energy consumption in 2020	
Reduction of primary energy consumption in the years 2010-2020 (Mtoe)	Final energy consumption (Mtoe)	Primary energy consumption (Mtoe)
13.6	71.6	96.4[9]

2) Total target in final energy savings, which is to be achieved in 2014-2020 and method of its calculating, taking into account possible deductions based on Article 7 paragraph 2 of Directive 2012/27/UE.

In document "Guidelines for directive 2012/27/UE on energy efficiency – article 7. Systems obliging to energy efficiency"[10], called later as "Guidelines", was identified method of calculating total target in cumulated and new final energy savings, to be achieved in obligation of years 2014-2020, and clarifies, which statistic data sets can be used. Above that, the size of the target can be reduced by Member States even by 25%, as a result of whichever from 4 possibilities, stated in article 7 paragraph 2 letter a-d of directive. According to guidelines, target in energy efficiency calculated and reported must be in final energy category, and because of that analysis are kept in that category. According to directive, to base of calculation of energy savings in system, the energy from transport section can be neglected. Value of the base, to which energy savings will be calculated are presented in table 6, on Eurostat data.

[9] According to the reference values for Poland, included in the forecast developed for the European Commission (PRIMES - Baseline 2007), the forecasted primary energy consumption level for 2020 is 110 Mtoe. Thus, taking into account energy consumption decrease by 13.6 Mtoe, we get: 110 Mtoe - 13.6 Mtoe = 96.4 Mtoe.

[10] The Commission Staff Working Paper – Guidelines for Directive 2012/27/UE on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC - Article 7. Energy efficiency obligation schemes, SWD(2013) 451 FINAL.

Table 6. Final energy consumption in 2010-2012 (Mtoe)

No.	Energy consumption	2010	2011	2012	Average
1.	Final energy consumption.....	66.33	63.87	63.64	64.61
2.	Final energy consumption – transport.....	17.61	17.81	17.30	17.57
3.	Final energy consumption (without transport)...	48.72	46.06	46.34	47.04

Source: Eurostat 2014
http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database (X 2013)

From based value of 47,04 Mtoe can be deducted up to 25% final energy consumed, if that energy is consumed in EU-ETS industry sector, defined in Attachment I to Directive 2003/87/EC[11].

Directive 2012/27/UE provides two possibilities of calculating total target in final energy savings in period 2014-2020:

- First – standard energy savings according to art. 7 par. 1 directive – 1.5% yearly to 2020, it is together 10,5%,
- Second – reduced energy savings according to art. 7 par. 2 letter a directive that is total of 9% yearly volume of energy being sold to end-users averaged in last three year period before 1 January 2013.

At the same time, according to art. 7 par. 2 directive 2012/27/UE Member State can:

- exclude from calculation total or part of volume used energy sale,
- in economic activity mentioned in Attachment I to directive 2003/87/EC (Art. 3, par. 2 letter c),
- deduct energy savings in sectors of processing, sending or energy distribution (Art. 7, Par. 2 letter b),
- deduct energy savings from individual activities since 31 December 2008, which will still have meaning in 2020 and can be measured and verified (Art. 7, Par. 2 letter d).

[11] Directive 2003/87/EC of The European Parliament and of The Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (Official Journal L 275, 25/10/2003, p 32).

Member states can freely use previously mentioned methods of deduction (it means choose one or more methods), where must have regard to the wording of Art. 7 Par. 3 directive 2012/27/UE, that total amount of deductions cannot be higher than 25% of energy savings volume.

After analysis it was decided that to accommodate to implementation standard program, that means 1.5% yearly to 2020, total of 10.5%, according to Art. 7 Paragraph 1 directive 2012/27/UE, which is equivalent to achievement of final energy saving in 2020 in value of 3.675 Mtoe.

3) Energy consumption in industrial part of the sector EU-ETS (with taking into account deductions based on article 7 paragraph 2 letter b directive 2012/27/UE)

Identification of final energy consumption in industrial part of EU-ETS sector is necessary to calculate possible amount of deductions, that means to calculate final target in energy saving, being realised in system (article 7 paragraph 2 letter b directive 2012/27/UE). Table 7 presents that consumption, according to Commission Guidelines[12], from possibilities of deducting it is to take off amount of energy consumed in activities of fuel combustion (in installation of nominal heat output not higher than 20MW), refined mineral oils and coke production.

[12] Guidelines section B4 point 18

Table 7. Average consumption of final energy in industry sectors in period 2010-2012

Specification		Average final energy consumption in period 2010-2012 (Mtoe)
1.	Iron and steel metalurgy.....	2.26
2.	Cement industry.....	1.08
3.	Ceramic industry.....	0.12
4.	Chemical industry.....	1.1
5.	Wood industry.....	0.35
6.	Paper industry.....	0.74
7.	Glass industry.....	0.82
8.	Lime industry.....	0.52
9.	Other.....	1.2
10.	All together: EU ETS without energy sector.....	8.19

Source: Calculates based on KOBiZE data

According to table 7, final energy consumption in industrial part of EU-ETS sector, so without energy sector, is 8.19 Mtoe. According to Commission Guidelines[13], consumption can be deducted from total final energy consumption in such part, to total value reduction of energy saving increasing for 2020 was not higher than 25% of that saving. It was decided to take advantage of possibility provided in Article 7 paragraph 2 letter b directive, thus causes that energy saving possible to achieve depends on energy consumption in industrial part of EU-ETS sector.

Therefore, in accordance with adopted standard program of energy saving (10.5% according to article 7 paragraph 1 directive) the size of deduction is mostly 4.90 Mtoe of final energy.

In table 8 are presented calculation for standard program of energy saving – 1.5% yearly growth, giving in 2020 total of 10.5% final energy saving.

