Paulina Szyja

Energy efficiency in the European Union and in Poland

Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania 44/1, 267-277

2016

UNIWERSYTET SZCZECIŃSKI
WYDZIAŁ NAUK EKONOMICZNYCH I ZARZĄDZANIA

Studia i Prace WNEiZ US
nr 44/1 2016

DOI: 10.18276/sip.2016.44/1-22

Paulina Szyja*
Uniwersytet Pedagogiczny w Krakowie

ENERGY EFFICIENCY IN THE EUROPEAN UNION AND IN POLAND

Abstract

The article undertakes the issue of energy efficiency in the context of the EU climate and energy package and the Polish circumstances. The study contains an explanation of concepts, statistics and information about the costs and benefits of increasing energy efficiency, taking into account the necessary action in this regard, both at European as domestic level.

Keywords: energy efficiency, energy use, economy

Introduction

During the negotiations on the establishment of a new agreement on greenhouse gas emissions, carbon dioxide in particular, efforts to increase energy efficiency are taken. This is important not only because of the issues of energy but also the climate security. Energy efficiency reduces the pressure of an economic man on the environment, generates savings, and creates an economy with competitive advantage.

The aim of article is to present the issue of energy efficiency, taking into account the definitions, dates, costs and benefits and specificity of Polish conditions in this area.

* Adres e-mail: paulinaszyja@wp.pl.

1. The concept of energy efficiency in energy and climate policy of the European Union

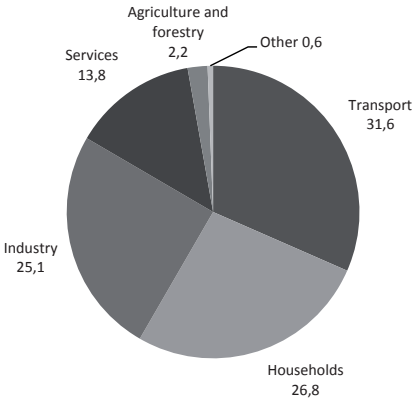
According to International Energy Agency *energy efficiency* is "a way of managing and restraining the growth in energy consumption. Something is more energy efficient, if it delivers more services for the same energy input, or the same services for less energy input" (IEA, http). In turn EU directive defines the concept as "the ratio of output of performance, service, goods or energy, to input of energy, also distinguishing related terms: *energy savings* and *energy efficiency improvements*". The first one highlights the amount of saved energy and the second „an increase in energy efficiency as a result of technological, behavioural and/or economic changes" (Directive 2012/27/EU).The most popular explanation of this term stresses the need to reduce energy consumption, but without affecting the provision of services at the same level or even to a greater extent (*What is Energy Efficiency*…, http). Similar understanding of definition is found in the Polish legal regulations, especially in the Energy Efficiency Act of April 15th 2011 (Ustawa, 2011).

The key issue is a rational use of energy which will yield benefits in terms of savings, but not only that. Currently, it takes on a special significance due to ongoing climate change and the creation of a new framework for socio-economic development – the green economy. In relation to this problem, the role of the third industrial revolution, aimed at improving the efficiency of manufacturing processes while reducing their impact on the environment, inter alia by saving energy, its storage and conversion of buildings in microgeneration has been emphasized (Szyja, 2014, p. 222). In one of the European Commission's publications it has been even emphasized directly: "energy efficiency – the first fuel for the EU Economy" (EEFIG, EU, 2014). It is justified by the statistical data on energy consumption (figure 1) and forecasts in this field for the future.

The issue of increased efficiency is particularly important in view of the projected demand for fossil fuels by 2050 (World Energy Council, 2013, p. 19), which can even rise up to 60%, and shaping sustainable development. In the new Sustainable Development Goals, adopted by the UN Assembly in September 2015, one of the priorities concerns energy: "ensure access to affordable, reliable, sustainable and modern energy for all" (UN, 2015, p. 14). Realisation of this goal may take a different form. In countries with appropriate geographical and climatic conditions

it may be associated with the development of renewable energy sources and in other countries increasing energy efficiency so that all inhabitants are provided with access to energy.

Figure 1. Final energy consumption, EU-28, 2013
(% of total, based on tonnes of oil equivalent)



Figures do not sum to 100% due to rounding

Source: *Consumption of Energy…*

To sum up, we are facing two challenges. The first one is the growing demand for energy and the other is progressive climate change. The European Union's efforts to tackle them include increasing the share of energy from renewable sources and promoting energy efficiency. Both objectives are reflected in the goals adopted in 2007 and modified in 2014 (table 1).

