Bumelytė, J., Galinienė, B. (2013), „The Place of Energy Efficiency in the State Economic Policy: The Importance of Housing Sector in Lithuania", *Transformations in Business & Economics*, Vol. 12, No 1 (28), pp.21-40.

---------TRANSFORMATIONS IN --------
BUSINESS & ECONOMICS

THE PLACE OF ENERGY EFFICIENCY IN THE STATE ECONOMIC POLICY: THE IMPORTANCE OF HOUSING SECTOR IN LITHUANIA

[1]Junona Bumelytė
Department of Economic Policy
Faculty of Economics
Vilnius University
Sauletekio av. 9
LT-10222, Vilnius
Lithuania
Tel.: +370 5 2193 272
Fax: +370 (5) 2366 127
E-mail: junona.bumelyte@ef.vu.lt

[2]Birutė Galinienė
Department of Economic Policy
Faculty of Economics
Vilnius University
Sauletekio av. 9
LT-10222, Vilnius
Lithuania
Tel.: +370 5 2193 272
Fax: +370 (5) 2366 127
E-mail: birute.galiniene@ef.vu.lt

[1]Junona Bumelytė, PhD of Social Sciences and is a lecturer in the Faculty of Economics at Vilnius University (Lithuania). She has presented papers at international conferences on energy efficiency, housing and the European Union structural support. Her articles have been published in scientific journal of Vilnius University *Ekonomika* and *Transformations in Business and Economics.*

[2]Birutė Galinienė, Professor, PhD of Social Sciences, Head of the Economics Policy Department of the Faculty of Economics at Vilnius University. Member of the editorial board of the scientific journal of Vilnius University *Ekonomika*, *Transformations in Business and Economics* and of Vilnius Gediminas Technical University *International Journal of Strategic Property Management*; Council Member of the Lithuanian Association of Property Valuers.

Received: November, 2012
1st Revision: December, 2012
2nd Revision: January, 2013
Accepted: January, 2013

ABSTRACT**. **This article is dedicated to the analysis of the concepts 'energy' and 'energy efficiency' as well as to the analysis of the main energy indicators. The article provides the analysis of the trends of energy policy, the connection between energy supply, transformation and improvement of efficient consumption, tendencies of consumption of energy resources worldwide and in Lithuania and also presents the summary of the aspects that have been analysed by showing the connection between the state economic policy and energy efficiency. The article examines the concept of 'housing' and analyses the relation between the housing sector, households and final energy consumption. At the end of the article authors present the state programme which aims to increase energy efficiency in the multi-apartment building sector in Lithuania.

KEYWORDS: energy efficiency, housing, households, multi-apartment buildings, energy efficiency investments, Lithuania.

JEL classification: M1, M12.

Introduction

Energy plays an important role in every person's daily life, and has an impact on pursuance of the energy policy objectives at the national level. Heat is the most widely spread type of energy. In most parts of the world, households are one of the largest energy consumers, with the highest energy consumption falling under home heating and cooling, depending on the region. The consumption of energy resources is also directly linked to environmental problems as it causes the emission of carbon dioxide (hereinafter referred to as CO2) - the main greenhouse gas contributing to global warming - into the environment. The increase in heat energy efficiency with a limited impact on the increase in energy pricing is a measure of paramount importance in combating climate change; it also influences the country's energy dependence on gas import. The mentioned challenges and possibilities are the main reason behind the fact that the issue of enhancing energy efficiency in the housing sector is gaining momentum in the country's economic policy aimed at competitive economy and sustainable development goals.

This article aims to answer the question how important the investments into energy efficiency improvement are in the context of state economic policy. At first the authors introduce the concepts of energy and energy efficiency as well as the analysis of the main energy indicators. In the first part of the article the trends of energy policy, the connection between energy supply, transformation and efficiency improvement, and the tendencies of consumption of resources in the world and in Lithuania are analysed. The first part of the article is summarized by defining the economic policy of the country and the role of efficient energy consumption in the global context.

The second part of the article concerns the concept of housing and the relation of the housing sector to households and final energy consumption. The authors present analysis of the impact of climate zones on energy consumption, evaluate energy characteristics of the Lithuanian multi-apartment building stock, and the benefit of renovation of the multi-apartment buildings as well as global tendencies of energy consumption in the building sector.

The third part of the article relates to the introduction of the implementation of the Programme of Modernisation (Renovation) of Multi-apartment Buildings and the logic behind its intervention while presenting the implementation measures chosen by the state. A summary of state investments into multi-apartment buildings and other investments into energy efficiency improvements in the buildings in Lithuania is also provided.

1. Importance and Concept of Energy Efficiency

While discussing the investments into energy efficiency improvement in the housing sector, it is important to understand the concept of energy efficiency itself and the related indicators.

Any economic activity requires energy resources. The whole history of civilization is related to energy consumption and the discovery of new types of energy. Well-developed countries and the countries of cold climate zones consume more energy than the third world

countries or the countries that have similar level of development, but are located in the warmer climate zones. Yet, the most important thing is not the quantity of energy consumed, but the efficiency of its consumption, the quantity of output produced in different countries using the same amount of energy, and the quantity of thermal energy necessary to heat identical housing (Jankauskas, 2008).

The term 'energy efficiency' itself is not complicated and is comprehensible in everyday life. It is usually understood as the use of the largest possible portion of energy for the main purpose rather than for the secondary one.

The theoretical analysis of this concept is rather complicated due to the fact that both, in legislation and scientific theoretical or empirical studies in Lithuania, many variations of this concept are used, e.g. *energy consumption efficiency* (Lith. *energijos vartojimo efektyvumas*) (Kveselis, 2008; Lepkova *et al.*, 2008; Jankauskas, 2008), *energy efficiency* (Lith. *energijos efektyvumas*) (Kveselis, 2008), *improvement of energy efficiency* (Lith. *energijos efektyvumo didinimas*) (Grigonienė *et al.*, 2004), *efficient energy consumption* (Lith. *efektyvus energijos naudojimas*) (Stankevičius, 2008), *efficiency of energy consumption* (Lith. *energijos naudojimo efektyvumas*) (Buivis *et al.*, 2004), *energy saving* (Lith. *energijos taupymas*) (Butvinskas, 2011) or *efficiency of energy consumption* (Lith. *energijos sąnaudų efektyvumas*) (Kugelevičius *et al.*, 2004). In addition, the Lithuanian legislation uses many different concepts related to energy efficiency.

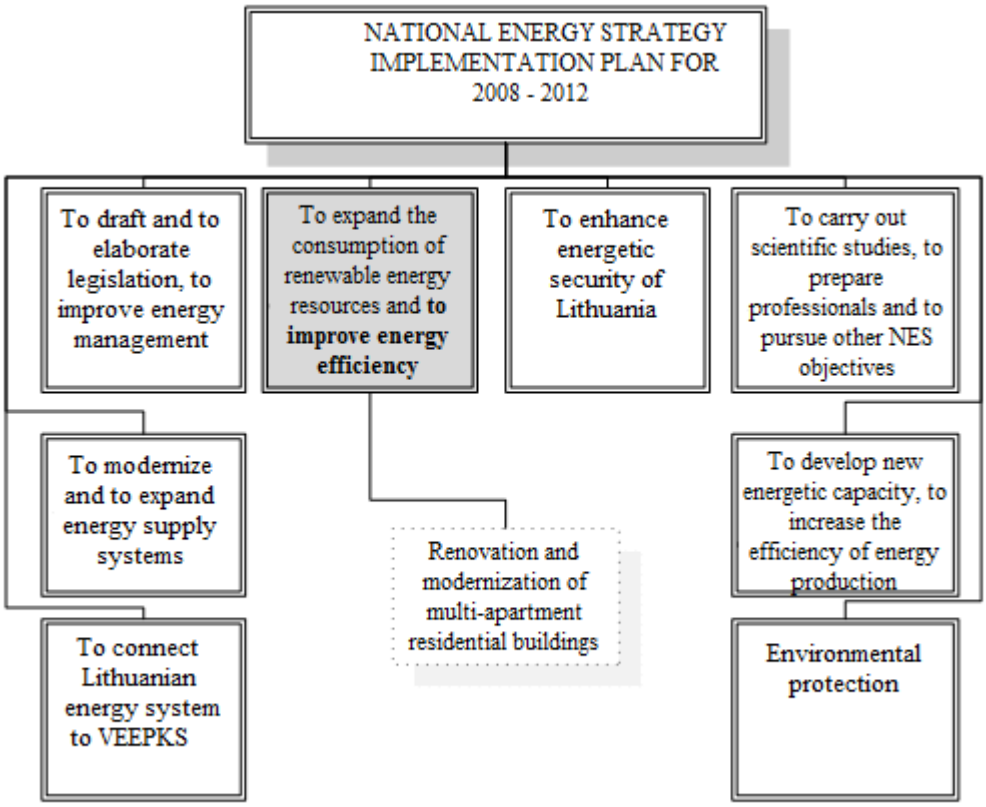
In order to understand the meaning behind the concept, it is important to identify its components. First of all, the concept of energy efficiency is related to power, energy, its sectors and energy consumption. In the Law on Electricity of the Republic of Lithuania (Lietuvos Respublikos Seimas, 2012) energy comprises power and thermal energy, for legislative purposes, natural gas also goes under the umbrella of energy. Energy is described as the state economy sector that covers energy related activities. Energy sector is a part of the energy area that encompasses one of the forms of energy or one of the resources of energy, such as power, nuclear energy, heat, ventilation energy, the energy of renewable resources or natural gas, solid fuels, oil and oil products.

