



## **Increase of Effectiveness of Economy Management in Municipalities (Through the Example of Energy Conservation)**

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### **ABSTRACT**

Provision of competitiveness and financial soundness of fuel and energy complex, increase of energy efficiency of economic sectors is one of priority lines of municipal politics development. In this article we attempt to analyse energy efficiency at the level of municipalities. The author has formed criteria and presented a method of express analysis based on ranking score of economy and energy potential of a particular territory. This method was tested when analysing municipal economy of one of the most energy-critical regions of the Russian Federation - the Lipetsk Region. The conducted research allowed to detect main means of increasing the efficiency of municipality economy management. The obtained results can be used in municipality management of various regions, especially if there is similarity to the Lipetsk Region by main groups of criteria.

**Keywords:** Energy Efficiency, Economy of Municipalities, Method of Express Analysis, Economy and Energy Potential

**JEL Classifications:** R19, Q48, O13, L97

### **1. INTRODUCTION**

Under conditions of economic recession in the Russian Federation (RF) and continued budget cutting of all levels, efficient utilization of budgetary funds at the level of municipalities remains one of the most significant issues.

Substantial reserve of financial savings and reduction of budgetary expenditures directed to the payment for energy resources is included in the implementation of energy intensity reduction measures in economic sectors of municipalities. At the same time, energy intensity of economic sectors of the RF is now high enough not only as against countries with advanced market economy, but also as against developing countries of BRICS (RF Ministry of Energy).

One of the topical issues of social and economic development of regions is shaping and implementing effective energy supply and energy conservation policy.

Economic growth and improvement of life quality require the development of power industry consistent with modern organisational, technological and technical principles (Gasho, 2015). Topicality of the increase of efficient energy consumption is due to continuous rise in prices and escalating costs of power consumption in housing and utilities and public sectors of municipal economy.

Current situation in the field of energy conservation shows that due to the absence of well-defined practical energy conservation machinery at the level of municipalities, basic principles of energy conservation policy in the RF specified at the federal level are not implemented in full force. Energy conservation is often considered an individual aspect of the territory which is not associated with major development programmes in a municipality or a region. However, energy conservation is a component and often a basic element of the municipality development on the whole.

Among negative consequences of rise in the cost of fuel and energy resources (FER) are earnings dilution and loss of the competitive edge of municipality's enterprises, decline in efficiency of municipal management due to increased expense ratio for FER and utilities payment and life quality deterioration.

Creating conditions for conversion of economy and public sector of a municipality to energy conservation development path is a priority task for regional and municipal authorities.

The goal of this article is to work out measures directed towards the increase of energy efficiency of municipal economy.

To achieve the desired goal, the author gradually solves a number of tasks, such as:

- Presenting a method of express analysis of energy efficiency of municipal economy;
- Conducting an analysis of energy efficiency in municipalities;
- Determining main lines of municipal energy policy;
- Suggesting a series of measures aimed at reduction of municipal economy energy intensity.

## 2. METHODOLOGY

Performance evaluation of economic systems on the whole and energy efficiency in particular is usually a systemic and multiple-factor process (Gasho, 2015). Comparing the efficiency of energy utilization in various regions and municipalities by only one index of gross regional product (GRP) energy intensity is obviously not enough due to a number of objective and subjective reasons.

Among objective factors are significant differences between regions in technological energy efficiency of the economy, in electric energy consumption to heat ratio. Among subjective factors are insufficiency of source statistical data, significant differences in secondary energy flow and balance calculation procedures, difficulties with complete account of heat energy consumption, etc.

Substantial diversification of regional specific features and conditions, methodical disagreement in determination of energy consumption and energy efficiency cause the necessity of development of a set of criteria for drawing up managerial decisions (Danilov et al., 2010).

## 3. METHODS

To achieve the desired goal, we use an original method of express-evaluation of energy efficiency of municipal economy. To form the parameters of the municipal economy energy efficiency analysis, we suggest using score system according to which each rating is given a certain score: The lower the rank value, the better the indicators of territory's economy energy efficiency and, accordingly, the greater the score.