[13] Guidelines section B4 point 18 and 19

Table 8. Calculation of the required savings after EU-ETS deductions

Year	Cumulative energy savings (%)	Energy savings net of allowances (Mtoe)	Deductions – total max of 25% (Mtoe)	Energy savings mostly 25% of deductions (Mtoe)	Deductions from industrial part of EU-ETS (Mtoe)	Energy savings after deductions EU-ETS (Mtoe)
2014	1.5	0.70	0.175	0.525	0.123	0.58
2015	3	1.40	0.35	1.05	0.246	1.15
2016	4.5	2.10	0.525	1.575	0.369	1.73
2017	6	2.80	0.70	2.10	0.491	2.31
2018	7.5	3.50	0.875	2.625	0.614	2.89
2019	9	4.20	1.05	3.15	0.737	3.46
2020	10.5	4.90	1.225	3.675	0.86	4.04

Source: 3 NEEAP, Calculations based on directive 2012/27/UE and Guidelines and Eurostat

The analysis shows, that in adopted standard energy savings program, deducted final energy consumption from industrial EU-ETS (3.44 Mtoe) does not cause exceeding 25% limit, leaving possibility of additional deduction based on Article 7 paragraph 2 letter c or d directive 2012/27/UE, in amount of 1.46 Mtoe final energy saving.

4) Overview of final energy savings

Introduction

Calculations were based on Central Statistical Office data, Eurostat and data achieved from project "ODYSSEE-MURE 2012" being realised in EU program "Intelligent Energy for Europe".

Central Statistical Office and the Polish National Energy Conservation Agency take part since 2002 in further projects targeting of energy efficiency (last titled "Monitoring of national and union targets in energy efficiency" on acronym ODYSSEE-MURE 2012 (http://www.odyssee-mure.eu/). In project are build and developed: ODYSSEE database and MURE database, including information about indexes of energy efficiency and activities on improving energy efficiency.

a) Calculation of final energy savings by top-down method

Below are presented calculations of final energy savings made by using top-down method, according to methodology publicised by European Commission in document entitled „Recommendations on Measurement and Verification Methods in the Framework of Directive 2006/32/EC on Energy end-use Efficiency and Energy Services". Year 2007 is recommended by European Commission, as base year. Based on analysis of arability of data, regarding to particular economy sectors, possible to use are indicators to calculate energy savings, as in table 9. Indicators preferred are marked by letter P, indicators minimal by letter M.

Table 9. Indicators to calculating energy savings

No.	Economy sector	Indicators
1.	Households	P1
2.	Services	M3, M4
3.	Transport	P9, P8
4.	Industry	P14

Mentioned above indicators used to calculate energy savings have meanings:

- P1 defines specific energy consumption;
- M3 defines specific energy consumption, without electricity;
- P9 defines energy consumption in road supply transport;
- P8 defines energy consumption by cars per passenger per kilometre;
- M4 defines specific electricity consumption in services;
- P14 defines energy consumption in industry sector related to production index.

Table 10 presents targets overview in energy savings calculated according to directive 2006/32/EC, that is 9% annual national final energy consumption from period 2001-2005 and achieved energy savings. Table 10 shows, that both the size of realized and planned final energy saving exceeds calculated target.

Values of achieved final energy saving in years 2010-2012 presented in tables 10 and 11 are different from presented in 2 NEEAP and brochure ”Energy Efficiency in Poland in Years 2002-2012” as a result of adjustment carried out, on years 2010-2012, of energy consumption in households and industry and values characterize transport sector.

Table 10. Overview of targets in terms of final energy savings

	Target in final energy savings		Final energy savings achieved in 2010 and planned to achieve in 2016	
	In absolute values (Mtoe)	Percentage – to annual consumption from 2001-2005 (%)	In absolute values (Mtoe)	Percentage – to annual consumption from 2001-2005 (%)
2010 r.	1.02	2	4.24	8.3
2016 r.	4.59	9	7.09	13.9

Table 11 present final energy savings achieved to 2013 in division on energy end-use sector.

Table 11. Overview on achieved final energy savings by sectors (Mtoe)

Economy Sector	2010	2011	2012	2013
Households.....	0.841	0.079	0.0773	1.091
Services.....	0	0	0	0
Industry.....	2.235	2.964	3.150	2.876
Transport.....	1.165	1.334	3.078	5.659
Total.....	**4.242**	**4.378**	**7.000**	**9.626**

b) Calculations of energy savings with use of ODEX indicators.

Energy efficiency index (ODEX) is calculated by aggregating the individual changes in energy consumption, observed on certain levels of end-use. ODEX indicator does not show the current level of energy intensity, but the improvement over the base year. ODEX is calculated for each year as the ratio of actual energy consumption in a given year and the theoretical energy consumption which does not take into account the individual effect (i.e.

assuming the previous level of energy intensity in the production processes). In order to reduce random fluctuations 3-year moving average is calculated. The decrease of indicator value represents an increase of energy efficiency.

Calculated based on ODEX indicator energy savings, taking 2010 as base year, in sectors and overall are shown in table 12.