Energy efficiency means a wider range of energy services, such as, e.g. production, transportation and heating per energy unit (for carbon, gas, electricity), i.e. the ability to receive the greatest possible benefit out of each energy unit: rational energy consumption using the technologies that help saving energy as using renewable energy resources (Lietuvos Respublikos ūkio ministerija, 2008). From the technical point of view *energy efficiency* means lower energy consumption while maintaining an equivalent level of economic activity or service. *Energy saving* is a broader concept that includes consumption reduction through behaviour change or decreased economic activity (Europos Komisija, 2011). In fact it is difficult to distinguish between these two concepts and in scientific literature as well as in the European Union (hereinafter referred to as EU) they are often used interchangeably.

The policies that encourage energy efficiency improvements enable to achieve large energy savings. The main task of the public sector referring to the implementation of energy policy is to plan the way energy resources have to be saved on the national level, to provide for the steps to be taken and to implement them. The main energy policy directions in Lithuania are defined by the National Energy Strategy (Lietuvos Respublikos Seimas, 2007) that defines the main provisions of the state and the guidelines for their implementation by 2025 as well as the guidelines for the improvement of economy of scale, energy security, environmental safety and guidelines for the improvement of management fully coordinating with increasing state needs and recent international requirements.

The National Energy Strategy stipulates that increase in energy efficiency in Lithuania is attributed to the weaker sides of the Lithuanian energy sector. During the second decade of the XXI century energy efficiency in the sectors of industry and commerce as well as in the service sector has essentially increased, however, situation in public sector (schools, universities etc.) and old construction multi-apartment buildings has slightly improved. Therefore, in comparison, energy consumption needed for heating in buildings in Lithuania remains twice as high as in the countries of the Western Europe.

In order to achieve the objectives the Government of the Republic of Lithuania provides for specific measures to be taken for a specific implementation period to implement the National Energy Strategy (Lietuvos Respublikos Vyriausybė, 2008). As shown in *Figure* ***Error! Reference source not found.***, the improvement of energy efficiency together with the increase of the use of renewable energy resources falls under the same group of measures. Based on high energy consumption levels in buildings, one of the objectives of the action plan is renovation and modernisation of the multi-apartment residential buildings.



Source: prepared on the basis of Lietuvos Respublikos Vyriausybė, 2008.

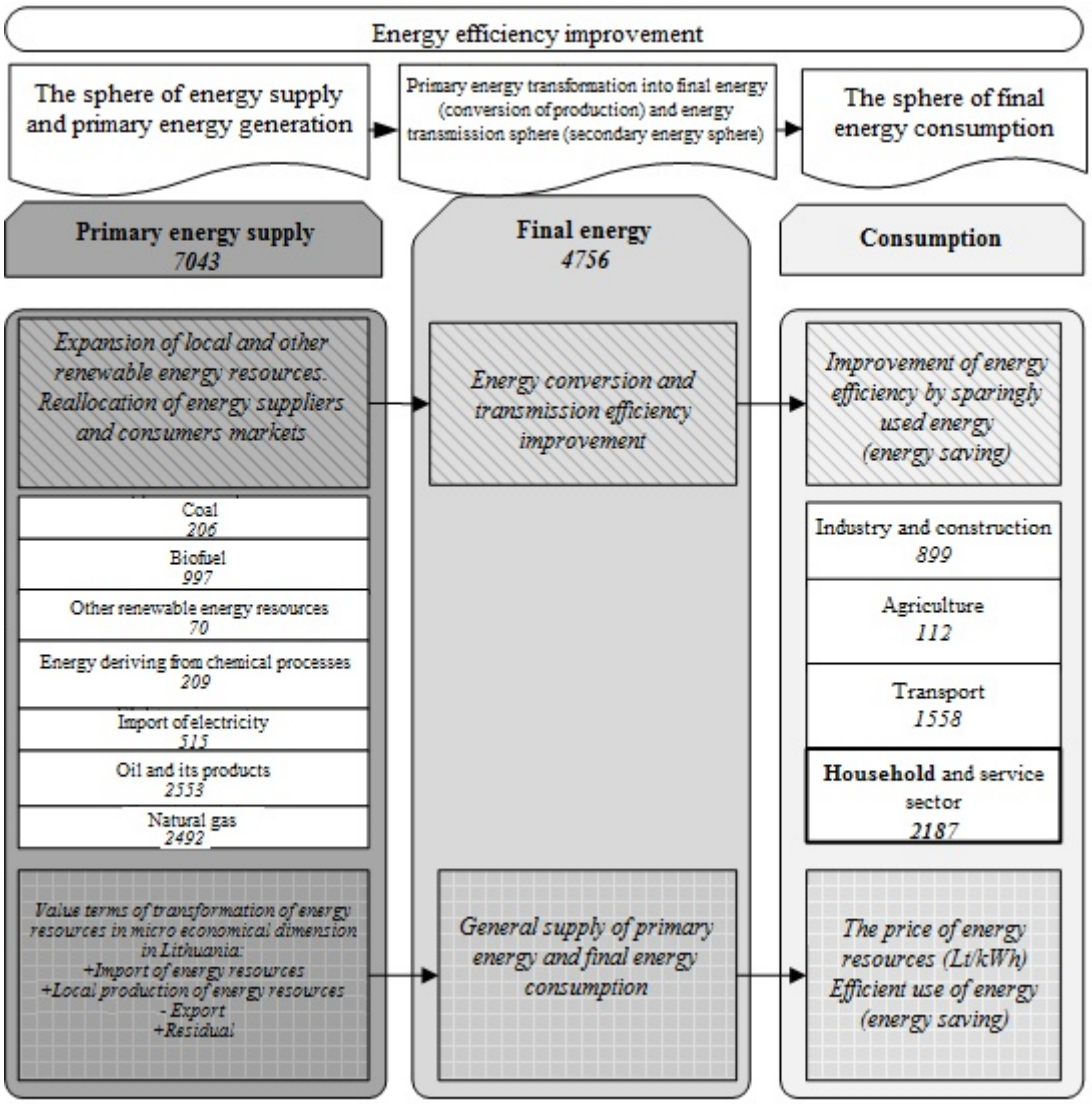
Figure 1. **The Place of Energy Efficiency Improvement in the National Energy Strategy**

According to conversion, transformation and the method of consumption of natural energy resources there are three types of energy: primary, secondary and final. *Primary energy* is the energy that is cumulated in natural resources, i.e. the energy that is found in organic fuel (oil, peat, biomass etc.); potential energy of water; wind energy, geothermic energy, energy of chemical processes; energy that is released during nuclear reaction process (Lietuvos statistikos departamentas, 2011a). This indicator is commonly used in statistical publications and technical studies (Lietuvos energetikos institutas, 2003). Part of the primary

energy is initially transformed into electric energy and heat or processed into types of fuel that are more suitable to customers (gasoline, diesel, fuel oil, briquettes etc) (Miškinis, 2000). The transformed energy resources are called *secondary energy*. *Final consumption* is fuel and energy that are supplied to final consumers: industrial enterprises, construction companies, agriculture and other kinds of economic activities and households. Therefore, in order to describe energy efficiency on the state level, it is necessary to distinguish between three large chain areas of energy transformation that comprise one coherent body: 1) energy supply and primary energy extraction area, 2) energy production (conversion) and transmission (transportation area); and 3) final energy consumption area. *Figure 2* shows the principal chain of energy transformation. Its analysis enables to understand the essence of energy and economic proportions in quantitative terms. If to compare industrial, agricultural, commercial, service and household sectors based on the final consumption of heat and electrical energy, the household sector consumes three times more than industrial and commercial sectors (Klevas, 2010). Considering the data given in the National Energy Strategy, household and transportation sectors consume over 60% of the energy supplied to the economic sectors and takes the top position in the final structure of energy consumption of the state (Lietuvos Respublikos Vyriausybė, 2008).