Development of renewable energy sources has, according to the European Commission, "a fundamental role in the transition towards a more competitive, secure and sustainable energy system". In turn, energy efficiency is related to execution of abovementioned targets of the EU climate and energy policies: "improved competitiveness; security of supply; sustainability; and the transition to a low carbon economy" (EC, 2014, p. 6–7). With specific comments on the last item, it is worth paying attention to the issue of the consequences of such actions for the economy as a whole. Activities for energy efficiency require changes in the way of energy use, both in production and consumption. It is therefore essential to start with rai-

sing awareness both in business and among consumers. Implementation of energy efficiency solutions requires the use of modern technological solutions in machinery and equipment and the related extensive investment processes. In this matter, it is important to ensure a "more resilient infrastructure" through inter alia relevant standards in the field of energy, transport and construction (EC, 2013, p. 9). However, success depends on the level of innovation, the amount of actual savings and the ability to create new jobs and maintain the existing ones. Not without significance is the question of the prices of energy from traditional sources.

Table 1. Goals of climate-energy policy of the European Union – progress

	Emission of greenhouse gases (% change)	Share of energy from renewable energy sources (% change)	Energy efficiency (% change)
2007	by 20% in 2020 compared to 1990	to 20% by 2020	by 20% by 2020
2014	by 40% in 2030 compared to 1990	to at least 27% in 2030	by at least 27% by 2030

Source: Brussels European Council 8/9 March 2007 Presidency Conclusions. 7224/1/07 REV 1, Brussels, 2 May 2007; Communication From the Commission to the European Parliament, The Council, The European Economic and Social Committee and The Committee of the Regions. A Policy Framework for Climate and Energy in the Period from 2020 to 2030. COM (2014) 15 final. Brussels, 22.1.2014.

2. Costs and benefits of increase in energy efficiency

Implementation of energy efficiency solutions in residential building leads to a disposable income, which allows to use saved money. That, together with the implementation of energy efficiency in business, which also generating savings, can contribute to economic growth and creation of local jobs (ACEEE, 2015). The potential for creating new jobs first due to labor input to implement (i.e. plan, manage, install, construct) and second more money by companies, which spend less on energy bills, and therefore would invest and employ (Bell, 2012, p. 2). Table 2 presents the possible benefits for households, public buildings and production processes as main fields of creating energy efficiency in the EU. Each of the identified benefits may differ due to diverse sector sizes. This issue is, however, a separate area of considerations.

Table 2. Benefits of energy efficiency

	Benefits of energy efficiency		
	Households	Public buildings	Production
Financial savings	x	x	x
Development of new technologies	x	x	x
Creating local jobs	x	x	x
Change in habits	x	x	x

Source: author's own.

Practice in the field of development of energy efficiency requires simultaneous involvement of three groups of entities: authorities (central and local authorities), enterprises, and society (households). Each of them can develop specific solutions depending on the capabilities and scale of operations. The government can contribute to the activity of others subjects through legal regulations or fiscal, financial, and even market instruments. All of them are supported by the European Commission:

a) annual reduction of 1.5% in national energy sales;
b) the EU countries' obligation to execute energy efficient renovations to at least 3% of buildings owned and occupied by central governments per year;
c) mandatory energy efficiency certificates accompanying sale and rental of buildings;
d) minimum energy efficiency standards and labelling various products such as boilers, household appliances, lighting and televisions (EcoDesign);
e) preparation of National Energy Efficiency Action Plans every three years in the EU countries;
f) the planned rollout of almost 200 million smart meters for electricity and 45 million meters for gas by 2020;
g) large companies conducting energy audits at least once every four years;
h) protecting the rights of consumers to receive easy and free access to data on real-time and historical energy consumption (*Energy efficiency, saving*…, http).

The EU's tools to create energy efficiency are: the refurbishment of buildings, green procurement in the public sector, and savings along with the energy supply chain from extraction to distribution (*Europe 2020 indicators*…, http). Table 3 includes examples of practical methods of increasing energy efficiency in practice in three sectors: transport, households and industry. Currently, one of the most important challenges for countries will be the implementation of the Directive 2010/31/

EU, which undertake the issue of "nearly zero-energy building". According to this document:

a) by December 31st 2020, all new buildings are nearly zero-energy buildings,
b) after December 31st 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings (Directive 2010/31/EU).

Table 3. Energy efficiency practices in transport, households, industry

Specification	Transport	Households	Industry
Energy efficiency practices	– Euro 6 Engines – eco-driving – fuel-efficient tyres – freight transport*	– smart meterings – buying smart electric appliances – switching off standby – installing room thermo-stat – installing double glazing – installing energy efficient boiler – insulating walls, roofs, lofts – reducing heating and cooling energy demand – using a sensor and timer on external lights	– smart meterings – buying smart electric appliances – switching off standby – reducing heating and cooling energy demand – insulating walls, roofs, lofts – using a sensor and timer on external lights

* Transport energy efficiency. Implementation of IEA Recommendations since 2009 and next steps. Energy Efficiency Series. IEA, Paris 2010.

