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ENERGY CONSUMPTION IN UKRAINE

Problem statement. The solution of the problem of industry and public energy supply is becoming very important for many countries. This is due to the increasing economies of scale, improved level of living standards in residential areas, etc. Energy is one of the basic types of primary resources in the sphere of material production, which ensures uninterrupted operations in industry, transport, construction, agriculture and other sectors of economy and functioning of the population. The continuous growth of the energy needs of enterprises, new household appliances and electronics, rising level of automobile availability and the need for transporting goods and people causes the necessity to analyze the total energy consumption within the national economy, because increasing total capacity of power units exceeds the capacity of industries producing required energies.

Analysis of recent research and publications. Energy efficiency is the investment in energy reduction to meet growing energy demand. Thus, this concept is focused on reducing energy losses. Historically, politicians considered energy efficiency as a strategy of minimum losses helping to ensure the use of smaller amounts of energy to provide the required level of consumption, especially in residential areas. Besides, energy efficiency reduces greenhouse gas emissions by decreasing consumption and peak loads, thereby slowing the capacity growth.

V. V. Markin [1], M. A. Ponomaryov [2], A. H. Zakharova [3], D. Y. Drozhzhinov [4] also observed the definition of energy efficiency as a means of achieving the following goals or energy efficiency management outcomes, including those of national and international politics, business, etc.:

– change in energy efficiency by a certain amount;
– minimizing energy resource cost while obtaining a beneficial effect;
– effective investment of resources in the energy development;
– energy efficiency policy at all governmental levels;
– introduction of managerial and technological innovations in the energy sector;
– optimization of fuel and energy balance and supply management based on the development of state and regional strategies;
– reduction of carbon emissions (climate change prevention);
– increasing the security of energy supply (due to more sustainable production), etc.

The study of energy consumption in Ukraine covers the period of 2002 – 2011. During this period the issue of energy efficiency and energy saving in Ukraine started to gain attention from both government authorities and businesses. This trend can be explained not only by changing the volume and structure of production due to the collapse of the economic system of the former USSR, but conscious actions to improve the energy efficiency of the national economy in Ukraine.

The aim of the research is to analyze the total energy consumption within the national economy.

General content. In order to conduct the study a detailed analysis of total primary energy supply (TPES) rate should be considered. This rate characterizes the amount of energy received by national economy from all sources, including domestic production, imports, exports, stock exchanges and international marine and aviation bunkering. The production of primary energy includes data on the quantity of extracted or produced fuel after processes of removing inert substances or impurities. Imports and exports of energy take into account data on the amount of fuel that has come from other countries or has been delivered to other countries, that is, fuel transported through the state border without transit.

The dynamics of TPES structure in Ukraine based on types of energy resources is shown in Fig. 1.

The analysis of the data presented in Fig. 1 indicates that according to the absolute value of TPES in oil equivalent the period of 2002 – 2011 can be divided into several stages on the basis of main trends of growth or decline. Thus, in 2002 – 2005 TPES in Ukraine tended to increase. During four years the figure rose by 11 mln t.o.e. or by 8% due to the influence of incentive policies in metallurgy and favorable conditions in the global market for domestic goods. However, during the years 2006 – 2009 in comparison with 2005 TPES in Ukraine fell sharply by 29 mln t.o.e. (20%). In the period of 2010 – 2011 the parameter under study increased again by 15 mln t.o.e. (11%). Figure 1shows that the changing trends in TPES are associated with changes in the supply of the two main types of energy resources to Ukraine – natural gas (its share is from 36% to 47% in different years) and coal and peat (their share ranges from 26% to 33%). Thus, during the growth of TPES in 2002 – 2005 there are negligible fluctuations of coal and natural gas shares in its structure, i.e. the value of the overall rate was not influenced by the structure based on the types of energy sources. At the same time, during the TPES

recession period in the years 2006 – 2009 there are the following changes in the structure: natural gas share decreased, respectively, the percentage of other types of energy resources, on the contrary, increased. On the whole, Fig. 2 indicates that changes in TPES largely determine the dynamics of natural gas supply.