To analyse and compare energy consumption in different countries, the general energy balance of the state is used together with the balance of separate fuel and energy types. Energy balance is one of the most important material balances and it defines fuel and energy resources of the country, their extraction, production, export and import, change in reserves, conversion and consumption of fuel in the production of electric and heat energy, final consumption of fuel and energy by the main fields of economic activities and households (Miškinis, 2000; Rudzkienė *et al.*, 2007).

While energy resources in Lithuania were used only for heating of housing, cooking, development of crafts and agriculture, local energy resources were sufficient: people used to exploit draught animals, water and wind mills as well as other constructed equipment. Even when Lithuanian industry and agriculture started using steam boilers, the main fuel was wood and to some extent peat. Only at the end of the XIX century kerosene was started to be used for illumination and at the beginning of XX century, when the internal combustion engines appeared, it became necessary to import other oil products. Greater amounts of carbon and oil products (diesel fuel, gasoline, fuel oil, lubricants) started to be imported to Lithuania only after the First World War, when the construction of new industrial enterprises and power stations as well as the development of transportation system started to develop. After the Second World War and until 1962 local energy resources were dominating. At that time about 60% of all fuel was used for heating buildings and cooking. From 1962 to 1965 when the first four plants of the Lithuanian nuclear power station were commissioned, the needs of imported fuel (oil products and natural gas) significantly increased. In 1961 a gas pipeline to Lithuania was built and efficient fuel from Ukrainian gas pool started to be supplied. When the Ukrainian gas field had been exhausted, the gas was being supplied from Western Siberia. Step by step all the biggest cities, power stations, largest greenhouses and poultry farms of the country were connected to the state gas supply system (Miškinis, 2000). After Lithuania gained its independence the needs of consumers were met by using both, local and imported fuel and energy resources. The main imported fuel and energy resources in Lithuania are oil, natural gas and coal.



Source: prepared on the basis of Klevas, 2010, Miškinis, 2011.

Figure 2. **The Principal Scheme of the Concepts of Energy Supply, Transformation and Improvement of its Efficiency, Based on the Main Energy Flows of 2010, Thousands of Tonnes of Oil Equivalent (Toe)**

Following the data given by the Lithuanian Department of Statistics, in 2010 the largest portion of general consumption went to oil products (36.3%) and natural gas (35.4%). General fuel and energy consumption of the country in 2010 as compared to the consumption in 2009, shrunk by 18.9% to 7042.7 thousand tonnes of oil equivalent (hereinafter referred to as toe) (Lietuvos statistikos departamentas, 2011e).

One of the most important aspects that should be analysed is the balance of heat. According to the Lithuanian Department of Statistics, it can be stated that the amount of heat supplied to the network and consumers is decreasing every year. In 1996 29,146 terajoules (hereinafter referred to as TJ) of heat were consumed in households, while in 2010 the consumption of heat reached 22,080 TJ.), Yet not only the amount of supplied energy, but also the transportation and distribution losses are decreasing: in 1996 they were equal to 26.4%, and in 2010 these reached only 12.6% of the overall amount of produced heat. Since the main heat transmission networks are 30-40 years old and their service life is moving

towards the end, it is necessary to renovate them to be able to reduce technologic losses (*Table 1*).

Table 1. Heat, TJ

	General production, total	Transportation and distribution losses	Final consumption in households
1996	68 861	18 222	29 146
2010	48 806	6 186	22 080

Source: Lietuvos statistikos departamentas, 2011.

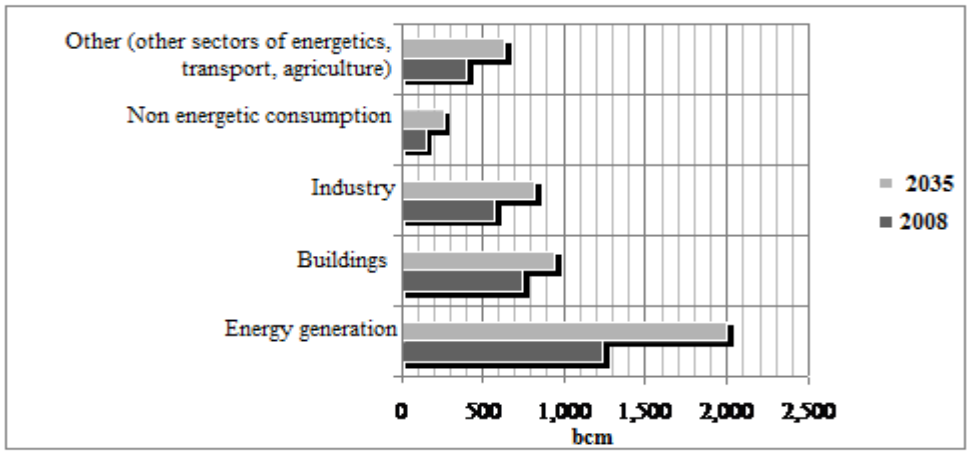
The balance of fuel and energy types also has an impact on the energy dependence of countries on the import. During the last ten years the dependence on import of Lithuania, in comparison to the EU average, was fluctuating, slightly exceeding it or decreasing. But in 2010 the dependence on imported organic fuel in Lithuania demonstrated a significant increase, i.e. it rose from 48.8% in 2009 to 79.4% in 2010 and significantly exceeded the average of the EU (Lietuvos statistikos departamentas, 2011e). The level of energy security in Lithuania is relatively low, and the high energy vulnerability of Lithuania is determined by several reasons: 1) 90% of oil and absolutely all natural gas is imported from Russia; 2) from the point of view of the energy infrastructure the Lithuanian territory is isolated from other EU countries; 3) the commitment to close Ignalina Nuclear Power Plant by 31 December 2009, stated in the treaty of joining the EU, has forced to substitute the portion of nuclear energy for natural gas; and 4) the possibilities to use alternative energy resources in Lithuania are limited (Vaičiūnas, 2009; Lietuvos energetikos institutas, 2003).

Many studies have attempted to quantify the potential for energy efficiency improvement. The calculations of International Energy Agency (hereinafter referred to as IEA) show that after the energy efficiency improvement measures had been implemented, the actual consumption of energy during the period of 1973 and 2004 decreased by 56% (International Energy Agency, 2008).

Recent tendencies in energy sector and the problems related to the global climate change affected the long term perspectives of the use of energy. Increasing demand of energy, sudden increase of energy price in business sector and lack of fossil fuel have started threatening the world economies that were created on the basis of cheap energy expectations (Golove *et al.*, 1996). It should be noted that today's way of life is based on consumption of raw materials in the quantities that have never had analogues in the past. Current energy supply is based namely on fossil fuel: in 1989 78% of world energy was produced by burning fossil fuel, 11% was generated by using biomass and garbage, 6% was produced by water power stations and 5% was produced by nuclear energy. Despite the fact that the fuel price increased, from 1971 to 1991 the worldwide commercial energy consumption increased by 45% and continues to increase by not less than 3% per year. During the period of 1987–1997 the annual energy increase in the countries that are member of the Organisation for Economic Co-operation and Development (hereinafter referred to as OECD) was about 1.5% and in the developing countries was equal to 4.5% (Klevas, 2010). In the XX century the consumption of fossil fuel increased 12 times and the extraction of material resources increased 34 times. In 2011 every EU citizen consumed an average of 16 tons (hereinafter referred to as t) of material per year (Europos Komisija, 2007).

Worldwide, gas demand in other end-use sectors (mainly residential and services) grows by 1.1% per year. Growth of the use of gas in buildings (which remains the largest end-use sector) to heat space and water is limited by saturation effects in many OECD countries

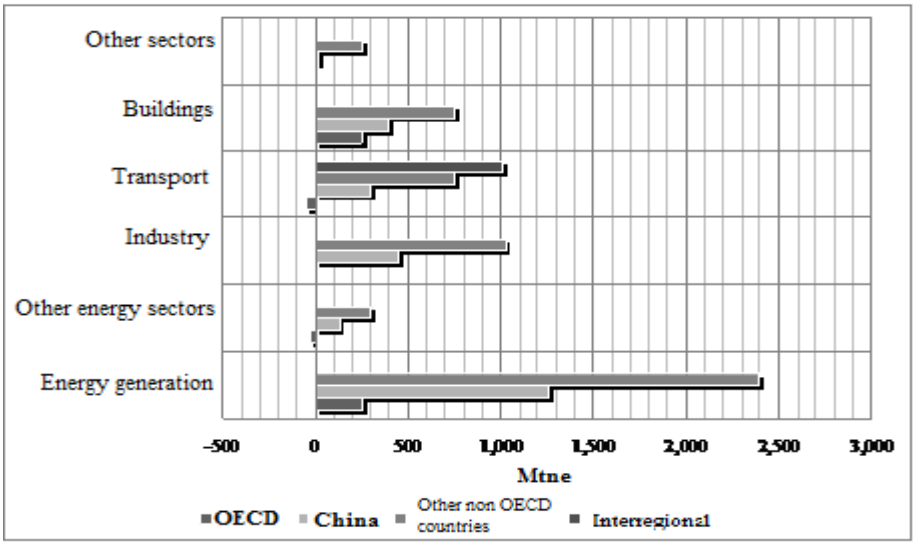
(*Figure 3*). In much of the rest of the world, the potential for using gas for space heating and hot water is generally lower, because of climatic factors and the high cost of building local distribution networks (International Energy Agency, 2010).