The following are the criteria allowing to make an objective assessment of economy and energy potential efficiency of a particular territory:

- I1-Energy intensity of municipal product. Currently such indicators as "gross municipal product" is not formed by statistical authorities and there is no uniform calculation procedure for it. Therefore, to calculate municipal product energy efficiency we used such indicators as "own-produced goods shipped, work and services performed by own efforts" and "Third party products sold" formed by statistical authorities in view of municipalities and indirectly characterizing the output of products within the particular territory;
- I2-Energy efficiency of municipal budget. Calculated as utilities expenses to total amount of municipality budgetary expenditure ratio. The information for calculating this indicator is taken from municipal budget execution review posted in the public domain on official websites of municipalities;
- I3-Energy intensity in apartment houses: Electric energy kWh per 1 resident;
- I4-Energy intensity in apartment houses: Heat energy Gcal per 1 m<sup>2</sup> of total area;
- I5-Energy intensity in municipal budgetary institutions: Electric energy kWh per 1 resident;
- I6-Energy intensity in municipal budgetary institutions: Heat energy Gcal per 1 m<sup>2</sup> of total area.

Final value is formed by summing up the scores of each indicator taking into account its significance according to the following formula:

$$V_p = \sum P_i * w_i \quad (1)$$

Where  $V_p$  is an integrated index of energy efficiency of the region's municipality;

$P_i$  is score by each marked criteria  $i$ .

$w_i$  is specific weight of factor  $i$  significance in energy sector of municipal economy.

The suggested method of express-evaluation of energy efficiency of municipal economy can be of considerable practical importance for energy-critical regions, among which is also the Lipetsk Region.

Statistical ratios of Lipetsk regional Russian Federal State Statistics Service, reporting information of executive government bodies of the region, as well as budgetary and financial reporting of local government of municipalities of the Lipetsk Region are used as informational background for the calculation.

## 4. DEVELOPMENT INDICATORS OF ENERGY ECONOMY OF THE LIPETSK REGION

The Lipetsk Region is one of industrialised regions of the RF: More than 40% of GRP is formed by multi-sector industrial complex. The major part of industrial production structure is taken by iron and steel industry, food industry and mechanical

engineering. According to Russian Statistics Committee data, at year-end 2013 the Lipetsk Region was one of the most energy intensive regions of the RF (RF Russian Federal State Statistics Service. Efficiency of Russian economy). Russian largest iron and steel complex functions within the territory of the Lipetsk Region, Special economic zones of industrial production, agro-industrial, tourist recreational and technology development kinds have been developing here since 2006. Such special nature determines particular significance of set regional energy efficiency increase tasks.

Consumption of FER accounts for 0.0527 kg of equivalent fuel per 1 rouble of GRP, which is almost 3.3 times more than average Russian index (Figure 1).

At the same time, the trend in the region has been toward reduction of GRP energy intensity amid the attraction of extra-budgetary investments and implementation of energy service contracts (RF Ministry of Energy). Reduction of GRP energy intensity in the Lipetsk Region over past 8 years (from 108.5 tons of equivalent fuels/million rouble in 2007 to 80.27 tons of equivalent fuels/million rouble in 2015) measured in prices of 2007 accounted for 26% and indicates that energy conservation and energy efficiency increase policy is being pursued at regional enterprises (Official website of the Lipetsk Region Administration).

Energy consumption has been steadily rising in the region since 2009 (Figure 2): Over past 7 years this indicator increased by 30% and by the end of 2015 accounted for 12254.59 million kWh.

Under total consumption of 12254.6 million kWh, at year-end 2015 electric power generation accounted for 5331.8 million kWh. In other words, only 43.51% of total electric power is generated within the territory of the region. Deficient energy resources are purchased wholesale from related sectors.

The Lipetsk Region Electric energy complex includes 212 power supply lines of 110-500 kW voltage type and 113 transformer

substations of 110-500 kW voltage type. Overall power of distribution substations accounts for 15251.5 MVA (Pattern and programme of Lipetsk Region power industry development for 2016-2020).

Operational and dispatcher management of power industry facilities is carried out by Lipetsk Regional Dispatching Office, branch of OAO Unified Energy System (UES). The following company operate in the region:

- 3 electronetwork companies – Branch of Federal Grid Company of the UES of Russia (JSC UES FGC) - Verkhne-Donskoye PMES (backbone electric grid); branch of JSC IDGC of Centre - Lipetskenergo; branch of OAO Russian Railways South Eastern Railway - Yelets distance of power supply;
- 1 generating company - branch of JSC Quadra - Eastern Generation, which includes Lipetsk, Yelets and Dankov heat stations;
- 10 energy service companies - wholesale market entities;
- 8 stations of industrial enterprises.