Table 12. Overview on achieved final energy savings based on ODEX indicator, regarding to 2010 (Mtoe)

Economy sector	2010	2011	2012	2013
Households.....	0	0.048	0.098	0.124
Services.....	0	0.000	0.000	0.000
Industry.....	0	0.841	1.119	1.241
Transport.....	0	0.474	0.655	1.919
Total.....	**0**	**1.363**	**1.872**	**3.284**

3.4. Energy efficiency improvement measures

Taken or planned activities and measures for energy efficiency improvement in all of European countries, including Poland, are presented in MURE database (*Mesures d'Utilisation Rationnelle de l'Energie*, http://www.measures-odyssee-mure.eu/). MURE database was created in project SAVE "Intelligent Energy – Europe", by European experts and is coordinated by ISIS (Institute of Studies for Integration of Systems, Italy) and Fraunhofer Institute for Systems and Innovation Research ISI (Germany). MURE database shows descriptions of being realised, planned and finished activities for energy efficiency improvement with their quantitative and qualitative assessment. Involvement of all European countries guarantee continuous updating of the database, which contains also some statistical data and outlining the issues of energy efficiency in individual countries. Base consist 5 sections classifying information on programs of efficiency improvement regarding to 4 fundamental economy sectors: industry, households, transport and services, and regarding to measures of horizontal characteristic (regarding to all economy).

The number of listed in MURE database activities on improving energy efficiency, regarding to all European countries ad Poland was illustrated on figures 34 and 35 below (as at 10 June 2015).

Figure. 35. Number of Energy efficiency measures, implemented or being planned in EU countries, presented in MURE database

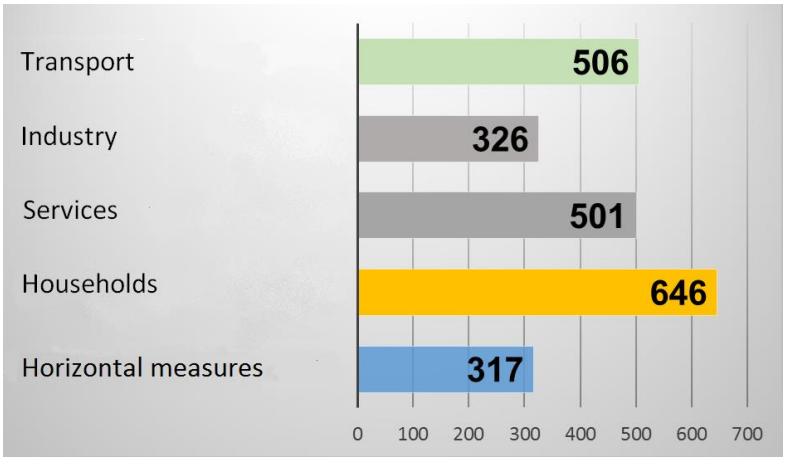
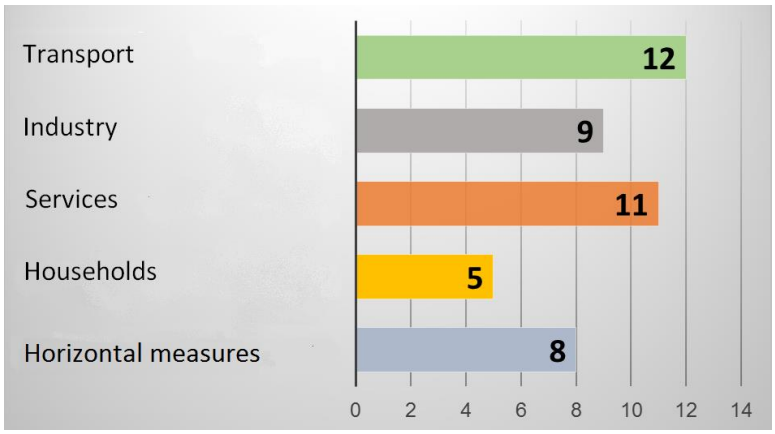


Figure 36. Number of Energy efficiency measures, implemented or being planned in Poland, presented in MURE



Number of measures in specific sectors for all countries, presented in MURE database is shown in table 13.

Table 13. Comparison of the number of actions to improve energy efficiency in countries and sectors, as at 10th June 2015

Country	Households	Services	Industry	Transport	Horizontal measures	Total
AT	10	10	2	13	6	41
BE	22	22	8	10	10	72
BG	21	16	15	14	17	83
HR	24	18	10	33	12	97
CY	7	5	4	13	4	33
CZ	15	6	7	9	21	58
DK	11	3	4	7	4	29
EE	26	30	21	26	21	124
FI	23	29	15	24	17	108
FR	48	26	16	34	25	149
DE	39	34	38	19	27	157
GR	10	16	6	11	5	48
HU	28	12	12	15	10	77
IE	28	26	15	25	7	101
IT	22	17	13	25	7	84
LV	18	17	8	14	10	67
LT	14	24	5	11	13	67
LU	15	4	8	6	5	38
MT	31	15	6	13	7	72
NL	30	17	22	23	7	99
NO	24	22	19	10	5	80
PL	5	11	9	12	8	45
PT	17	14	3	27	7	68
RO	12	13	10	15	8	58
SK	17	18	12	7	19	73
SL	15	13	10	9	12	59
ES	32	42	15	50	5	144
SE	12	6	6	15	10	49
UK	17	15	7	16	8	63

Of course, the effects of measures are different, but all of them has national coverage. Numbers as above illustrates high weight as specific countries attach to the issue of improving energy efficiency.

Activities on energy efficiency in Poland

Activities in Poland presented in MURE database are in majority presented in third National Energy Efficiency Action Plan (3 NEEAP).

In 3 NEEAP are listed measures of energy efficiency improvement as follows.

Horizontal measures:

- The obligatory energy efficiency improvement scheme (white certificates);
- The priority programme "Smart Power Grids";
- Operational Programme Infrastructure and Environment 2014-2020 (Investment Priority 4.iv.) – Development and implementation of smart distribution systems at average and low voltage levels;
- Information and educational campaigns.