Source: International Energy Agency, 2010.

Figure 3. **Global Oil Demand Forecast in Sectors during the Period of 2008 – 2035, Billion Cubic Metres**

IEA forecasts that the power sector (which includes both, heat and electricity generation) accounts for 53% of the growth in global primary energy demand in 2008-2035. Total final consumption is projected to grow by 1.2% per year throughout the same period. Industry demand grows most rapidly, at 1.4% per year, having overtaken transport in 2008 to once again become the second-largest final-use sector, after the building sector. In the building sector, energy use grows at an average rate of 1.0% per year through the period of 2008-2035. Electricity consumption is projected to increase at an annual average rate of 2.2% in the period 2008-2035, resulting in overall growth of around 80% (International Energy Agency, 2010) (*Figure 4*).

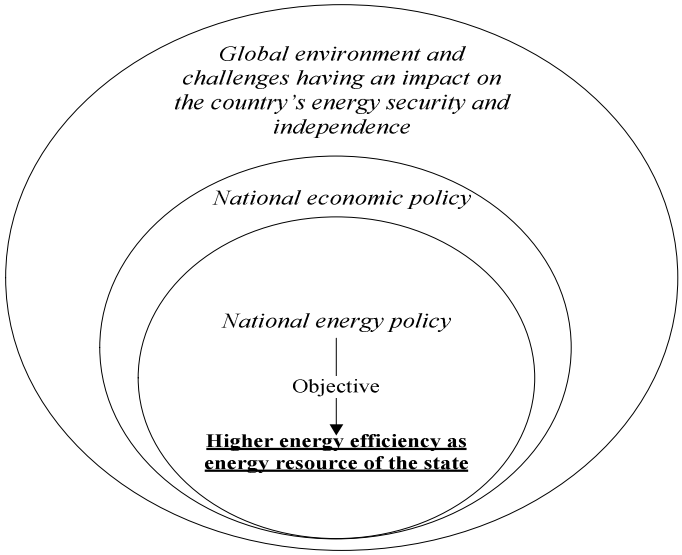


Source: International Energy Agency, 2010.

Figure 4. **Energy Demand in Sectors and Regions during the Period of 2008-2035, Million Toe**

One of the main targets of energy economy and specifically of the field of energy efficiency is considered to be the reduction of impact on environment. It is predicted that if the recommendations in the energy efficiency field were implemented immediately, by 2030 it would be possible to save about 7.6 gigatonnes (hereinafter referred to as Gt) of CO_2 per year, which equals to an amount that is 1.5 times higher than the one currently emitted to atmosphere by the United States of America (hereinafter referred to as USA). In 2010 this corresponded to the savings of 82 exajoules (hereinafter referred to as EJ) per year till 2030 or 17% of current worldwide annual energy consumption (International Energy Agency, 2011).

To sum up, the energy sector, being a part of modern economy has to assure reliable and safe supply of energy to all economy sectors and consumers. One of the main objectives of state economy policy is to help to stop the climate change, to increase the growth, to guaranty the energy supply in future by restraining the use of not renewable resources and also to increase energy import at the same time increasing the immunity to external shocks and possible political pressure from outside.



Source: created by the authors.

Figure 5. **Place of the National Economic Policy and Effective Consumption of Energy in the Global Environment**

Thus, the efficient energy consumption is one of the most important long term objectives of national economy policy as well as national energy policy as its part, and is also one of the most cost-effective ways to increase the safety of energy supply and to reduce emissions of greenhouse gases and other. From many aspects more effective energy consumption can be assessed as the major energy resource of the state (Johnson, 2011) (*Figure 5*).

2. The Importance of Housing Sector in Efficient Consumption of Energy

Housing sector is associated with households and is related to final energy consumption. Household sector comprises households as consumers and as producers that produce goods and/or provide service for market or for themselves (Lietuvos statistikos departamentas, 2011b). Generally speaking, households can be identified as small social

groups that have a function to organize its own everyday life, to exist and to recommence (regenerate) (Vanagas, 2008).

It is important to analyse the portion of final energy consumed in households in the national fuel and energy balance to evaluate the actual situation in the sectors of national energy production, transformation and consumption.

Households are one of the greatest energy consumers in most parts of the world. The main types of fuel and energy, used in households are electrical energy, natural gas, liquefied petroleum gas, liquid fuel, heat, coal, wood and wood waste fuel as well as other fuel. In comparison to 2009, in 2010 the final energy consumption in Lithuania grew by 3.7% (Lietuvos statistikos departamentas, 2011e).

To satisfy their needs residents have to provide themselves with various goods and services. Households take the greatest portion of energy for heating of housings and preparation of hot water, illumination and electric equipment as well as cooking. Following the data of the National Deparment of Statistics on energy consumption in the Lithuanian household sector, in 2009 around one third (more than 31%) of all final energy was consumed in housing owned by households. Almost 12% of all energy was consumed by households for illumination and electric appliances and more than 7% was spent on cooking. Home heating and preparation of domestic hot water account for the major part of all energy consumed in households, i.e. as much as 81% (Lietuvos statistikos departamentas, 2011f).

A large portion (approximately one third) of all final energy in Lithuania as well as in other Central and Eastern Europe (hereinafter referred to as CEE) countries is consumed in housings and the greatest portion of it (approximately 80%) is used for heating and preparation of hot water. This fact is directly related to geographic location of the region as domestic energy requirements are closely linked to climatic conditions. Climate affects the amount of energy consumed to achieve a comfortable indoor temperature. Climate is also related to the building materials used are used and how the building is designed; for example, ventilation and insulation vary according to climate. Consequently, improvements undertaken to improve energy efficiency as well as measures applied differ in different climates. In this context, three broad climatic zones are relevant: cold, moderate, and warm. In a cold climatic zone there are on average 4500 heating degree days (hereinafter referred to as HDD) per year, 3500 HDD in a moderate one and 1800 HDD in a warm one (Petersdorff *et al.*, 2005). The heating season in Lithuania on average lasts around 200 days per year. Lithuania is located in moderately cold climate zone characterized by moderately warm summers and moderately cold winters (Gudzinskas *et al.*, 2011). There are approximately 3800 HDD in Lithuania (Bukantis, 2002) and the heating season lasts for approximately six months per year (Lietuvos statistikos departamentas, 2011e).

The 'hidden geography' of energy poverty has become a serious problem for Lithuania and other CEE countries. The problem arose due to the impact of the geographic location as well as the post-socialist energy crisis (Buzar, 2007). It is considered that a household is energy-poor if a person is living in an inadequately heated home, which means that the average indoor temperature is below the biologically-determined limit of 20^0C necessary to ensure comfort and health, or that the amount of warmth in the home is lower than the subjective minimum which allows the individual to lead person's everyday life (Boardman, 1991). A variety of evidence demonstrates that the problem of energy poverty in the post-Soviet countries continues to grow due to specific social and physical conditions, such as cold weather, temperature fluctuations, the abolition of universal socialist-era energy price subsidies and since 1990 falling real incomes (Buzar, 2007; Lampietti *et al.*, 2002).

When households are provided with high quality living space, it gives people security, guarantees and enables them to organise their everyday activities at the same time also providing psychological security (Vanagas, 2008). Considering Maslow's pyramid of human needs the need of housing (a shelter that protects from weather conditions and other impact) is seen as the second most important need after physiological needs (fresh air, water, food) (Maslow *et al.*, 1987).

A normal use of a place of living means implementation of preventive and other measures to meet the main requirements of building during entire period of use. These measures cover the maintenance of proper condition, renovation, installation and substitution of separate parts of a building (Lietuvos Respublikos aplinkos ministerija, 2008). The objective of the user of the building, on the other hand, is to keep the building in such a condition that the elements of the building in use would not lose their qualities meeting essential requirements of the building that had been registered at the initial moment of use of the building (Lepkova *et al.*, 2008).

The building, its heating, conditioning, ventilation and other utility systems must be projected and built in such a way that energy consumption during their exploitation would be as low as possible with regard to local climate conditions and the needs of the building users (Lietuvos Respublikos aplinkos ministerija, 2008). From this point of view, one of the essential requirements for a building is its energy saving and heat preservation, i.e. the quantity of heat consumed, in relation to local climate conditions and population needs must not exceed the necessary one (i.e. the one that has been calculated according to hygiene standards and the requirements of the purpose of building or its premises) (Lietuvos Respublikos Seimas, 2011).