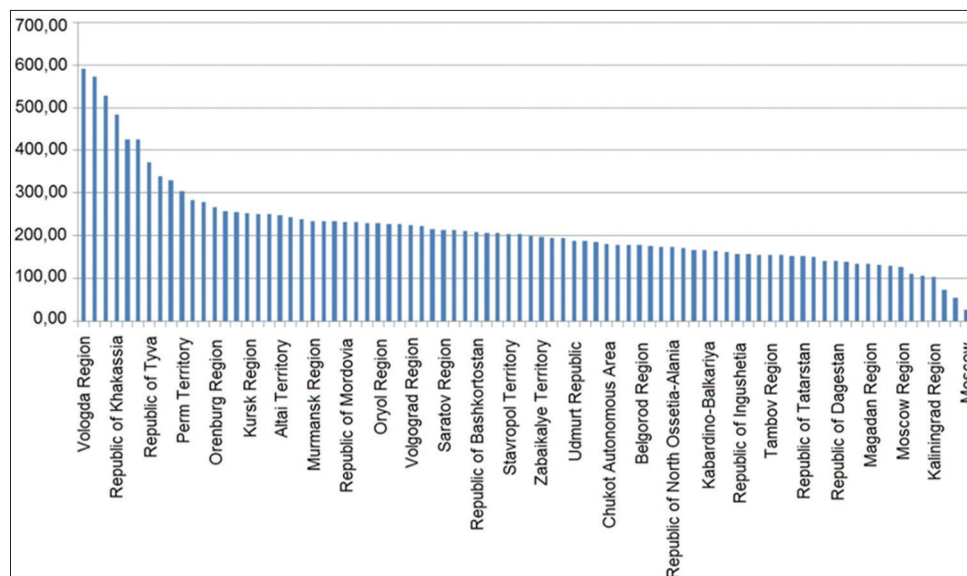
The largest consumers of electric power are industrial enterprises, they account for more than 64% of equivalent fuel (Figure 3).

The largest industrial consumer of electric power in the region is Novolipetsk Steel (OAO NLMK): It accounts for 55.76% of all electric power consumed in the region. OAO NLMK has its own power generation capacities: In 2014 the company’s power self-sufficiency rate was 54% (NLMK energy efficiency).

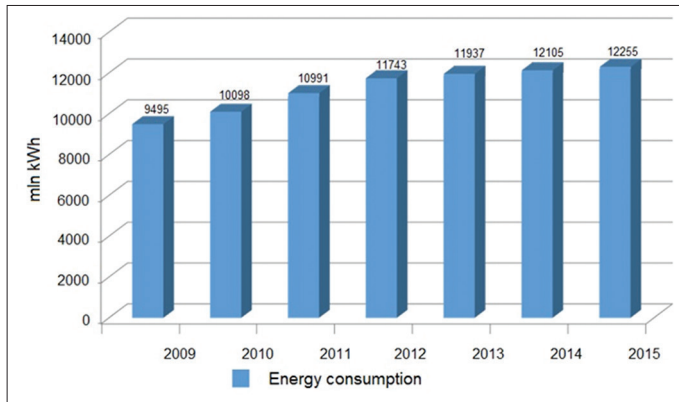
Power in the region is generated at 1755 heat sources with total capacity of 7.387 Gcal per hour. Total length of heat and steam networks in the Lipetsk Region is 2305 km in two-pipe terms, 95% of which is the share of urban area.

Generation of heat energy in 2015 accounted for 10.1 million Gcal. Heat energy loss in the Lipetsk Region accounted for 10.2%, which is significantly less than average in Russia (15.7%) and in the district (11.7%).

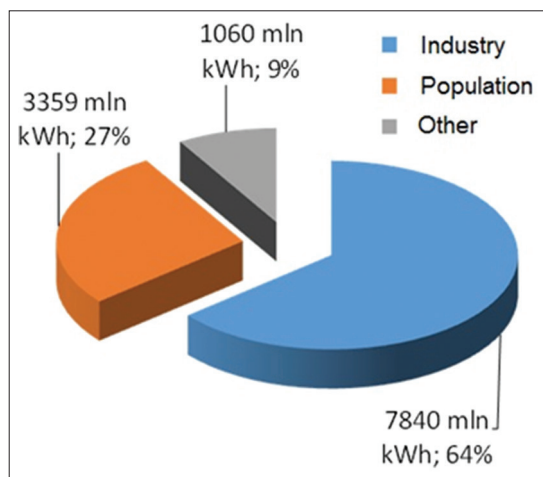
**Figure 1:** GRP power capacity in regions of the Russian Federation, kg of equivalent fuel /10 thousand roubles



**Figure 2:** Dynamics of energy consumption in the Lipetsk Region in 2009-2015



**Figure 3:** Energy consumption mix on the territory of the Lipetsk Region in 2015



In compliance with requirements of current legislation, Energy efficiency and energy development in the Lipetsk Region programme has functioned within the Lipetsk Region since 2014 (Lipeckaja Gazeta). According to this programme, regional enterprises of public sector, industrial complex, housing services and utilities actively implement energy conservation measures. Similar energy conservation programmes aimed at the development of energy conservation and increase of the territory’s energy efficiency have been designed and are now being implemented at the level of municipalities.