Measures in the field of energy performance of buildings and in public institutions:

- Thermal modernisation fund;
- Green Investment Scheme. Part 1 – Energy management in buildings of selected public sector entities;
- Operational Programme Infrastructure and Environment 2014-2020 (Investment Priority 4.iii.) – Supporting energy efficiency, intelligent energy management and use of renewable energy source in public infrastructure, including public buildings and residential sector;
- Improvement of energy efficiency, Part 3 - Subsidized loans to build energy-efficient homes;
- Operational Programme PL04 "Saving energy and promoting renewable energy sources" in Financial Mechanism EOG in years 2009-2014 (area no. 5 - energy efficiency and area no. 6 – renewable energy sources);
- Green Investment Scheme, Part 5 - Energy management in buildings of selected public sector entities;
- Efficient use of energy (Part 4 - LEMUR) - Energy-efficient public utility buildings;

- Operational Programme Infrastructure and Environment (Measure 9.3) – Thermal modernisation of public utility buildings;
- Efficient use of energy (Part 6 – SOWA) – Energy-efficient street lighting systems.
- Regional operation program for years 2014-2020.

Energy efficiency measures in industry and Small and Medium Business:

- Support to entrepreneurs focused on low-emission economy and resource-efficient economy Part 1 – Energy/Electricity audits of enterprise;
- Support to entrepreneurs focused on low-emission economy and resource-efficient economy Part 2 – Increasing energy efficiency;
- Access to financial instruments dedicated to SMEs (PolSEFF);
- Improvement of energy efficiency, Part 4 – Energy saving investments in Small and Medium Business;
- Operational Programme Infrastructure and Environment (Measure 9.1) - Highly efficient power generation;
- Operational Programme Infrastructure and Environment (Measure 9.2) - Efficient energy distribution;
- Operational Programme Infrastructure and Environment 2014-2020 (Investment Priority 4.ii.) – Promoting energy efficiency and usage of renewable energy sources in enterprises;
- Regional operation program for years 2014-2020.

Energy efficiency measures in transport:

- Operational Programme Infrastructure and Environment 2007-2013 (Measure 7.3) – City transport in metropolitan areas and (Measure 8.3) – Development of intelligent transport systems;
- Green Investment Scheme (Part 7 - Gazela) - Low-emission urban transport;
- Operational Programme Infrastructure and Environment 2014-2020;
- Regional operation program for years 2014-2020.

Efficiency of energy production and supply (Article 14 directive):

- Operational Programme Infrastructure and Environment 2014-2020 (Investment Priority 4.v.) – Promoting low-emission strategies for all types of territory, in particular city areas, including supporting multimodal sustainable urban mobility and adaptation measures aimed at mitigating the impact of climate change;
- Operational Programme Infrastructure and Environment 2014-2020 (Investment Priority 4.v.) – Promoting the use of high-efficiency cogeneration of heat and electricity based on useful heat demand.

Energy efficiency improvement measures in selected sectors of the economy are specified and described below.

Horizontal measures

The energy efficiency obligation scheme in the form of energy efficiency certificates (white certificates

The energy efficiency obligation scheme was introduced under the Energy Efficiency Act of 15 April 2011 (Journals of Laws: No. 94, item 551; and of 2012, items 951, 1203 and 1397), hereinafter referred to as „the Act". The scheme has been operating since 1 January 2013. The Act requires energy sales companies which sell energy to final customers to obtain energy efficiency certificates, hereinafter referred to as „white certificates", and submit those certificates for redemption to the President of the Energy Regulatory Office, hereafter referred to as the „President of ERO".

Pursuant to Article 25 of the Act, the energy efficiency certificates are a source of transferable property rights which constitute a commodity tradeable on commodity exchanges, within the meaning of the Act of 26 October 2000 on commodity exchanges (Journal of Laws of 2014, item 197), and are thus tradeable on the Power Exchange. Energy efficiency certificates may only be obtained for projects characterised by the highest economic efficiency. The projects are selected by way of tenders organised by the President of ERO. The successful winners are those entities which declare the largest energy savings compared to the value of energy efficiency certificates obtained.

The first tender to select energy efficiency improvement projects for which energy efficiency certificates might be obtained was announced by the President of ERO on 31 December 2012, and covered the following three categories:

- increase in energy savings by final customers,
- increase in energy savings by devices operated to meet own needs, which devices were understood as a set of auxiliary facilities or installations used for electricity or heat generation process,
- reduction of transmission losses or distribution losses of electricity, heat or natural gas.

Under the scheme, companies subject to the energy efficiency obligation have to obtain certificates with a specific value and present those certificates for redemption each year starting from 2013. The certificates' value and the method of its calculation is set out in the Regulation of the Minister of Economy of 4 September 2012 on the method of calculating primary energy amount corresponding to the value of an energy performance certificate, and on the unit value of the substitution fee (Law Gazette, item 1039).

Up to 19 January 2015 were closed three tenders, in which are bid as follow:

- First tender (announcement of President of ERO No. 1/2012 from 31 December 2012) was decided on 31 August 2013. From 212 offers were chosen 102, with a pot of certificates 550000 toe. In first tender awarded energy efficiency certificates of value 20,5ktoe, which is just under 4% of available pot of 550 ktoe.
- Second tender (announcement of President of ERO No. 1/2013 from 27 December 2013) was decided on 29 October 2014. From 383 offers were chosen 302, with a pot of certificates 1 268 296 toe.
- Third tender (announcement of President of ERO No. 1/2014 from 19 December 2014). Time for folding offers expired at 19 January 2015 – 734 offers.

Information and consultancy programmes for customers

The Polish National Energy Conservation Agency (KAPE S.A.) provides information and advisory services in the field of energy saving measures and their promotion. In Poland, there are also other organisations, associations and institutions operating in this area. In particular, they include: the National Agency for Energy Conservation - „NAPE"; the Foundation for Efficient Energy Consumption - „FEWE"; regional energy agencies (e.g. the Baltic Energy Conservation Agency - „BAPE", Regional Energy Conservation Agency in Toruń - „RAPE", Mazowsze Regional Energy Agency - „MAE", Podkarpackie Regional

Energy Agency – „PAE"); the Institute for Sustainable Development, and other sectoral organisations.