Lifespan of a building, i.e. theoretical period during which a building is normally exploited considering the properties of products or materials, which had been used to build it, and local climate conditions (Lietuvos Respublikos aplinkos ministerija, 2003). It also depends on the purpose of building and durability of construction products, conditions of use of a building, proper exploitation and timely execution of due building maintenance and repair works.

It should be noted that around 60% of multi-apartment buildings in Lithuania were built during last four decades of the last century (*Table 2*), when standard multi-apartment constructions from bricks and large-slabs were dominating in the sector. These tendencies directly relate to the city expansion model that had been put into practice in Lithuania since the 6th decade of XX century (Vanagas, 1996).

Table 2. Distribution of the multi-apartment buildings by the year of construction

Year of construction	Number of buildings		Total floor area	
	units	percentage, %	m²	percentage, %
Till 1940	10362	28	3790024	7,4
1941−1960	3740	10	2259107	4,4
1961−1992	21090	56,5	39244450	76,4
1993 and after	2075	5,5	4092634	11,8
Total	***37267***	***100***	***51386305***	***100***

Source: Lietuvos Respublikos Vyriausybė, 2012.

A group of houses, residential quarter, microdistrict and residential district were the main structural units of this system (Vanagas, 2008). The greatest amount of multi-apartment buildings was naturally built in the cities during the period of 1961 – 1990. As far as height of the buildings is concerned, majority of the buildings have 3 to 5 floors. It is important to state

that this group of houses in particular has very poor thermal resistance of external walls, and also does not comply with current normative requirements and the practice of Lithuania neighbours in the north (for example, Scandinavian countries). The projected consumption of heat, expressed in kilowatt hours (hereinafter referred to as kWh) for one square meter of premises in these buildings is of 160–180 kWh/m² per year, while in the newly built buildings that were constructed after 1993 it reaches 80–90 kWh/m² per year. Heat consumption in multi-apartment buildings that had been constructed following the technical construction requirements valid until 1993 is about 5000 gigawatt hours (hereinafter referred to as GWh) per year (Lietuvos Respublikos Vyriausybė, 2012).

It should be noted that in 2010 the household expenses for housing (rent, electricity, gas, heating, water, other utilities, housing loan interest, compensations for heating, hot and cold water) made up to 12.3% of the disposable funds (Lietuvos statistikos departamentas, 2011c). In 2010 the expenses for housing were very difficult to sustain for 40% of households. In comparison to 2009 the portion of the disposable funds to cover housing expenses has increased by 2.3 percentage points (Lietuvos statistikos departamentas, 2011d). Almost half (47%) of general housing fuel and energy costs composed the expenses for heat (Lietuvos statistikos departamentas, 2011f).

Payments for heat in multi-apartment buildings are determined by the price of kWh and the consumption of heat in the buildings. The largest part of heat price is determined by the fuel costs. According to the data provided by the National Control Commission for Prices and Energy, the increase of heating price is determined by continuously increasing price of natural gas that is still most widely used in the production resources of centralized heat supply. During last 10 years other costs of heat production remained almost the same (Lietuvos šilumos tiekėjų asociacija, 2011).

The condition of multi-apartment and other buildings determines the heat consumption for heating purposes. According to the quantity of heat consumed in the multi-apartment buildings in Lithuania, all the buildings are divided into four categories (Lietuvos šilumos tiekėjų asociacija, 2011) (*Annex 1*).

The lifespan of a building use as well as its economic efficiency can be extended by properly implementing measures that improve energy efficiency. During the last ten years almost two thirds (65%) of the multi-apartment buildings were partly renovated. Most often renovations were carried out by the initiative of households and financed from their own funds. In 88% of multi-apartment buildings windows have been replaced with more energy efficient ones, 33% of block of flats implemented insulation of the roofs, 28% of multi-apartment buildings had their heating systems or their parts replaced and almost 16% of such buildings implemented insulation of external walls (Lietuvos statistikos departamentas, 2011f).

It is recognized that only renovation of houses can guarantee efficient energy consumption in country. Statistics shows that from 1996 till 2010 the loss of heat in the thermal rout decreased more than twice (from 32.3% to 15.7%) while the consumption in the buildings remained unchanged. Studies regarding the condition of centralized heating supply network prove that the loss of heat in thermal route in Lithuania can technically be reduced from current 15.7% to 12%. It is expected that in any case Lithuanians would save around LTL 63 million per year, and average payment for heating of an apartment of 60 m^2 would decrease from LTL 345/month to LTL 335/month. Therefore, if old multi-apartment buildings, in which heat is consumed inefficiently, were renovated, heat consumption losses would decrease by around 50% and it would allow residents to save approximately LTL 680

million per year, while payments for heat would decrease to as low as ~ LTL 172/month for a 60 m^2 apartment (Lietuvos šilumos tiekėjų asociacija, 2011).

It should be noted that households are one of the largest energy consumers throughout most of the world, with most of energy consumption falling to household heating and cooling, depending on the region. 40% of energy is consumed in the buildings, one third of this is consumed in the buildings of industrial, commercial and public purpose (offices, schools, hospitals, hotels etc), the other part is consumed in multi-apartment and individual buildings (living premises) (Lietuvos Respublikos ūkio ministerija, 2008). According to IEA, in 2009 this sector reached such a potential that by 2030 it would be able to reduce energy consumption by around 20 EJ per year, i.e. as much as electric energy currently consumed by the USA and Japan together per year (International Energy Agency, 2011). The calculations of energy efficiency market on energy saving potential and regarding energy savings policies show that the cost-effective energy savings potential in the building sector (i.e. covering both, residential and non-residential buildings and estimated to be 65 Mtoe) corresponds to a cumulated investment need of approximately EUR 587 billion for the period of 2011-2020. This translates into an investment need of around EUR 60 billion per year to realize this savings (Wesselin *et al.*, 2010; Fraunhofer *et al.*, 2009).

3. Implementation of State Policy Related to the Increase of Energy Efficiency in the Multi-apartment Buildings

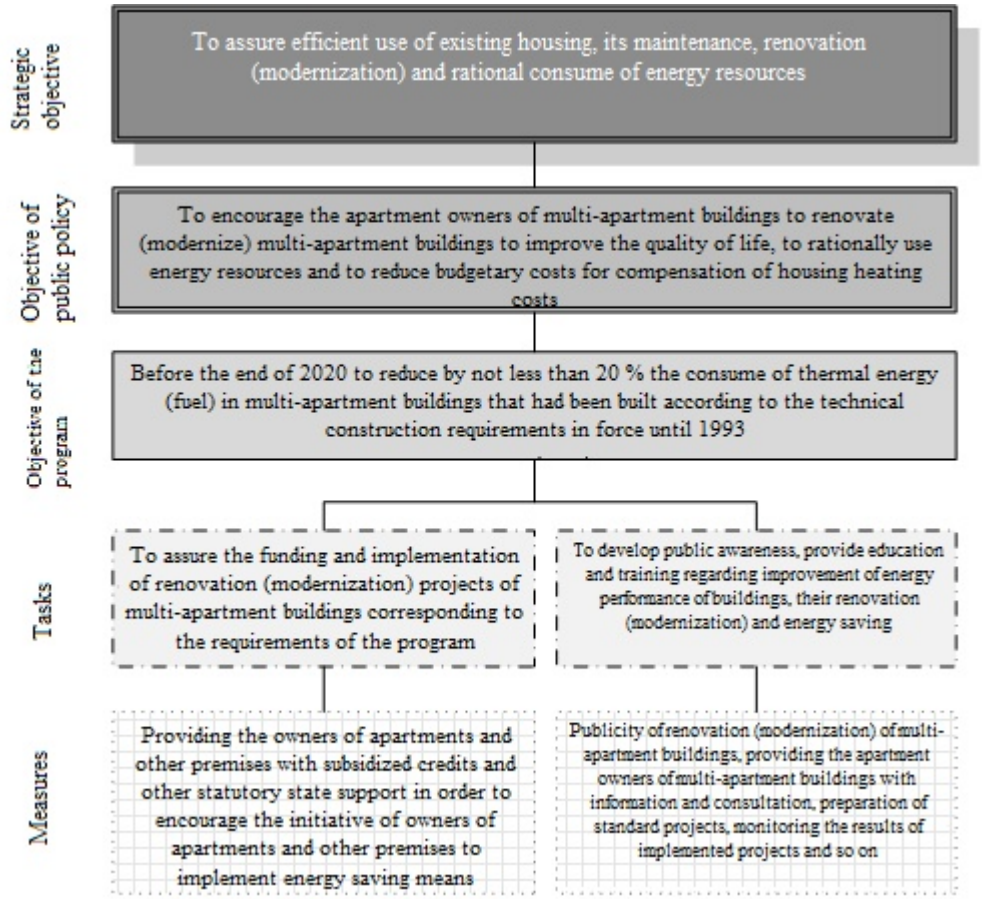
After the Independence was re-established in 1990 essential reforms of Lithuanian economy were being implemented. The development of Lithuanian economy encouraged the changes of housing policy too. The sector was restructured, the direct housing market regulation was refused, and population was given the right of housing proprietorship. Already in 2001 the portion of private housing fund reached 97% of all country housing fund. The level of building maintenance in Lithuania, as well as in other countries with transitional economy period, was low (Lepkova *et al.*, 2008).