Last year total financing of energy conservation measures within Energy conservation and energy efficiency increase sub-programme from all the sources accounted for 963.3 million roubles (including: Regional budget - 114.7 million rouble, local budgets - 4 million rouble, extra-budgetary sources (resources of investors) - 844.6 million rouble).

It should be noted that amid a number of energy efficiency practical projects implemented by regional and municipal authorities, little attention is paid to key lines of state policy, in particular, regional sectoral problems do not have energy efficiency indicators and maintaining mechanisms are rarely used.

## 5. ANALYSIS OF ENERGY EFFICIENCY OF LIPETSK REGION MUNICIPALITIES

To successfully implement energy policy and reduce energy intensity of the region’s economy, it is necessary to take adequate managerial measures so as to solve the tasks set by executive authorities at the municipal level.

Regional authorities of the Lipetsk Region should have objective information on how effectively energy efficiency programmes are implemented in municipalities, evaluate the adequacy of management activities and level of achievement of tasks set in municipal programmes for the increase of economy energy efficiency.

To implement energy policy of the Lipetsk Region and reduce energy intensity of the region’s economy, efficiency level of energy use at the level of particular municipalities has been assessed. Comparative analysis of energy efficiency of municipal economies will allow to objectively assess development prospects and potential of the Lipetsk Region energy complex, to ensure efficiency of budgetary expenditures.

Due to the absence of necessary statistical data for 2015 the efficiency of municipalities was assessed by the data from 2014.

To calculate the indicator I1 - “Energy intensity of municipal product” we adjusted the data of actual heat and power consumption to a single unit of measurement - kWh - by using recalculation coefficient 1 Gcal = 1163 kWh (Kryshov and Zalesskaya, 2015).

Calculation of energy intensity of municipal product (MP) of the Lipetsk Region municipalities is presented in Table 1.

Folloing the results of the calculations, a rating of municipalities was formed, according to which each municipality was given a respective score (Table 2).

Calculation of the indicator I2 “Energy intensity of municipal budget” is presented in Table 3.

As the results of the calculations showed, energy intensity of local budgets of the Lipetsk Region is significantly spread in municipalities. Budgets of 4 municipalities have more than 3% of utilities expenses.

Data on electric and heat energy intensity in municipalities of the Lipetsk Region is presented in Table 4.

Results of energy resources consumption ranking for municipalities of the Lipetsk Region are presented in Table 5.

Wighted coefficients of the criteria of energy efficiency of municipalities were determined by expertise and have the following values:

I1 - 0.2; I2 - 0.2; I3 - 0.15; I4 - 0.15; I5 - 0.15; I6 - 0.15

Calculation on the complex index of energy efficiency of municipal economies of the Lipetsk Region is presented in Table 6.