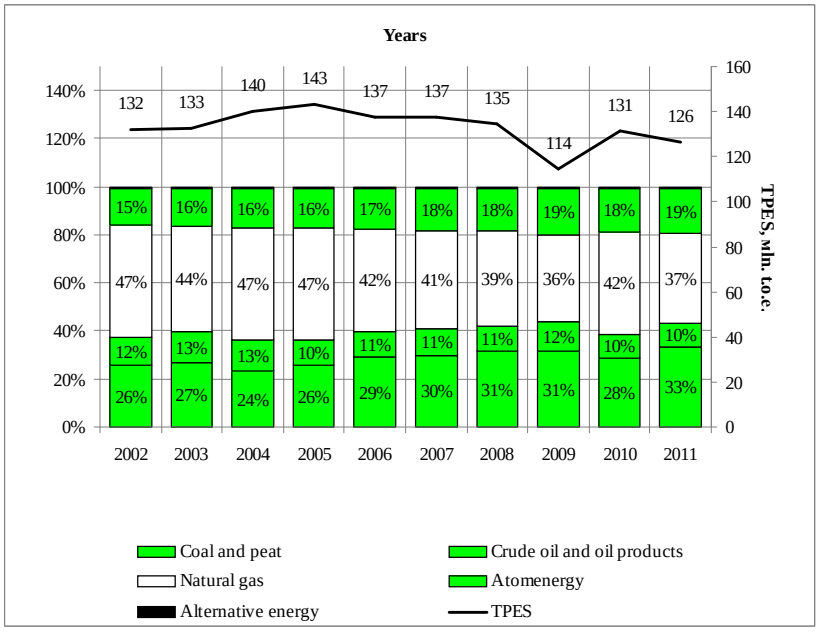

Fig. 1. The dynamics of TPES structure based on types of energy resources in Ukraine in 2002 – 2011 *

* Compiled by the author according to the sources [5 – 12]

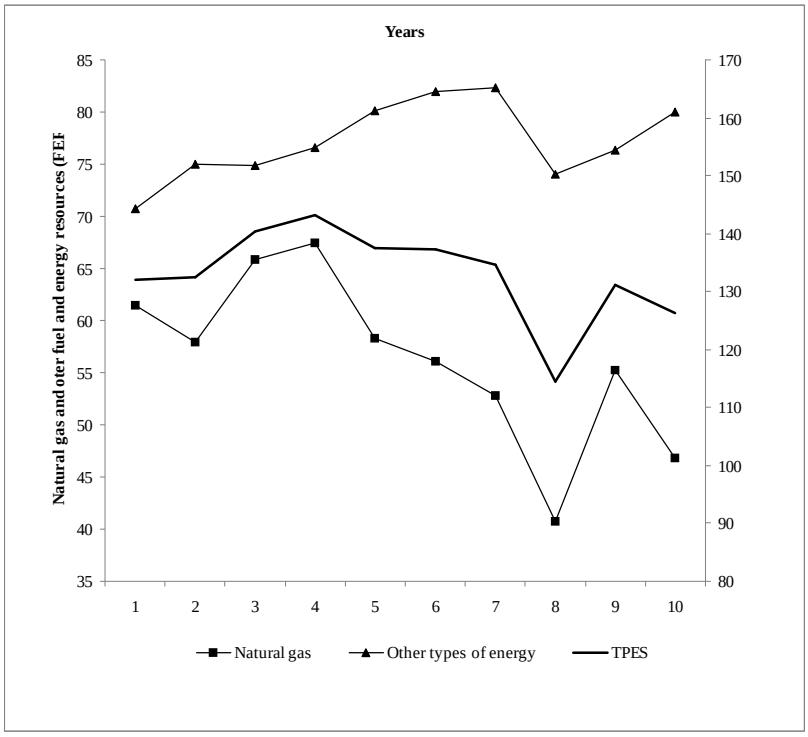

Fig. 2. Dynamics of TPES volumes, natural gas and other energy sources supply in Ukraine in 2002-2011, mln t.o.e. *

* Compiled by the author according to the sources [5 – 12]

Table 1 shows that in 2002 – 2011 about 41% of needs for fuel and energy resources in Ukraine is satisfied by imports. Thus, during the period under consideration TPES structure tended to lowering import FER from 47% in 2002 to 40% in 2011. Obviously, natural gas share is prevailing in the structure of imported energy carrier. Thus, according to Table 1 imported gas share made about 70% of total energy imports and about 35% of TPES in Ukraine annually during the period under study.