To solve these problems during the primary stage of economic transformation (1992–1996) in 1992 new normative requirements were set for building walls, heating and cooling systems as well as restructuring of industry of construction materials was started by increasing the production of thermo insulating materials. In 1992 a state-supported programme „Housing", one of the objectives of which was to promote energy saving in the buildings, was approved (Juozaitienė, 2007). In 1992 the Law on Provision of Living Premises was approved (Lietuvos Respublikos Aukščiausioji Taryba - Atkuriamasis Seimas, 1992). At the time the Law defined the ways of purchasing living premises, the forms of state support when purchasing a house or an apartment, the order and conditions for granting this support, as well as supervision of construction and exploitation of living premises.

In 1996 a Demonstrative Project of Energy Saving in Housing (hereinafter – DPESH) that was financed by using loans from International Bank for Reconstruction and Development (hereinafter – IBRD) and budgetary funds was started. This project also received financial support from the governments of Denmark and the Netherlands. Municipalities that took part in DPESH, associations of the owners of multi-apartment buildings as well as the owners of individual houses could have received preferential loans to implement energy saving measures. Project management and other project related activities were assigned to Housing and Urban Development Fund.

The success of DPESH[1] showed that there is a great demand of investments for the renovation of existing multi-apartment buildings in the country, and that the owners are able to implement complex building renovation projects successfully if an efficient support system is created and the project financing conditions are inviting (Lietuvos Respublikos Vyriausybė, 2012).

Since 2004 Lithuania has started encouraging renovation by using budgetary funds. The Lithuanian Strategy on Housing of 2004 set a brave objective to renovate 70% of the multi-apartment buildings by 2020. During the new programming period of the EU 2007 – 2013 the National Energy Strategy of Lithuania set an objective to use the EU structural funds for renovation of the multi-apartment and public buildings to increase energy efficiency (Bumelytė *et al*, 2011; Galinienė *et al*, 2011).



Source: created by the authors according to the basis of the legislation of the Republic of Lithuania.

Figure 6. **The Logic of Intervention of the Programme of Modernisation (Renovation) of the Multi-apartment Buildings**

The Government of the Republic of Lithuania approved the Programme of Modernisation (Renovation) of the Multi-apartment Buildings in 2004 (hereinafter referred to as the Renovation Programme) (Lietuvos Respublikos Vyriausybė, 2012). The Renovation Programme implemented provision of the National Energy Strategy (Lietuvos Respublikos Seimas, 2007) that required to secure reliable and safe energy supply at minimal costs and

[1] During the period of implementation of the project over 700 multi-apartment buildings were renovated. Total amount of investments exceeded LTL 70 million.

with minimal impact on the environment increasing the efficiency of energy sector continuously. The Renovation Programme also implemented provisions of the Lithuanian Housing Strategy (Lietuvos Respublikos Vyriausybė, 2004b) as well as the objectives stated in the Resolution of Implementation of the Measures of the Lithuanian Housing Strategy for the period of 2004–2006 (Lietuvos Respublikos Vyriausybė, 2004a). The main objective of the Renovation Programme was to help the owners of multi-apartment houses to modernize multi-apartment buildings by improving energy efficiency and reducing heating costs as well as to guarantee favourable conditions to low-income persons. The Renovation Programme also aims to ensure efficient use of existing housing, its maintenance and modernisation and rational consumption of energy resources set as an objective of the Lithuanian Housing Strategy *Figure 6* presents the logic of intervention of the Renovation Programme.

Conclusions

Tthe analysis of a variety of notions related to energy efficiency reveals that energy efficiency means lower energy costs while maintaining economic activity and service at the same level. The significance of energy sector has been growing continuously as a result of threateningly growing energy demand, satisfaction of which is not always kept up by limited energy resources, as well as a result of highly increased concern about global climate warming. The article allows to draw a conclusion that effective use of energy is one of the most important long-term goals of the national economic policy and also of energy policy as its component, as well as one of the most cost-effective ways to increase energy supply security and reduce emissions of greenhouse gases and other pollutants. In many ways more effective energy consumption can be assessed as the major energy resource of the state.

Potential of energy saving in the buildings is significant and can give a substantial contribution to the numeric expression of energy efficiency in the general global context of energy saving. Fixing rational energy needs for heating is a complex task that has to be solved taking into consideration climate conditions of each country or region. There is concealed a great potential of energy saving in energy sector that has been inherited in Lithuania, especially from consumers' side, where in substance everything is projected on the basis of cheap energy conditions. The main strategic objective is fast and overall exploitation of this potential. As Lithuania has almost no cheap primary energy resources of its own, rational, efficient and economical consumption of various energy types in all stages of the energy cycle is a constant objective and priority. The measures to improve energy efficiency in residential sector are closely related to housing sector and to the multi-apartment buildings sector in particular. The main incentive for economic entities to improve energy efficiency is the objective to use the limited economic resources as well as possibility for households to reduce the costs for energy consumption at the same time increasing their purchasing power.

When a new programming period of the EU for 2007 – 2013 started and budget resources previously allocated for the renovation of the housing sector became exhausted, the Lithuanian National Energy Strategy set a task to use the funds of the EU Structural Funds for the renovation of multi-apartment buildings while improving their energy efficiency. The main objective of the state Renovation Programme in Lithuania is to help the owners of multi-apartment buildings to modernise their housing by improving energy efficiency and reducing heating costs as well as to guarantee favourable conditions to low-income persons to take advantage of modernisation.

References

Boardman, B. (1991), *Fuel Poverty: from Cold Homes to Affordable Warmth*, Belhaven Press.

Buivis, L., Turauskas, Z. (2004), "Elektros energijos sąnaudų efektyvumo įvertinimas vandentiekio siurblinėje", *Elektronika ir elektrotechnika*, Vol. 1, No 50, pp.34-38, [Efficiency of Consuming Electric Power in Water-Supply Pump, *in Lithuanian*].

Bukantis, A. (2002), Klimato įtaka energetikos ūkiui, available at, http://www.hkk.gf.vu.lt/nauja/studentams/taikomoji_meteorologija/TM_7.pdf, referred on 11/10/2012, [Impact of Climate on Energy Economy, *in Lithuanian*].

Bumelytė, J., Galinienė, B., Markauskas R. (2011), "Energy Efficiency Investments in Housing", *Ekonomika*, Vol. 2, No 90, pp.47-61.

Butvinskas, K. (2011), "Dvigubų fasadų architektūrinės ir konstrukcinės savybės", *14-osios Lietuvos jaunųjų mokslininkų konferencijos „Mokslas – Lietuvos ateitis" 2011 metų teminės konferencijos „Statyba" straipsnių rinkinys*, available at, http://dspace.vgtu.lt/handle/1/789, referred on 11/10/2012, [Double-Skin Facades Architectural and Constructional Characteristics, *in Lithuanian*].

Buzar, S. (2007), *Energy Poverty in Eastern Europe: Hidden Geographies of Deprivation*, Ashgate Publishing, Ltd.

Europos Komisija (2011), Efektyvaus išteklių naudojimo Europos planas, available at, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0571:FIN:LT:HTML, referred on 11/10/2012, [Roadmap to a Resource Efficient Europe, *in Lithuanian*].

Europos Komisija (2007), Europos Komisijos sprendimas, nustatantis šiltnamio efektą sukeliančių dujų išmetimo apskaitos ir ataskaitų teikimo gaires vadovaujantis Europos Parlamento ir Tarybos direktyva 2003/87/EB, available at, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2007D0589:20110921:LT:PDF, referred on 09/10/2012, [Commission Decision establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, *in Lithuanian*].

Fraunhofer Institute for Systems and Innovation Research (Fraunhofer ISI) and partners (2009), "Study on the Energy Savings Potentials in EU Member States, Candidate Countries and EEA Countries", *Final Report for the European Commission Directorate-General Energy and Transport*, available at, http://ec.europa.eu/energy/efficiency/studies/efficiency_en.htm, referred on 18/09/2012.

Galinienė, B., Bumelytė, J., Markauskas, R. (2011), "Economic and Financial Impact of Large Scale Energy Efficiency Programme for Housing using the European Union Structural Funds: Case of Lithuania", *Ekonomia*, Vol. 2, No 14, pp.254-263.