**Table 1: Calculation of MP energy intensity of the Lipetsk Region municipalities**

Municipality	Own-produced goods shipped, work and services performed by own efforts (without small business entities), thousand roubles	Third party products sold (without small business entities), thousand roubles	Electric power consumption, million kWh	Heat consumption		II–Energy capacity of municipal product, kWh/rub
				Thousand Gcal	million kWh	
Volovsky	12,6,95,085	4,00,255	181.3	51.4	59.7	0.14
Gryazinsky	177,5,33,593	5,8,74,738	381.4	321.9	374.3	0.03
Dankovsky	42,0,27,921	14,7,87,609	312.6	140.4	163.3	0.08
Dobrinsky	123,0,62,286	22,5,95,024	344.0	277.3	322.6	0.05
Dobrovsky	7,3,10,982	7,44,738	242.1	61.6	71.7	0.21
Dolgorukovsky	12,6,05,463	5,21,974	234.2	85.6	99.6	0.19
Yeletsky	42,4,46,245	2,92,064	305.8	390.3	454.0	0.17
Zadonsky	32,4,60,512	32,4,81,038	221.0	171.2	199.1	0.06
Izmalkovsky	8,7,57,214	8,9,56,813	282.8	0.0	0.0	0.16
Krasninsky	20,8,58,982	1,0,28,393	152.5	68.5	79.6	0.07
Lebedyansky	267,4,62,167	22,1,05,053	415.1	332.1	386.3	0.03
Lev-Tolsovsky	88,4,63,662	11,6,60,140	252.6	75.3	87.6	0.02
Lipetsky	223,2,78,725	7,1,12,133	627.0	291.0	338.5	0.03
Stanovlyansky	15,0,65,248	9,98,987	413.8	157.5	183.2	0.24
Terbunsky	44,9,77,349	1,7,35,352	265.0	126.7	147.3	0.07
Usmansky	33,1,92,159	3,0,21,024	439.7	116.4	135.4	0.09
Khlevensky	15,8,54,244	2,4,11,673	213.8	78.8	91.6	0.08
Chaplyginsky	3,3,10,005	2,6,92,174	327.7	130.1	151.3	0.08
City of Yelets	221,1,30,473	97,9,39,161	1217.6	1403.9	1632.7	0.09
City of Lipetsk	4095,9,13,206	1549,7,81,279	5275.1	5796.9	6741.8	0.02

**Table 2: Rating of the Lipetsk Region municipalities by energy intensity of municipal product**

Municipality	II–Energy intensity of MP kWh/rub	Rating	Score
Lev-Tolsovsky	0.02	1	13
City of Lipetsk	0.02	1	13
Gryazinsky	0.03	2	12
Lebedyansky	0.03	2	12
Lipetsky	0.03	2	12
Dobrinsky	0.05	3	11
Zadonsky	0.06	4	10
Krasninsky	0.07	5	9
Terbunsky	0.07	5	9
Dankovsky	0.08	6	8
Khlevensky	0.08	6	8
Chaplyginsky	0.08	6	8
Usmansky	0.09	7	7
City of Yelets	0.09	7	7
Volovsky	0.14	8	6
Izmalkovsky	0.16	9	5
Yeletsky	0.17	10	4
Dolgorukovsky	0.19	11	3
Dobrovsky	0.21	12	2
Stanovlyansky	0.24	13	1

The conducted research allowed to detect municipalities which have rather high economy and energy potential and municipalities with the weakest economies according to energy efficiency indicator.

Regional authorities together with institutions of local government need, as a matter of priority, to develop and implement a number of measures to reduce energy intensity of these territories.

On the whole, the obtained rating showed that higher quality results are characteristic of the municipalities with the most actively updated capital funds and implemented energy conservation programmes.

Among the main energy conservation issues hindering the fulfilment of economy and energy potential of the region are the following:

- Technical deterioration of energy infrastructure units;
- Growing shortage of reserve generating capacities and heat and power networks;
- Lack of consumers' motivation towards energy conservation;
- Low-degree involvement of local, renewable and non-traditional FER into economic turnover.

That said, it should be mentioned that almost all municipalities of the region have significant economy and energy potential. So long as key lines of regional energy policy are implemented, including modernization of energy complex management system and introduction of the mechanism of public sector energy declarations, energy efficiency rates of the region can be substantially increased.

## 6. MAIN LINES OF ENERGY EFFICIENCY INCREASE FOR ECONOMY OF THE LIPETSK REGION MUNICIPALITIES

The following can be pointed out as main lines of regional policy aimed at the reduction of the Lipetsk Region economy energy intensity:

1. Introduction of energy declarations into public sector of the economy.

When the Federal law “On introduction of alterations to the Federal law “On energy conservation and increase of

**Table 3: Calculation of energy intensity of the Lipetsk Region municipalities' local budgets**

Municipal districts	Municipal budget expenditures, thousand roubles	Utilities expenses, thousand roubles	Budget energy intensity indicator, %	Rank	Score
Volovsky	28,9,87,700	4,83,59	0.17	1	18
Gryazinsky	8,3,21,182	18.038	0.22	2	17
Dankovsky	4,8,57,647	2,21,902	0.46	6	13
Dobrinsky	7,74,23799	2,39,822	3.10	15	4
Dobrovsky	36,5,08,620	4,77,416	1.31	11	8
Dolgorukovsky	3,32,905	3,25,722	0.98	9	10
Yeletsky	5,49,419	50.392	0.92	8	11
Zadonsky	4,26,718	66.786	1.57	13	6
Izmalkovsky	3,61,178	5316,43	1.47	12	7
Krasninsky	32,0,64,528	3,66,922	1.14	10	9
Lebedyansky	6,4,17,481	1,1,99,495	1.87	14	5
Lev-Tolsovsky	3,76,495	34,647	0.92	8	10
Lipetsky	5,93,107	3,95,901	0.67	7	12
Stanovlyansky	3,58,978	1,64,541	0.46	6	13
Terbunsky	4,16,607	18.733	0.45	5	14
Usmansky	6,12,381	2,51,716	0.41	4	15
Khlevensky	3,34,252	13.667	4.09	17	2
Chaplyginsky	5,31,828	15.751	0.30	3	16
City of Yelets	8,5,09,241	4,0,40,276	4.75	18	1
City of Lipetsk	16,1,05,251	6,34,023	3.94	16	3