For a long time until 2006 the largest supplier of natural gas to Ukraine was Turkmenistan, which accounted for about 67% of imports. Russian Federation mainly transferred gas as payment for gas transit services to Europe through Ukraine. In addition, all imported gas was transported to Ukraine by the gas transport system of the Russian Federation. In 2006 the agreements with Turkmenistan were cancelled and Ukraine became dependent on a single supplier – Russia. As a result in recent years virtually all imports volume is formed by the deliveries from Russia.

Ukraine also imports crude oil, which accounts for about 19% of average energy imports and of 8% in TPES (see Table 1). In Ukraine, annually about 3 – 4 million tons of oil are extracted, which can provide only about 20% of domestic needs, the rest of the volumes come from imported resources. As a result of lack of oil production in the country, the domestic oil and oil products are sensitive to price fluctuations in foreign markets simultaneously depending on the economic and political situation in the country. It should be noted that imports of oil and its processed products is mainly from Russia. During the 2002 – 2011 minor amounts of these goods were also imported from Belarus, Poland, the USA, Lithuania, Kazakhstan, Azerbaijan and Turkmenistan.

The analysis of the dynamics of primary energy supply structure based on supply sources (see Table 1) indicates that coal and nuclear power are the strategic

Table 1

The structure of primary energy supply based on FER supply in Ukraine during 2002 – 2011, mln t.o.e. *, **

Years		Coal and peat		Crude oil and oil products		Natural gas		Nuclear energy	Alternative energy	Total	
		Mln t.o.e.	%	Mln t.o.e.	%	Mln t.o.e.	%	Mln t.o.e.	Mln t.o.e.	Mln t.o.e.	%
2002	Prod	30,50	90	3,26	21	14,33	23	20,33	1,09	69,51	53
	Imp.	3,38	10	12,23	79	47,15	77	-	-	62,76	47
2003	Prod	30,83	86	2,46	15	11,62	20	21,22	1,06	67,18	51
	Imp.	5,04	14	14,41	85	46,35	80	-	-	65,80	49
2004	Prod	26,91	81	3,85	21	13,75	21	22,68	1,28	68,46	49
	Imp.	6,38	19	14,11	79	52,10	79	-	-	72,58	51
2005	Prod	32,79	88	4,29	31	15,21	23	23,13	1,33	76,75	54
	Imp.	4,52	12	9,68	69	50,48	77	-	-	64,68	46
2006	Prod	33,26	83	4,38	29	17,68	30	23,51	1,69	80,52	58
	Imp.	6,75	17	10,48	71	42,11	70	-	-	59,34	42
2007	Prod	31,36	77	4,47	28	17,69	30	24,12	1,67	79,32	56
	Imp.	9,28	23	11,41	72	42,00	70	-	-	62,69	44
2008	Prod	34,32	80	4,26	29	16,12	28	23,57	2,59	80,85	57
	Imp.	8,57	20	10,24	71	42,46	72	-	-	61,27	43
2009	Prod	31,09	86	3,92	28	16,15	35	21,76	2,48	75,40	62
	Imp.	5,14	14	9,95	72	30,65	65	-	-	45,73	38
2010	Prod	28,65	79	3,59	27	15,42	34	23,39	2,60	73,65	61
	Imp.	7,62	21	9,79	73	29,55	66	-	-	46,96	39
2011	Prod	34,46	81	3,41	27	15,53	30	23,76	2,53	79,60	60
	Imp.	8,34	19	9,27	73	36,18	70	-	-	53,79	40

* Compiled by the author according to the sources [5 – 12]

** Prod. – production of primary energy for the needs of Ukraine , i.e. total production minus exports.
Imp. – the supply of primary energy in Ukraine from abroad, i.e. imports.

types of energy sources for Ukraine. Primary energy share derived from these sources is about 42% and 30% respectively in average for the years 2002 – 2011.