Golove, W.H., Eto, J.H. (1996), *Market barriers to energy efficiency: a critical reappraisal of the rationale for public policies to promote energy efficiency*, available at, http://eetd.lbl.gov/ea/emp/reports/38059.pdf, referred on 09/10/2012.

Grigonienė, J., Kveselis, V., Tamonis, M. (2004), "Šilumos poreikių gyvenamuosiuose pastatuose analizė pagal šilumą tiekiančios įmonės duomenis", *Energetika*, No 4, pp.29-35, [Heat Consumption by Premises According to Data of a Heat-Supplying Enterprise, *in Lithuanian*].

Gudzinskas, J., Lukoševičius, V., Martinaitis, V., Tuomas, E. (2011), Šilumos vartotojo vadovas, available at, http://www.lsta.lt/files/Leidiniai/SILUMOS_vartotojo_vadovas/Silumos_vartotojo_VADOVAS.pdf, referred on 08/07/2011, [Guideline for Consumer of Heating System, *in Lithuanian*].

International Energy Agency (2008), Promoting energy efficiency investments: case studies in the residential sector, available at, http://www.iea.org/textbase/nppdf/free/2008/PromotingEE2008.pdf, referred on 11/10/2012.

International Energy Agency (2010), *World Energy Outlook 2010*, International Energy Agency.

International Energy Agency (2011), 25 Energy Efficiency Policy Recommendations, available at, http://www.iea.org/papers/2011/25recom_2011.pdf, referred on 11/10/2012.

Jankauskas, V. (2008), *Energetikos ekonomika: mokomoji knyga*, Technika, [Economics of Energy: Study Book, *in Lithuanian*].

Johnson, I. (2011), *Sustainability under Scrutiny*, available at, http://www.clubofrome.org/cms/wp-content/uploads/2011/11/CoR-Discussion-Paper-Series-01-2011-Ian-Johnson.pdf, referred on 11/10/2012.

Juozaitienė, J. (2007), Daugiabučių gyvenamųjų namų padėtis Lietuvoje, available at, http://www.lsta.lt/files/events/1_j.juozaitiene.ppt.pdf, referred on 11/10/2012, [Condition of Multi-apartment Buildings in Lithuania, *in Lithuanian*].

Klevas, V. (2010), *Energetikos ekonomikos pagrindai*, Technologija, [Basics of Energy Economics, *in*

Lithuanian].
Kugelevičius, J.A., Kuprys, A. (2004), "Energijos sąnaudų prognozės lyginamosios analizės metodais", *Energetika*, No 2, pp.28-32, [Energy Consumption Forecast by Methods of Comparative Analysis, *in Lithuanian*].
Kveselis, V. (2008), Energijos vartojimo efektyvumo didinimo stebėsenos sukūrimas, available at, http://www.ena.lt/doc_atsi/EVED_stebesena.pdf, referred on 11/10/2012, [Creation of Increase in Energy Efficiency Monitoring, *in Lithuanian*].
Lampietti, J.A., Meyer, A.S. (2003), *Coping with the Cold: Heating Strategies for Eastern Europe and Central Asia's Urban Poor*, available at, http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2003/02/15/000094946_03020504033551/Rendered/PDF/multi0page.pdf, referred on 11/09/2012.
Lepkova, N., Vilutienė, T. (2008), *Pastatų ūkio valdymas: teorija ir praktika*, Technika, [Management of Buildings Economy: Theory and Practice, *in Lithuanian*]
Lietuvos energetikos institutas (2003), Nacionalinė energetikos strategija, available at, http://www.lei.lt/_img/_up/File/atvir/leidiniai/energ.pdf, referred on 18/10/2012, [National Energy Strategy, *in Lithuanian*]
Lietuvos Respublikos aplinkos ministerija (2003), Įsakymas dėl statybos techninio reglamento STR 1.12.06:2002 Statinio naudojimo paskirtis ir gyvavimo trukmė. 2002 m. spalio 30 d. Nr.565, Žin. 2002, Nr. 109-4837, [Order on Technical Regulation on Construction No STR 1.12.06:2002 on Purpose of Exploitation and Lifespan of a Building, 30/10/2002, Official Gazette No 109-4837, *in Lithuanian*]
Lietuvos Respublikos aplinkos ministerija (2008), Įsakymas dėl statybos techninio reglamento STR 2.01.01(6):2008 Esminis statinio reikalavimas, "Energijos taupymas ir šilumos išsaugojimas" patvirtinimo, *Valstybės žinios*, 2008 kovo 27 d., Nr. 35-1255, [Order on Technical Regulation on Construction No STR 2.01.01(6):2008 on Approval of Essential Requirement for a Building "Energy Saving and Preservation of Heat", 27/03/2008, Official Gazette No 35-1255, *in Lithuanian*]
Lietuvos Respublikos Aukščiausioji Taryba - Atkuriamasis Seimas (1992), Lietuvos Respublikos gyventojų apsirūpinimo gyvenamosiomis patalpomis įstatymas. Valstybės žinios, 1992 m. gegužės 20 d., Nr. 14-378, [Law on Provision of Living Premises, 20/05/1992 Official Gazette No 14-378, *in Lithuanian*].
Lietuvos Respublikos Seimas (2012), Lietuvos Respublikos energetikos įstatymas. 2002 m. gegužės 16 d. Nr. IX-884, Žin., 2002, Nr. 56-2224, [Law on Energy, 16/05/2002 Official Gazette No 56-2224, *in Lithuanian*].
Lietuvos Respublikos Seimas (2007), Nutarimas dėl nacionalinės energetikos strategijos patvirtinimo. 2007 m. sausio 18 d. Nr. X-1046, *Valstybės žinios*, 2007 m. sausio 26 d., Nr. 11-430, [Resolution on the Approval of the National Energy Strategy, 26/01/2007, Official Gazette No 11-430, *in Lithuanian*].
Lietuvos Respublikos Seimas (2011), Lietuvos Respublikos Statybos įstatymas. 1996 m. kovo 19 d. Nr. I-1240, Žin., 1996, Nr. 32-788, [Law on Construction, 19/03/1996, Official Gazette No 32-788, *in Lithuanian*].
Lietuvos Respublikos ūkio ministerija (2008), Efektyvaus energijos vartojimo pastatuose vadovas, available at, http://www.ena.lt/doc_atsi/EE_vadovas.pdf, referred on 08/07/2011, [Guideline for Effective Energy Consumption in Buildings, *in Lithuanian*].
Lietuvos Respublikos Vyriausybė (2004a), Nutarimas dėl Lietuvos būsto strategijos įgyvendinimo 2004-2006 metų priemonių patvirtinimo. 2004 m. rugsėjo 8 d. Nr. 1145, Žin. 2004 m. rugsėjo 10 d., Nr. 137-4996, [Resolution on the Approval of the Implementation Measures for the Lithuanian Housing Strategy for the period of 2004-2006, 10/09/2004, Official Gazette No 137-4996, *in Lithuanian*]
Lietuvos Respublikos Vyriausybė (2004b), Nutarimas dėl Lietuvos būsto strategijos patvirtinimo. 2004 m. sausio 21 d. Nr. 60, Žin. 2004 m. sausio 24 d., Nr. 13-387, [Resolution on the Approval of the Lithuanian Housing Strategy, 24/01/2004, Official Gazette No 13-387, *in Lithuanian*]
Lietuvos Respublikos Vyriausybė (2008), Nutarimas dėl nacionalinės energetikos strategijos įgyvendinimo 2008–2012 metų plano patvirtinimo. 2007 m. gruodžio 27 d. Nr. 1442, *Valstybės žinios*, 2008 m. sausio 10 d., Nr. 4-131, [Resolution on the Approval of the Implementation Plan of the National Energy Strategy for the Period of 2008-2012, 27/01/2007, Official Gazette No 4-131, *in Lithuanian*].
Lietuvos Respublikos Vyriausybė (2012), Nutarimas dėl Lietuvos Respublikos Vyriausybės 2004 m. rugsėjo 23 d. nutarimo nr. 1213 „Dėl daugiabučių namų atnaujinimo (modernizavimo) programos ir valstybės paramos daugiabučiams namams modernizuoti teikimo ir investicijų projektų energinio efektyvumo nustatymo taisyklių patvirtinimo" pakeitimo. 2011 m. gruodžio 28 d. Nr. 1556, *Valstybės žinios*, 2012-01-04, Nr.1-1, [Resolution on the Government Resolution No 1213 dated 23 September 2004 on the Programme for the Renovation (Modernisation) of Multi-apartment Buildings, 04/01/2012 Official Gazette No 1-1, *in Lithuanian*].
Lietuvos šilumos tiekėjų asociacija (2011), Šilumos tiekimo bendrovių 2010 metų ūkinės veiklos apžvalga,

available at, http://www.lsta.lt/files/statistika/13361%20LSTA%20ukines%20veiklos%20apzvalga%202010_W.pdf, referred on 12/09/2012, [Economic Performance Review of Heat Supply Companies in 2010, *in Lithuanian*].