**Table 4: Electric and heat energy intensity in municipalities of the Lipetsk Region (Lipetsk region Russian Federal State Statistics Service)**

Municipalities	I3-Energy intensity in apartment houses: Electric energy kWh per 1 resident	I4-Energy intensity in apartment houses: Heat energy Gcal per 1 m <sup>2</sup> of total area	I5-Energy intensity in municipal budgetary institutions: Electric energy	I6-Energy intensity in municipal budgetary institutions: Heat energy
Volovsky district	467	0	62.34	0.14
Gryazinsky district	396.4	0.24	27.2	0.155
Dankovsky district	577.1	0.272	44.25	0.17
Dobrinsky district	494	0.26	51.86	0.162
Dobrovsky district	706.8	0.21	55.07	0.16
Dolgorukovsky district	577.2	0	67.1	0.18
Yeletsky district	444.2	0.26	51.13	0.19
Zadonsky district	728	0.2	33.74	0.16
Izmalkovsky district	385	0	75.2	0
Krasninsky district	499.5	0.19	67.98	0.19
Lebedyansky district	619.7	0.24	52.36	0.19
Lev-Tolsovsky district	530	0	80.5	0.12
Lipetsky district	630	0.18	66.52	0.19
Stanovlyansky district	400.9	0.17	121.8	0.78
Terbunsky district	411.2	0.299	64.27	0.188
Usmansky district	577	0.2	67.5	0.15
Khlevensky district	448	0	58.8	0.201
Chaplyginsky district	611	0.15	58.28	0.17
City of Yelets	620	0.18	63.2	0.15
City of Lipetsk	967.6	0.209	38.52	0.16

energy efficiency” was adopted (Sobranie Zakonodatel'stva Rossijskoj Federacii), mandatory energy audit was cancelled and replaced by a simplified form of providing key information in public sector. Repeated energy examination is replaced by providing energy declaration which contains the information not only on energy consumption, but also on the state of buildings, capital repairs and expenses for conducting such

repairs, equipment used, efficiency of budgetary funds aimed at upkeep of property.

- Introduction of energy service contract system. As the study showed, one of the hindering problems of economy energy efficiency in the Lipetsk Region is technical deterioration of housing and utilities sector units almost in all municipalities of the region. Financial

**Table 5: Results of energy resources consumption ranking for municipalities of the Lipetsk Region**

Municipalities	I3		I4		I5		I6	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Volovsky district	7	14	1	16	11	10	3	18
Gryazinsky district	2	19	11	6	1	20	6	15
Dankovsky district	12	9	15	2	4	17	11	10
Dobrinsky district	8	13	13	4	6	15	10	11
Dobrovsky district	18	3	10	7	8	13	7	14
Dolgorukovsky district	13	8	1	16	15	6	13	8
Yeletsky district	5	16	14	3	5	16	15	6
Zadonsky district	19	2	7	10	2	19	8	13
Izmalkovsky district	1	20	1	16	18	3	1	20
Krasninsky district	9	12	6	11	17	4	16	5
Lebedyansky district	15	6	12	5	7	14	17	4
Lev-Tolsovsky district	10	11	1	16	19	2	2	19
Lipetsky district	17	4	4	13	14	7	18	3
Stanovlyansky district	3	18	3	14	20	1	20	1
Terbunsky district	4	17	16	1	13	8	14	7
Usmansky district	11	10	8	9	16	5	4	17
Khlevensky district	6	15	1	16	10	11	19	2
Chaplyginsky district	14	7	2	15	9	12	12	9
City of Yelets	16	5	5	12	12	9	5	16
City of Lipetsk	20	1	9	8	3	18	9	12