An important role in promoting energy efficiency improvement measures is also played by information campaigns addressed to the society, and aimed at developing pro-environmental attitudes through presenting possible energy saving measures.

Ministry of Economy, in cooperation with National Fund for Environmental Protection and Water Management, plans realizing nationwide advisory program on energy efficiency (including RES), as well in enterprises. Program will be implemented in period of 2015-2023. It will be indispensable element of support construction low-emission economy in Poland related to so called low-emission economy plans prepared by municipalities from among other funds of Operational Programme of Infrastructure and Environment.

Initiative targets constructing advisory system on low-emission economy in regions, based on advisory structure offering services on regional level and local for units of local government, enterprises, individuals and community and housing associations.

The target of the program will be:

- incresing social awareness on energy efficiency and RES by making available information exchange on local and regional level and good practices on implementing directive 2010/21/UE and 2012/27/UE (for example creating uniform standards and guidelines);
- support on local level on preparing low-emission economy plans and resulting projects on energy efficiency and RES;
- creating incentive for units of local government to creating posts for energy advisors promoting energy efficiency;
- creating systems of schooling to improvement of qualifications of municipal energetics.

Nationwide advisory program on energy efficiency and RES and will be realizing assumptions of directive 2012/27/UE (article 12 and article 17) and directive 2009/28/EC (article 14 paragraph 6).

Implementing program will be funded from funds of Cohesion Fund in Operational Programme Infrastructure and Environment 2014-2020.

Also in 2012-2014 were conducted following information-educational campaigns:

In 2012 – 2014, such information campaigns were conducted by:

- the Ministry of Economy which uses, inter alia, the form of campaigns to meet its obligation to carry out informational and educational activities required under the Energy Efficiency Act,
- the Ministry of Environment which carries out its duties under the Act of 27 April 2001 - The Environmental Protection Law (Law Gazette 2013 item 1232 and 1238 and from 2014 items 40, 47 and 457).

To-date the following information and education campaigns have been carried out:

- **Time to save energy**

  An information campaign conducted by the Ministry of Economy with the aim to promote rational use of energy under the slogan "time to save energy." The campaign presents specific energy efficiency measures and their profitability, as well as informs the Polish society of relevant issues, in accordance with the responsibilities of the Minister of Economy in the field of increasing energy efficiency of the Polish economy.
- **Switch off the power - turn on savings; and Poles save heat even more**

  The campaigns were conducted by the Ministry of Environment in 2012 and were dedicated to energy savings in households. Within the campaigns, the largest national television channels broadcast advertising spots in which famous people (actors, scientists and publicly respected persons) encouraged people to take simple, everyday activities which translate into energy savings and help reduce energy bills.
- **Unleash your energy! Protect the environment!**

  TV spots produced by the Energy Regulatory Office and broadcast over a period of 14 days. The spots were viewed by over 15 million TV viewers. The campaign began on 17 June 2012 on TVP channels as a part of the broader "Information and education campaign to promote effective and efficient use of energy for the benefit of the environment and household budgets." The aim of the campaign was to inform consumers of their rights as well as benefits they may get if they are aware and active participants of the energy market.

Access to the qualification, accreditation and certification systems

Currently the Polish legislation provides for three main categories of documents which help those interested in energy efficiency improvement to assess energy consumption of buildings, equipment and installations, to identify the sources of potential energy savings and to determine the costs of implementing energy saving solutions. These document categories are:

- **Energy Audit**

  Energy audit, within the meaning of the Act of 21 November 2008 on support to thermal modernisation and renovation of buildings (Law Gazette No. 223, item 1459, as amended[14)]), is an expert opinion determining the scope as well as technical and economic parameters of a thermal modernisation project. An energy audit document indicates the optimum energy saving solution in terms of implementation costs and energy savings potential. The energy audit document is required to apply for co-financing of a thermal modernisation project. The aim of such a project is to reduce the consumption of energy used to heat the building space and to produce domestic hot water, and thus to reduce the costs of ensuring appropriate comfort conditions inside the building.

- **Energy efficiency audit**

  Energy efficiency audit, within the meaning of the Act, is an analytical document containing an analysis of energy consumption of the building/structure/technical device or installation in question and of its technical condition. The document contains a list of projects aimed at improving energy efficiency of the building/structure/technical device or installation, as well as an analysis of their cost-effectiveness and possible energy savings. An energy efficiency audit has to be carried out in order to obtain support in the form of white certificates.

- **Building's energy performance certificate**

  Building's energy performance certificate, within the meaning of the Act of 7 July 1994 - Construction Law (Journal of Laws of 2013, item 1409, and of 2014, item 40) is a document which determines the amount of energy (expressed in kWh/m2/year) which has to be ensured to meet the different energy needs connected with using the

[14)] The amendments to the Act were published in Law Gazette 2010, No. 157, item 1241; 2010, No. 76, item 493; 2011, No. 106, item 622; and 2012, items 951 and 1342.

building, as well as a specification of possible works which may improve the cost-effectiveness of the different energy-consuming systems in the building.

Market for energy services

Targeting stimulation of market for energy services enterprises, such as enterprises of energy saving as ESCO, in Act were implemented regulations for possibilities to proceed to tender by such units to obtain energy efficiency certificates (white certificates). Enterprises of energy saving as ESCO can be beneficent of white certificates system thanks to Act, which allow the aggregation of energy savings and joining with them to tender in name of other units, in which were realized enterprise leading to improvement of energy efficiency, achieving cumulated energy save of at least 10 toe. Furthermore, units of public sector, while being obliged to use provided in Act measures of energy efficiency improvement, can contain agreements, which target is to realize and fund enterprises to improve energy efficiency, with such unit as enterprises of energy savings like ESCO.