It is known that Ukraine has substantial coal stocks, which makes it one of the main domestic sources of energy in Ukraine. However, today the coal is taken in old mines under difficult geological conditions: almost 96% of mines have been working without any reconstruction, more than 50% of machinery and equipment for mining is completely worn out. The high cost of domestic coal leads to the need for subsidies from the state budget sector. In addition to the problems mentioned above, high level of accidents in the industry, the negative environmental impacts of production and consumption of coal should be stated [13, p. 14 – 22].

Atomic (nuclear) energy in Ukraine is recognized as one of the priority areas of energy sector [14]. Nuclear industry is considered as science-driven. Other advantages of using atomic energy are the absence of actual emissions of greenhouse gases, relative independence from fuel due to the necessity to use a small amount of fuel at a relatively low price for the energy produced on this source. On the other hand the positive features of nuclear energy as a strategic resource in Ukraine meet a number of challenges, including the lack of funds for the construction of generating facilities, power plants and high-voltage transmission lines to free up capacity and deliver power to consumers. In addition, there are the following factors which neutralize the price attractiveness of nuclear power: complex accident-prevention systems in modern plants, the necessity of their liquidation after resources depletion, the problem of disposal of nuclear fuel, and the fact that now fuel for nuclear power plants is imported to Ukraine from Russia and the U.S. [15].

However, the strategic importance of coal and nuclear energy for the Ukrainian economy, which is declared in the Energy Strategy of Ukraine till 2030 [14], should not be diminished but more attention to justify the ways of solving these problems is required.

Conclusions. The analysis of primary energy supply, according to its directions indicates that despite the current Energy Strategy of Ukraine till 2030, Ukraine is still dependent on imported energy carriers, especially on foreign supplies of natural gas. The trend to reduce TPES volumes and energy carriers imports could be considered positive providing steady production output in the country, which could indicate the increasing energy efficiency of the national economy of Ukraine. However, this trend is related to the following causes: production reducing and corresponding decrease in energy demand due to the global financial crisis in 2008, high depreciation and low productivity in the mining industry. Ultimately, we can say that the extraction of domestic resources is conducted in complex geological conditions, which makes production unprofitable at the current technology level. Therefore, it can be assumed that in the near future, the economy of Ukraine will remain energy inefficient which causes the need for imported fuel.

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Окаряченко Г. П. Енергоспоживання в Україні

У статті було виявлено необхідність аналізу загального енергоспоживання в межах національної економіки; досліджено енергоспоживання в економіці України за 2002 – 2011 рр.; наведено динаміку обсягів ЗППЕ, постачання природного газу та інших джерел енергії в Україні у 2002 – 2011 рр.; проаналізовано структуру первинного постачання енергії за джерелами постачання ПЕР; було розглянуто енергетичну ефективність як капіталовкладення у скорочення енергоспоживання для задоволення зростаючого попиту на енергію.

Ключові слова: енергоспоживання, показник загального первинного постачання енергії (ЗППЕ), динаміка постачання, імпорт, первинні енергоресурси.

Окаряченко А. П. Энергопотребление в Украине

В статье было выявлена необходимость анализа общего энергопотребления в рамках национальной экономики; исследовано энергопотребление в экономике Украины за 2002 – 2011 гг; приведена динамика объемов ОППЭ, поставки природного газа и других источников энергии в Украине в 2002 – 2011 гг; проанализирована структура первичной поставки энергии по источникам поставок ТЭР; была рассмотрена энергетическая эффективность как капиталовложение в сокращение энергопотребления для удовлетворения растущего спроса на энергию.

Ключевые слова: энергопотребление, показатель общей первичной поставки энергии (ОППЭ), динамика поставки, импорт, первичные энергоресурсы.

Okaryachenko A. P. Energy Consumption in Ukraine

This article has highlighted the need for analysis of the total energy consumption in the domestic economy, studied the power consumption in the economy of Ukraine for the 2002 – 2011 years, shows the trend in the volume of TPES, the supply of natural gas and other energy sources in Ukraine in 2002 – 2011, analyzed the structure of primary energy supply by sources of supply of energy resources; was considered energy efficiency as the investment in reducing energy consumption to meet the growing energy demand.

Key words: energy consumption, the rate of total primary energy supply (TPES), the dynamics of the supply, importation, primary energy.

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