**Table 6: Calculation on complex index of energy efficiency of municipal economies of the Lipetsk Region**

Municipalities	Weighted value				Complex index of energy efficiency Vp			
Volovsky district	1.2	3.6	2.1	2.4	1.5	2.7		13.5
Gryazinsky district	2.4	3.4	2.85	0.9	3	2.25		14.8
Dankovsky district	1.6	2.6	1.35	0.3	2.55	1.5		9.9
Dobrinsky district	2.2	0.8	1.95	0.6	2.25	1.65		9.45
Dobrovsky district	0.4	1.6	0.45	1.05	1.95	2.1		7.55
Dolgorukovsky district	0.6	2	1.2	2.4	0.9	1.2		8.3
Yeletsky district	0.8	2.2	2.4	0.45	2.4	0.9		9.15
Zadonsky district	2	1.2	0.3	1.5	2.85	1.95		9.8
Izmalkovsky district	1	1.4	3	2.4	0.45	3		11.25
Krasninsky district	1.8	1.8	1.8	1.65	0.6	0.75		8.4
Lebedyansky district	2.4	1	0.9	0.75	2.1	0.6		7.75
Lev-Tolsovsky district	2.6	2	1.65	2.4	0.3	2.85		11.8
Lipetsky district	2.4	2.4	0.6	1.95	1.05	0.45		8.85
Stanovlyansky district	0.2	2.6	2.7	2.1	0.15	0.15		7.9
Terbunsky district	1.8	2.8	2.55	0.15	1.2	1.05		9.55
Usmansky district	1.4	3	1.5	1.35	0.75	2.55		10.55
Khlevensky district	1.6	0.4	2.25	2.4	1.65	0.3		8.6
Chaplyginsky district	1.6	3.2	1.05	2.25	1.8	1.35		11.25
City of Yelets	1.4	0.2	0.75	1.8	1.35	2.4		7.9
City of Lipetsk	2.6	0.6	0.15	1.2	2.7	1.8		9.05

resources are required for sustainable development of the region's economy on the whole and maintenance of energy and utility systems.

Under conditions of limited available budgetary funds for implementation of modernization and update of capital funds, one of the most promising and economically sound methods of energy efficiency increase and real economy of budgetary funds by means of energy conservation is energy service contract system.

Energy service is a business model where investments required for implementation of energy efficiency measures today are covered by saved energy resources in the future, while risks are hedged.

Energy service contract has several clear advantages, as compared to other types of contracts aimed at saving utilities.

First of all, there is no need in financial investment and loan obligations from the client's side (Petrov, 2013).

It should also be noted that economy parameters included in energy service contract are based on the data from objective energy examination and precise technical and economic reports instead of promotional leaflets advertising technical characteristics of different equipment. One of the key advantages is the pattern of return of investments itself. Return of investments by means of actual economy guarantees that energy service company will be interested in achieving the best results from the implementation, as well as offering the most reliable technical decisions.

3. Involvement of renewable and non-traditional FER into economic turnover.

The Lipetsk Region has potentially necessary possibilities

for creation of integrated energy complex for generation of heat and power energy to solve social problems of the population.

Active modernization, introduction of innovation technologies, change-over to renewable energy sources are the basis for the formation of a new policy in the field of energy conservation as an enormous source of reducing energy consumption and achieving their reasonable use and energy efficiency.

Among the promising lines of development for the energy complex of the region allowing to reduce energy dependence of the Lipetsk Region are development of small-scale distribution power generation (diesel and gas-turbine power stations), wind-power engineering, small-scale water power engineering, solar power, tidal, geothermal power generation, bioenergetics.

4. Moulding the consciousness of consumers through popularization and promotion of energy conservation and increase of energy efficiency.

One of the most important aspect of reasonable use of energy resources and increase of energy efficiency is the need to change the mentality of consumers of these resources and to mould energy efficient consciousness in the society. Energy conservation should be promoted both in professional and everyday life. This will motivate people to use energy resources and water more carefully.

To coordinate the implementation of regional and municipal energy conservation programmes in the Lipetsk Region informationally and technically, we suggest creating an independent structure the main tasks of which would be: Implementation of information and consultancy policy regarding energy conservation, promotion of use of energy conservation technologies and facilitation in the implementation of energy conservation projects. The created structure should shape a positive image of energy conservation and culture of careful power and water consumption, as well as attract extra-budgetary funds to the modernization of public sector units and units of fuel and energy complex of the Lipetsk Region.

This structure can become an investment forum for concluding energy service contract and attracting extra-budgetary funds to the modernization of public institutions and units of fuel and energy complex and housing services and utilities of the Lipetsk Region.