On Ministry of Economy website has been placed elaboration of The Polish National Energy Conservation Agency titled "Time for energy saving. Textbook directed to units of public sector". In that publication was described inter alia master agreements on different services categories which guarantee improvement of energy efficiency and specified a list of available energy services deliverers[21)].

Measures in the field of energy performance of buildings

Building renovation strategy

Strategy of buildings renovations titled "Supporting Investments in Building Modernisation" was prepared by Ministry of Infrastructure and Development based on article 4 of directive 2012/27/UE, was presented in attachment 4 to 3 NEEAP.

Additional measures relating to energy performance of buildings

Support to investments in the improvement of energy efficiency of buildings is provided pursuant to the Act of 21 November 2008 on support to thermal modernisation and renovation of buildings.

The Thermal Modernisation and Renovation Fund, with resources coming from the state budget, is a programme of support to thermal modernisation and related renovation works carried out in old multi-family residential buildings. The programme in its current form has

been implemented since 2009. The Fund's resources are allocated to partial re-financing of the costs of thermal modernisation and renovation projects aimed at improving technical condition of the existing housing stock and reducing its heat demand.

In 2012, the Thermal Modernisation and Renovation Fund allocated the overall amount of 139.42 million PLN to the implementation of 2859 thermal modernisation projects with a total value of 1018.8 million PLN. It also allocated 31.79 million PLN to the implementation of 658 renovation projects with a total value of 226.2 million PLN.

In the field of energy efficiency of buildings, including residential buildings, activities have been undertaken to establish minimum energy saving requirements and thermal insulation requirements, as well as the path of achieving compliance with the requirements to be met in 2021 when all newly constructed buildings will have to be nearly zero-energy buildings (the Regulation of the Minister of Transport, Construction and Maritime Economy of 5 July 2013 amending Regulation on technical conditions to be met by buildings and their location (Law Gazette item 926).

Energy efficiency measures in public institutions

The National Fund for Environmental Protection and Water Management implements the following programmes improving energy efficiency in public utility buildings:

- Operational Programme PL 04 - Saving energy and promoting renewable energy sources (area no. 5 - energy efficiency and area no. 6 – renewable energy sources);
- Green Investment Scheme, Part 5 - Energy management in buildings of selected public sector entities;
- Efficient use of energy (Part 4 - LEMUR) - Energy-efficient public utility buildings;
- Priority program Ecological education for 2014.

Energy efficiency measures in the transport sector

Energy efficiency improvement projects were implemented under the Operational Programme Infrastructure and Environment (Measure 7.3 - Urban transport in metropolitan areas, and Measure 8.3 - Increasing the application scope of Smart Transport Systems). In addition, the National Fund for Environmental Protection and Water Management implements the Low Emission Urban Transport programme under the Green Investment Scheme (GIS), Part 7. The programme aims to reduce or avoid carbon dioxide emissions by co-funding projects involving reduction of energy and fuel consumption in urban transport. The programme

includes activities such as: purchase of new hybrid buses fuelled with compressed natural gas (CNG); training for public transport vehicle drivers who drive low-emission vehicles; infrastructure and management training related to modernisation or construction of refuelling stations for public transport vehicles, and adjusting those stations to hybrid buses fuelled with CNG; modernisation or construction of cycling lanes; modernisation or construction of bus lanes; modernisation or construction of „Park and Ride" car parks; implementation of urban transport management systems; implementation of urban cycling systems.

4. Summary

Increasing the energy efficiency of the processes of generation, transmission and use of energy is a pillar of a sustainable energy policy. This is reflected in legislation and actions undertaken by national and EU institutions. Most recent Directive 2012/27/EU of 25 October 2012 on energy efficiency is a continuation and stresses the importance of policies to improve the efficiency of the European Union. The Directive obliges EU Member States to introduce measures to improve energy efficiency for achieving the target of 20% primary energy savings by 2020. In case of Poland target was set at 96.4 Mtoe.

Poland actively participates in the creation of common energy policy and legislation on energy efficiency and makes its implementation in national conditions, taking into account the protection of the interests of customers, owned energy resources and technological conditions of production and transmission of energy. Poland pursues indicative target resulting from the Directive 2006/32/EC of the European Parliament and of the Council. By 2013, Poland has completed most of the assumed energy savings.

In Poland energy efficiency systematically improves, both in terms of the economy as a whole and for most sectors. Over the last 10 years, primary energy intensity was decreasing by over 3% per year and the final energy consumption by more than 2% per year. The fastest rate of energy efficiency improvement was recorded in the industrial sector, while the slowest in the services sector. The most important factors affecting the change in energy consumption were rising economic activity increasing energy demand and improving energy efficiency resulting in a decrease in the demand. In European comparison it can be observed that Poland was improving energy efficiency at a rate exceeding the European average, while in case of energy intensity Poland remains above the European average.

The necessity of monitoring the effects of measures to improve energy efficiency, the pursuit of harmonization and making international comparisons, force changes in the process of collection of statistical data, ie. extending the subject and object scope of surveys in official statistics and the availability of administrative data sources.