Lietuvos statistikos departamentas (2011a), Elektroninis statistikos terminų žodynas, available at, http://zodynas.stat.gov.lt/index/apie.aspx, referred on 12/09/2012, [Electronic Vocabulary of Definitions of Statistics, *in Lithuanian*].

Lietuvos statistikos departamentas (2011b), Elektroninis statistikos terminų žodynas. Elektroninis statistikos terminų žodynas, available at, http://zodynas.stat.gov.lt/index/detail.aspx?id=278, referred on 12/09/2012, [Electronic Vocabulary of Definitions of Statistics, *in Lithuanian*].

Lietuvos statistikos departamentas (2011c), Energijos sunaudojimas namų ūkiuose 2009, available at, http://www.stat.gov.lt/lt/catalog/download_release/?id=3685&download=1&doc=1885, referred on 12/09/2012, [Energy Consumption in Households in 2009].

Lietuvos statistikos departamentas (2011d), Gyventojų pajamos ir gyvenimo sąlygos (2011 m. katalogas), available at, http://www.stat.gov.lt/lt/catalog/pages_list/?id=1580, referred on 29/10/2012, [Income and Living Conditions of Residents (Catalogue of 2011), *in Lithuanian*].

Lietuvos statistikos departamentas (2011e), Kuro ir energijos balansas 2010, available at, http://www.stat.gov.lt/lt/catalog/download_release/?id=3672&download=1&doc=1933, referred on 29/10/2012, [Fuel and Energy Balance in 2010, *in Lithuanian*].

Lietuvos statistikos departamentas (2011f), Energijos sunaudojimas namų ūkiuose 2009, available at, http://www.stat.gov.lt/lt/news/view/?id=9272, referred on 29/10/2012, [Energy Consumption in Households in 2009, *in Lithuanian*].

Maslow, A.H., Frager, R.D., Fadiman J. (1987), *Motivation and Personality*, New York, Harper and Row.

Miškinis, V. (2000), Lietuvos energijos poreikiai – praeitis, dabartis, prognozės, available at, http://ausis.gf.vu.lt/mg/nr/2000/04/4miskin.html, referred on 12/09/2012, [Needs of the Lithuanian Energy – Past, Current Days and Forecast, *in Lithuanian*].

Miškinis, V. (2011), Energy in Lithuania, available at, http://www.lsta.lt/files/Leidiniai/Liet%20%20energetika-2010_galutinis.pdf, referred on 12/10/2012.

Petersdorff, C., Boermans, T., Harnisch, J., Stobbe, O., Ullrich, S., Wartmann, S. (2005), *Cost-Effective Climate Protection in the Building Stock of the New EU Member States*, available at, http://www.ecofys.com/files/files/ecofys_2005_costeffectiveclimateprotectionbuildingstock.pdf, referred on 12/10/2012.

Rudzkienė, V., Burinskienė, M. (2007), *Plėtros krypčių vertinimo ir valdymo informaciniai modeliai*, Technika, [Information Models for Assessment and Management of Development Trends, *in Lithuanian*].

Stankevičius, Č. (2008), Nacionalinio saugumo aspektai Lietuvos energetikos strategijoje, available at, http://www.elektroklubas.lt/pdf/IAE/%20Stankev.pdf, referred on 12/10/2012, [Aspects of National Security in the Lithuanian Energy Strategy, *in Lithuanian*].

Stasiūnas, V. (2010), Lietuvos šilumos ūkis: esama padėtis ir kliūtys vystymuisi, available at, http://www.lsta.lt/files/Leidiniai/Pranesimas_LT_100920.pdf, referred on 12/10/2012, [Lithuanian Heating Economy: Present Situation and Barriers for Development, *in Lithuanian*].

Vaičiūnas, Ž. (2009), "Europos Sąjungos bendros energetikos politikos formavimasis ir Lietuvos interesai", *Politologija*, No 3, pp. 89-120, [Common European Union Energy Policy on the Making and the Interests of Lithuania, *in Lithuanian*].

Vanagas, J. (1996), *Miesto sociologijos pagrindai*, Aldorija, [Basics of City Sociology, *in Lithuanian*].

Vanagas, J. (2008), *Urbanistikos pagrindai*, Technika, [Basics of Urban Science, *in Lithuanian*].

Wesselin, B., Harmsen, R., Eichhammer, W. (2010), Energy Savings 2020, available at, http://www.roadmap2050.eu/attachments/files/1EnergySavings2020-FullReport.pdf, referred on 10/09/2012.

ENERGIJOS VARTOJIMO EFEKTYVUMO VIETA VALSTYBĖS EKONOMINĖJE POLITIKOJE: BŪSTO SEKTORIAUS REIKŠMĖ LIETUVOJE

JunonaBumelytė, Birutė Galinienė

SANTRAUKA

Straipsnis skirtas energijos ir jos vartojimo efektyvumo sampratos bei pagrindinių energetinių rodiklių analizei. Analizuojamos energetinės politikos kryptys, energijos tiekimo, transformavimo ir vartojimo efektyvumo didinimo ryšys, pasaulinės ir Lietuvos energijos išteklių vartojimo tendencijos. Tiriamieji aspektai apibendrinami nusakant valstybės ekonominės politikos ir efektyvaus energijos vartojimo ryšį. Nagrinėjama būsto samprata, analizuojamos būsto sektorius sąsajos su namų ūkiais ir galutiniu energijos vartojimu. Straipsnio pabaigoje pristatoma Lietuvoje įgyvendinama valstybinės daugiabučių namų atnaujinimo programa.

Autoriai daro išvadą, kad pastatų energijos taupymo potencialas yra reikšmingas ir gali iš esmės padidinti skaitinę energijos vartojimo efektyvumo išraišką bendrajame pasauliniame energijos taupymo kontekste. Racionalūs šildymo energijos poreikiai kompleksiškai nustatomi atsižvelgus į kiekvienos šalies ar regiono klimato sąlygas. Šiuolaikinės Lietuvos paveldėtasis energetikos sektorius, ypač kai vartotojams buvo pritaikytos visos pigios energijos sąlygos, turi daug energijos taupymo potencialo. Lietuva beveik neturi savų pigių pirminių energijos išteklių. Tad jos nuolatinis tikslas ir prioritetas turi būti racionalus, efektyvus ir taupus įvairių rūšių energijos vartojimas visose energetinio ciklo grandyse. Gyvenamojo sektoriaus energijos vartojimo efektyvumo didinimo priemonės yra glaudžiai susijusios su būsto, konkrečiu daugiabučių namų, sektoriumi. Pagrindinė paskata ūkio subjektams didinti energijos vartojimo efektyvumą yra siekis kuo našiau panaudoti ribotus ekonominius išteklius, o namų ūkiams – mažinti energijos vartojimo išlaidas ir taip didinti savo perkamąją galią. Straipsnio pabaigoje dėmesys skiriamas valstybinei Lietuvos daugiabučių namų atnaujinimo (modernizavimo) programai.

REIKŠMINIAI ŽODŽIAI: energijos vartojimo efektyvumas, būstas, namų ūkiai, daugiabučiai namai, investicijos į energijos vartojimo efektyvumą, Lietuva.

Annex 1. **Groups of Multi-apartment Buildings in Lithuania Based on the Quantity of Energy Consumed**

No	Categories of multi-apartment buildings	Quantity of heat consumed (kWh), payments for heat, heating season 2010-2011 (~24,0 ct/kWh VAT included) and fuel consumption			Number of apartments and population in the category		Portion of buildings in Lithuania, percentage
		For heating of 1 m² of apartment per month, kWh/m²	*For heating of a 60 m² apartment per month, kWh, Lt/month*	*Fuel, consumed in the source of heat producer for a 60 m² apartment, kgoe*	*Number of apartments, thous.*	*Population, million*	
I.	Multi-apartment residential buildings with lowest heat consume (new construction, high quality houses)	~10 kWh/m²	144 Lt/month	60 kgoe	32	0.09	4.6
II.	Multi-apartment residential buildings with low or medium heat consumption (new construction houses and other houses with some ability to save heat)	~15 kWh/m²	216 Lt/month	60 kgoe	121	0.36	17.3
III.	Multi-apartment residential buildings with high heat consumption (old construction not renovated houses)	~25 kWh/m²	360 Lt/month	60 kgoe	390	1.17	55.7
IV.	Multi-apartment residential houses with very high heat consumption (old construction, buildings with very poor insulation)	~35 kWh/m² and more	504 Lt/month.	60 kgoe	157	0.47	22.4

Source: prepared on the basis of Lietuvos šilumos tiekėjų asociacija, 2011, Stasiūnas, 2010.