Source: author's own.

3. The issue of energy efficiency in Poland

Energy consumption in Poland continues to grow (table 4), although with some changes. During the global real economy crisis there was a slight decrease. Taking into account gross inland energy consumption, this is noticeable fact.

Table 4. Gross inland energy consumption in Poland 1990–2013
(million tonnes of oil equivalent)

Specification	1990	1995	2000	2005	2010	2013
Poland	103,3	98,8	88,6	92,2	100,7	98,2

Source: Gross in Land Consumption of Energy, 1990-2013, Eurostat, http://ec.europa.eu/eurostat/statistics-explained/images/c/c3/Gross_inland_consumption_of_energy%2C_1990%E2%80%932013_%28million_tonnes_of_oil_equivalent%29_YB15.png.

Comparing the data from table 5 and the graph 1, it should be emphasized that in Poland, in contrast to the data from the whole of the European Union, second and third place in terms of energy consumption are occupied by industry and households sectors.

Table 5. Poland's energy consumption in general, in transport, industry and household in MWh 2003–2013

Specification	2003	2007	2009	2012	2013
Transport	No data	No data	188 406 000	194 221 000	181 428 000
Industry	40 726 000	46 317 000	40 427 000	45 806 000	47 918 000
Households	22 052 000	26 369 000	27 534 000	28 318 000	28 442 000
General energy consumption	**127 000 000**	**140 000 000**	**137 000 000**	**148 000 000**	**150 000 000**

Source: author's own, based on STRATEG, Energy. CSO, http://strateg.stat.gov.pl/Home/Strateg.

Data from table 5 and goals of climate – energy package of European Union shows that there is a need to cut down the use of energy. Activity in this area is much more possible and easier to implement than abandonment of traditional energy sources in the energy balance and the development of renewable energy sources. Nevertheless, in the latter case Poland experienced a lot of success in period of 2005–2014 as there was a 19% growth in production of energy from renewable sources (STRATEG, *Energy*). However, over 90% of the electric energy is coal-generated. Therefore activities in this field require changes aimed at shaping energy efficiency, which is in fact more complicated challenge. For example, the percentage of customers with intelligent energy meters in Poland in 2014 was at the level of 2.96% (STRATEG, *Energy*). Moreover, it is necessary to meet the requirements of the Directive of "nearly zero-energy building". Poland is one of the few countries which has not presented a national plan in this area. Currently each country of the European Union is also obliged to implement energy efficiency Directive (2012/27/EU):

> Each Member State shall 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 under paragraph 4 operating in each

Member State's territory achieve a cumulative end-use energy savings target by 31 December 2020, without prejudice to paragraph 2.
That target shall be at least equivalent to achieving new savings each year from 1 January 2014 to 31 December 2020 of 1,5% of the annual energy sales to final customers of all energy distributors or all retail energy sales companies by volume, averaged over the most recent three-year period prior to 1 January 2013. The sales of energy, by volume, used in transport may be partially or fully excluded from this calculation (Directive 2012/27/EU).

Therefore, we will now see how the matter of shaping energy efficiency in Poland in 2014–2020, on the basis of the European Commission's calculation guidelines, may look like. Final energy consumption in 2010–2012 was 66,352.9, 64,826.0 and 64,486.3, respectively (Eurostat), giving an average of 65,221.7 Mtoe in the period of three years ended December 31st 2012. The total amount of savings required in this Member State in relation to 2014 through the implementation of Article 7 would therefore be (65,221.7 x 1.5% x 1 year) = 978,37 Mtoe.

Table 6. Polish energy efficiency estimated on the basis of article 7 of the Directive 2012/27/EU

Year	Energy savings (Mtoe)							Total
2014	978,33							978,33
2015	978,33	978,33						1956,66
2016	978,33	978,33	978,33					2934,99
2017	978,33	978,33	978,33	978,33				3913,32
2018	978,33	978,33	978,33	978,33	978,33			4891,65
2019	978,33	978,33	978,33	978,33	978,33	978,33		5869,98
2020	978,33	978,33	978,33	978,33	978,33	978,33	978,33	6848,31
Total								**27 393,24**

Source: author's own based on 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.

According to the data above, Poland should create energy efficiency on the level 27 Mtoe in six years, which is 43% of today's consumption. Therefore, a greater effort is needed to raise the awareness of energy efficiency in business and among consumers. In the latter case, taking a look at the sources of energy may show

in which areas it is possible to save the most energy. For example, in household consumers should cut down space and water heating (table 7).