TABLES

Table 1. Energy consumption and intensity of GDP

No.	Specification	Unit	2003	2004	2005
1	Primary energy consumption ……..…..	Mtoe	91.2	91.5	92.7
2	Final energy consumption ……..	Mtoe	54.3	56.2	56.9
3	Final energy consumption with climatic correction…….	Mtoe	54.4	56.6	57.2
4	Primary energy intensity of GDP……...	kgoe/euro00	0.458	0.437	0.428
5	Final energy intensity of GDP…..……	kgoe/euro00	0.273	0.268	0.263
6	Final energy intensity of GDP with climatic correction……...	kgoe/euro00	0.273	0.270	0.264

Table 2. Energy intensity of industry branches

No.	Specification	Unit	2003	2004	2005
1	Food.....	kgoe/euro05	0.416	0.395	0.272
2	Textile.....	kgoe/euro05	0.167	0.140	0.148
3	Wood.....	kgoe/euro05	0.417	0.406	0.461
4	Paper.....	kgoe/euro05	0.440	0.391	0.599
5	Chemical.....	kgoe/euro05	1.497	1.448	1.298
6	Mineral.....	kgoe/euro05	1.153	1.051	0.949
7	Primary metals.....	kgoe/euro05	2.624	3.011	2.157
8	Machinery.....	kgoe/euro05	0.118	0.097	0.079
9	Transport equipment.....	kgoe/euro05	0.115	0.094	0.109
10	Other.....	kgoe/euro05	0.088	0.115	0.118

Table 3. Energy intensity of production

No.	Specification	Unit	2003	2004	2005
1	Steel……	toe/t	0.290	0.281	0.273
2	Cement..……..	toe/t	0.090	0.106	0.103
3	Paper..…….…….	toe/t	0.603	0.510	0.572

2006	2007	2008	2009	2010	2011	2012	2013	Lp.
97.7	97.8	98.7	94.9	101.3	102.4	98.0	97.7	1
59.4	59.8	60.7	60.4	65.3	63.7	63.3	62.2	2
60.1	61.6	62.9	61.2	63.7	64.9	63.6	62.7	3
0.424	0.396	0.385	0.361	0.371	0.358	0.336	0.330	4
0.258	0.242	0.237	0.229	0.239	0.223	0.217	0.210	5
0.261	0.250	0.245	0.233	0.233	0.227	0.218	0.212	6

2006	2007	2008	2009	2010	2011	2012	2013	Lp.
0.232	0.237	0.219	0.196	0.207	0.194	0.199	0.183	1
0.116	0.096	0.080	0.063	0.050	0.049	0.048	0.051	2
0.366	0.331	0.341	0.332	0.384	0.355	0.360	0.385	3
0.554	0.450	0.447	0.428	0.417	0.379	0.367	0.420	4
1.174	1.110	1.072	1.071	0.826	0.857	0.812	0.850	5
0.794	0.817	0.767	0.736	0.654	0.638	0.611	0.591	6
1.782	1.763	1.763	1.148	1.182	1.024	1.022	1.060	7
0.060	0.048	0.038	0.034	0.031	0.029	0.027	0.028	8
0.092	0.087	0.073	0.059	0.053	0.045	0.044	0.046	9
0.113	0.096	0.084	0.067	0.072	0.073	0.067	0.079	10

2006	2007	2008	2009	2010	2011	2012	2013	Lp.
0.250	0.237	0.223	0.210	0.219	0.195	0.205	0.208	1
0.109	0.098	0.088	0.090	0.095	0.093	0.087	0.094	2
0.552	0.552	0.556	0.472	0.443	0.448	0.455	0.514	3

Table 4. Energy efficiency indicators in households sector

No.	Specification	Unit	2003	2004	2005
1	Energy consumption per dwelling.....	toe/dwelling	1.422	1.415	1.449
2	Energy consumption per dwelling with climatic correction.....	toe/dwelling	1.428	1.442	1.467
3	Energy consumption per m^2.....	kgoe/m^2	20.7	20.5	20.9
4	Energy consumption for heating per m^2 a).....	kgoe/m^2	14.1	14.0	14.4
5	Electricity consumption per dwelling.....	kWh/dwelling	1973 b)	2008.6	1976.6

Table 5. Energy efficiency indicators in service sector

No.	Specification	Unit	2003	2004	2005
1	Energy intensity.....	kgoe/euro05	0.050	0.048	0.046
2	Electricity intensity.....	Wh/euro05	231.9	231.6	240.2
3	Energy consumption per employee.....	toe/emp.	0.922	0.916	0.891
4	Electricity consumption per employee.....	kWh/emp.	4265.9	4396.5	4625.3

Table 6. Energy efficiency indicators in transport and energy sector

No.	Specification	Unit	2003	2004	2005
1	Fuels consumption per equivalent car.....	toe/eq. car	0.426	0.458	0.496
2	Heat plants efficiency.....	%	78.3	77.2	77.3

Table 7. ODEX indicator

No.	Specification	Unit	2003	2004	2005
1	Manufacturing.....	2000=100	84.7	80.6	75.3
2	Transport.....	2000=100	97.0	98.4	96.8
3	Households.....	2000=100	79.2	79.0	78.7
4	Global ODEX.....	2000=100	86.2	85.1	82.8

a) Data estimated

2006	2007	2008	2009	2010	2011	2012	2013	Lp.
1.528	1.419	1.418	1.421	1.621	1.479	1.511	1.473	1
1.572	1.522	1.537	1.465	1.552	1.557	1.527	1.500	2
22.0	20.3	20.2	20.2	22.4	20.4	20.8	20.2	3
15.3	13.9	13.9	13.8	15.8	14.3	14.6	14.1	4
2055.4	2029.4	2061.9	2069.9	2124.3	2079.8	2063.5	2053.1	5

2006	2007	2008	2009	2010	2011	2012	2013	Lp.
0.047	0.045	0.046	0.046	0.051	0.047	0.047	0.045	1
253.1	240.9	256.7	245.7	259.9	257.5	251.2	239.1	2
0.931	0.895	0.926	0.966	1.067	1.006	1.025	0.979	3
4973.4	4829.9	5165.6	5134.5	5489.3	5515.1	5506.6	5266.3	4