5. Creation of economically favourable conditions for attraction of private investments to the energy complex of the region's economy.

Creation of favourable conditions for attraction of investments and development of business is one of priority tasks of regional and local authorities of the Lipetsk Region. The main measures for achieving this goal is creating administrative environment and preparing the necessary infrastructure for investments, forming convenient tariff rates and financial mechanisms of investment attraction and support, tax encouragement of investments, training professionals for support of the investment process.

## 7. CONCLUSION

Today energy saving is the most important part of the economy of the region, municipalities and industrial facilities. People's comfort and life quality on a particular territory depends on how effectively these problems are solved.

Energy conservation and energy efficiency have been priority tasks of state policy for many years now, and recently current complicated economic picture have been urging not only directors of enterprises and organizations and local authorities, but also members of the public to take energy conservation more seriously.

The presented method is of practical importance for assessment of energy efficiency of municipalities within a particular region.

The results of the conducted research allow to draw a conclusion that despite energy dependence of the region, municipalities of the Lipetsk Region have substantial economy and energy potential.

To increase energy efficiency of the region, a number of measures should be implemented, such as introduction of energy declarations in public sector of the region's economy, active development of energy service contract, creation of conditions for renewable and non-traditional types of FER, popularization of energy conservation among energy consumers, including the population; creation of economically favourable conditions for attraction of private investments to the energy complex of the region's economy.

## REFERENCES

- Danilov, N.I., Dobrodey, V.V., Bikbulatov, S.R. (2010), *Sravnitelny analiz reitinga energoeffektivnosti munitsipalnykh obrazovaniy Sverdlovskoy oblasti za 2008 I 2009 gody* [Comparative analysis of energy efficiency rating of municipalities of the Sverdlovsk Region in 2008 and 2009], In: *Materials of Research Scientific Work, Ministry of Energy and Housing of the Sverdlovsk Region; State-financed Institution of the Sverdlovsk Region Energy Conservation Institution, Yekaterinburg.*
- Gasho, E.G. (2015), *Povysheniye energoeffektivnosti i regionalnoye razvitiye: Promyshlennyy aspekt* [Increase of energy efficiency and regional development: Industrial aspect]. – *Regionalnaya energetika I energosberezheniye* [Regional Energy and Energy Conservation], 1, 86-88.
- Kryshov, S.I., Zalesskaya, E.I. (2015), *Metodika opredeleniya pokazateley energopotrebleniya zhilykh domov po platezhnym dokumentam. Stroitelnyy ekspert* [Method of determining energy consumption indexes in apartment houses by payment documents. Construction expert]. Available from: <http://ardexpert.ru/article/3999>. [Last retrieved on 2015 May].
- Lipeckaja Gazeta [Lipetsk Newspaper]. (2013), No. 230.
- Official Website of the Lipetsk Region Administration. Available from: <http://www.admlip.ru>. [Last retrieved on 2015 May].
- Petrov, I.V. (2013), *Energoservisnyy kontrakt – Vozmozhnosti dlya byudzhednoi sfery* [Energy service contract – Possibilities for public sector]. *Rukovoditel byudzhednoi organizatsii* [Manager of Public



Sector Organization], 7, 51-60.

RF Ministry of Energy. Gosudarstvenny doklad o sostoyanii energosberezheniya i povyshenii energeticheskoi effektivnosti v Rossiiskoi Federatsii v 2014 godu [National Report on the State of Energy Conservation and Increase of Energy Efficiency in the Russian Federation in 2014]. Moscow, 2015. Official Website of RF Ministry of Energy. Available from: [http://www.minenergo.gov.ru/sites/default/files/texts/444/61309/Gosdoklad\\_EiPEE\\_-\\_2014.pdf](http://www.minenergo.gov.ru/sites/default/files/texts/444/61309/Gosdoklad_EiPEE_-_2014.pdf). [Last retrieved on 2015 May].

Russian Federal State Statistics Service. Effektivnost ekonomiki Rossii [Effectiveness of Russian economy]. Official Website of Russian Statistics Committee. Available from: [http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/efficiency/#](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/efficiency/#). [Last retrieved on 2015 May].

Federal Law number 399-FZ "On Amendments to the Federal Law "On energy saving and energy efficiency". Sobranie Zakonodatel'stva Rossijskoj Federacii [SZ RF] [Collection of Legislation of the RF] (Part 1), 2013, No. 52, Item 6964.