Table 7. The structure of energy consumption in households by directions for use

Direction of USE	2002		2009		2012	
	GWh	%	GWh	%	GWh	%
In all	211 945	100	217 806	100	218 333	100
Space heating	151 111	71,3	152 889	70,2	150 278	68,8
Water heating	31 889	15	31 278	14,4	344 44	14,8
Cooking meals	15 139	7,1	17 889	8,2	18 056	8,3
Lighting	4778	2,3	3944	1,8	3333	1,5
Electrical appliances	9028	4,3	11 806	5,4	14 444	6,6

Source: *Energy Consumption*… (2014), p. 73.

Conclusions

Creating energy efficiency in the European Union represents the current challenge, especially given the expected increase in energy consumption across the globe. Activities in this area require the involvement of states, enterprises and consumers. Success depends on the expected costs and benefits. It is especially important for Poland, country which is based on coal energy, and the goals of the EU climate and energy package. Within six years, Poland is obliged to increase energy efficiency by 43%. It will not be an easy project due to inter alia a delay in preparing a "nearly zero building" national plan, and introducing intelligent meters.

Bibliography

Bell, C.J. (2012). *Energy Efficiency Job Creation: Real World Experiences*, Washington: An ACEEE White Paper.

Brussels European Council 8/9 March 2007 Presidency Conclusions. 7224/1/07 REV 1. Brussels, 2 May 2007.

Commission Staff Working Document Guidance note on Directive 2012/27/EU on energy efficiency, amending Directives 2009/125/EC and 2010/30/EC, and repealing Directives 2004/8/EC and 2006/32/EC. Article 7: Energy efficiency obligation schemes. SWD (2013) 451 final. Brussels, 6.11.2013.

Communication from The Commission to The European Parliament, The Council, The European Economic and Social Committee and The Committee of The Regions. An EU Strategy on adaptation to climate change. COM (2013) 216 final. Brussels, 16.4.2013.

Communication from The Commission to The European Parliament, The Council, The European Economic and Social Committee and The Committee of The Regions. A Policy Framework for Climate and Energy in the Period from 2020 to 2030. COM (2014) 15 final. Brussels, 22.1.2014.

Consumption of Energy. Eurostat Statistic Explained.

http://ec.europa.eu/eurostat/statisticsexplained/index.php/Consumption_of_energy.

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.

Directive 2010/31/EU of The European Parliament and of The Council of 19 May 2010 on the energy performance of buildings. *Official Journal of the European Union* L 153/13.

Draft Outcome Document of the United Nations Summit for the Adoption of the post-2015 Development Agenda. UN, New York, 12 August 2015, A/69/L.85, p. 14.

Energy Efficiency: Getting Energy Smart (2015). American Council for an Energy-Efficient Economy, Washington.

Energy Efficiency, Saving Energy, Saving Money. Retrieved from: https://ec.europa.eu/energy/en/topics/energyefficiency.

Energy Consumption in Households in 2009 (2012). Warsaw: CSO.

Energy Consumption in Households in 2012 (2014). Warsaw: CSO.

Energy Efficiency – the First Fuel for the EU Economy. How to Drive New Finance for Energy Efficiency Investments (2014). Brussels: EEFIG, European Commission.

http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tsdpc320&plugin=1.

International Energy Agency, Energy efficiency. Retrieved from: http://www.iea.org/topics/energyefficiency.

STRATEG, Energy. CSO. Retrieved from: http://strateg.stat.gov.pl/Home/Strateg.

Szyja, P. (2014). The Role of Environmentally-Friendly Solutions in the Process of Industrial Restructuring. *Studies of Industrial Geography Commission of the Polish Geographical Society. Impact of the economic crisis on changes of industrial structures*, *27*, 219–235.

Ustawa z 15.04.2011 r. o efektywności energetycznej. Dz.U. 2011, nr 94, poz. 551.

What is Energy Efficiency and How Much Can it Help Cut Emissions? *The Guardian*. Retrieved from: http://www.theguardian.com/environment/2012/jun/08/energy-efficiency-carbon-savings.

World Energy Scenarios. Composing Energy Futures to 2050 (2013). London: World Energy Council.

STRESZCZENIE

Artykuł porusza problematykę efektywności energetycznej w kontekście unijnego pakietu klimatyczno-energetycznego oraz polskich uwarunkowań. Opracowanie zawiera wyjaśnienie pojęć, dane statystyczne oraz informacje dotyczące korzyści i kosztów zwiększenia efektywności energetycznej z uwzględnieniem koniecznych działań w tym zakresie zarówno na szczeblu unijnym, jak i krajowym.

Słowa kluczowe: wydajność energetyczna, zużycie energii, gospodarka
Kody JEL: E21, O14, O44, P28, P48, Q4