2006	2007	2008	2009	2010	2011	2012	2013	Lp.
0.514	0.532	0.518	0.523	0.529	0.511	0.477	0.432	1
77.7	77.0	79.2	80.2	81.0	81.1	81.1	81.4	2

2006	2007	2008	2009	2010	2011	2012	2013	Lp.
70.5	65.6	62.5	58.5	56.6	51.7	50.0	50.7	1
95.5	92.1	89.4	87.3	85.7	83.6	79.4	76.6	2
78.7	78.5	78.1	77.8	77.6	77.3	77.1	76.8	3
80.9	78.3	76.8	75.1	74.3	72.0	69.7	68.4	4

Table 8. Impact of selected factors on variation of final energy consumption in years 2003-2013 (Mtoe)

Specification	Industry	Households	Transport	Services	Agriculture	Total
Variation of final consumption……..	-1.1	2.5	5.5	1.6	-0.6	7.8
FACTORS						
Activity…….....	9.6	–	8.0	3.0	0.5	21.1
Number of dwellings…….....	–	2.0	–	–	–	2.0
Lifestyle..……..	–	1.4	–	–	–	1.4
Structural changes..	-0.8	–	2.0	–	–	1.2
Energy savings…..	-8.9	-1.9	-3.5	0.0	-1.1	-15.3
Climate effect…….	–	-0.3	–	-0.1	–	-0.4
Other……..	-1.0	1.3	–	-1.4	–	-1.1

Attachment. EU documents concerning issues related to energy efficiency

List of legal acts

1) *Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC.*
2. *Directive 2010/30/EU of the European Parliament and of the of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.*
3. *Commission Delegated Regulation (EU) No 1059/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household dishwashers.*
4. *Commission Delegated Regulation (EU) No 1060/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household refrigerating appliances.*
5. *Commission Delegated Regulation (EU) No 1061/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household washing machines.*
6. *Commission Delegated Regulation (EU) No 1062/2010 of 28 September 2010supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of televisions.*
7. *Commission Delegated Regulation (EU) No 626/2011 of 4 May 2011 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of air conditioners.*
8. *Commission Delegated Regulation (EU) No 392/2012 of 1 March 2012 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household tumble driers.*
9. *Commission Directive 96/60/EC of 19 September 1996 implementing Council Directive 92/75/EEC with regard to energy labelling of household combined washer-driers.*
10. *Council Directive 98/11/EC of 27 January 1998 implementing Council Directive 92/75/EEC with regard to energy labelling of household lamps.*

11. *Commission Directive 2002/340/EC of 8 May 2002 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric ovens.*
12. *Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings.*
13. *Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast).*
14. *Commission Regulation (EC) No 1275/2008 of 17 December 2008 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment.*
15. *Commission Regulation (EC) No 107/2009 of 4 February 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for simple set-top boxes.*
16. *Commission Regulation (EC) No 244/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps.*
17. *Commission Regulation (EC) No 245/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaries able to operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council.*
18. *Commission Regulation (EC) No 278/2009 of 6 April 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for no-load condition electric power consumption and average active efficiency of external power supplies.*
19. *Commission Regulation (EC) No 640/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for electric motors.*
20. *Commission Regulation (EC) No 641/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products.*

21. *Commission Regulation (EC) No 642/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for televisions.*
22. *Commission Regulation (EC) No 643/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for household refrigerating appliances.*
23. *Commission Regulation (EC) No 859/2009 of 18 September 2009 amending Regulation (EC) No 244/2009 as regards the ecodesign requirements on ultraviolet radiation of non-directional household lamps.*
24. *Commission Regulation (EU) No 347/2010 of 21 April 2010 amending Commission Regulation (EC) No 245/2009 as regards the ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps.*
25. *Commission Regulation (EU) No 1015/2010 of 10 November 2010 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for household washing machines.*
26. *Commission Regulation (EU) No 1016/2010 of 10 November 2010 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for household dishwashers.*
27. *Commission Regulation (EU) No 327/2011 of 30 March 2011 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for fans driven by motors with an electric input power between 125 W and 500 kW.*
28. *Commission Regulation (EU) No 206/2012 of 6 March 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air conditioners and comfort fans.*
29. *Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC.*
30. *Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC.*
31. *Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics.*

32. *Commission Regulation (EU) No 147/2013 of 13 February 2013 amending Regulation (EC) No 1099/2008 of the European Parliament and of the Council on energy statistics, as regards the implementation of updates for the monthly and annual energy statistics.*
33. *Regulation (EU) No 333/2014 of the European Parliament and of the Council of 11 March 2014 amending Regulation (EC) No 443/2009 to define the modalities for reaching the 2020 target to reduce CO 2 emissions from new passenger cars.*

Information and communications

1) *Green Paper for a European Union Energy Policy (1995).*
2) *Energy Charter Treaty and Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA).*
3) *White Paper Energy for the Future: RES.*
4) *Council Resolution on energy efficiency in the European Community (1998).*
5) *Action Plan to Improve Energy Efficiency in the European Community.*
6) *European Climate Change Programme (ECCP).*
7) *A sustainable Europe for a better world – A European Union strategy for sustainable development.*
8) *Green Paper - Towards a European Strategy for Energy Supply Security.*
9) *White Paper. European Transport Policy for 2010: Time to Decide.*
10) *EUROPE 2020 - A European strategy for smart, sustainable and inclusive growth.*
11) *White Paper. Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system.*
12) *Energy Efficiency Plan 2011.*
13) *Green Paper. Lighting the Future - Accelerating the deployment of innovative lighting technologies.*
14) *Communication from the Commission to the European Parliament and the Council - Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy, COM(2014) 520 final.*