

Outlook for implementing renewable energy in Ukraine

Annotation. Fuel and Energy Complex of Ukraine is characterized by increasing scarcity of domestic primary energy, increasing their value on the world market and the problems of external supply, ineffective use of available energy resources, virtually no diversification of sources of supply of fuel, which poses a threat to national security of Ukraine. The article discusses the most important measures for the development of renewable and non-traditional energy in Ukraine. At present, the practical use of renewable sources of energy is a pretty small share in the total energy consumption in Ukraine. To solve the energy problem in the fuel and energy complex of Ukraine is possible only by taking comprehensive measures, including through the use of clean renewable energy sources, the most common and affordable for Ukraine is wind, solar, geothermal energy and the environment, biomass and small rivers.

Keywords: fuel and energy complex, energy, renewable energy.

The fuel and energy complex of Ukraine is characterized by the growing deficiency of domestic primary energy resources; increase in their cost in the global market and external supply problems; low use efficiency of the available fuel and energy resources, actual absence of diversification of fuel supply sources, all of which poses a threat for the national security of Ukraine.

Ukraine has elaborated the Economic reform program of Ukraine for 2010-2014 which sets out that Ukraine's energy sector has unique spare capacity for power generation however a number of problems limit the capability to sustainably provide the economy with power energy [1]:

- obsolescence and depreciation of key assets of power sector enterprises (about 80% fixed assets of thermal power plants, and 60% of fixed assets of power distribution companies are used-up) as a result of lack of budget funds and unattractiveness of the industry for private investments;
- low efficiency of power production and transmission (power resource consumption in the generation is 35%, and expenditure level at transportation is two times higher than in the OECD countries;
- critical financial and economic condition of thermal generating and power distributing companies, high indebtedness rate among energy market players.

Consumption of primary energy in Ukraine gradually reduces. In 2010 118 tons have been consumed which is the half of 1987 level, and 2% lower than in 2000. Another observation is the reduction in the number of oil equivalent kilograms per one dollar of which in 2010 was 0,39. It is almost three times less than in 1987 and 2000.

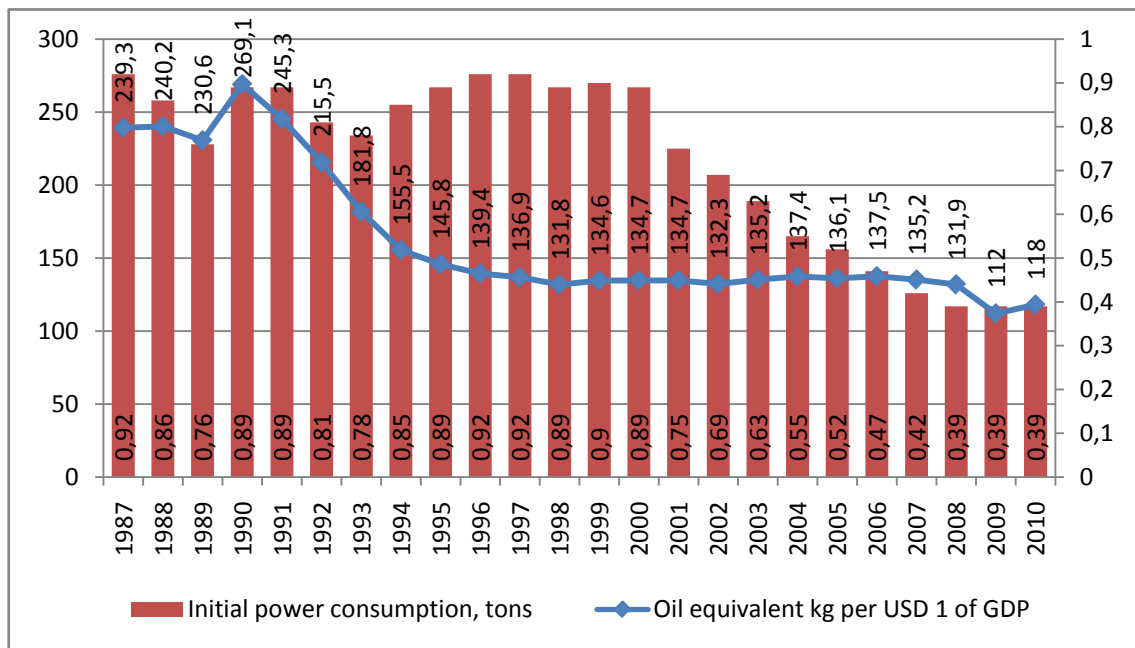


Fig. Key indicators of energy supply in Ukraine

Problems in the fuel and energy complex of Ukraine could be solved only with the help of comprehensive measures, in particular due to the use of environmentally sound renewable energy sources, of which the most wide spread and accessible for Ukraine are geothermal energy and ambient energy of the biomass and small rivers. Energy saving due to the use of renewable sources has become a vital necessity of the time, as it furthers solving of not only energy supply problems, but also many environmental and economic problems to ensure national income growth.

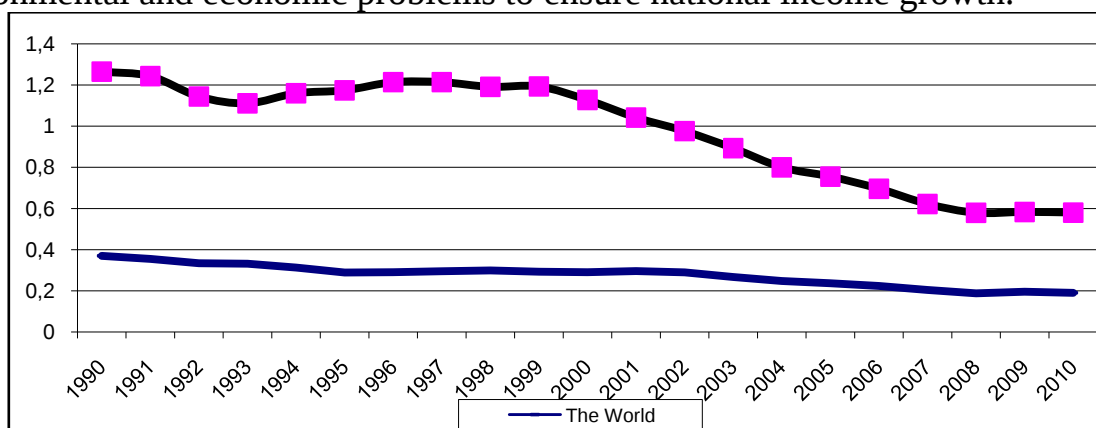


Fig. GDP energy content in Ukraine and countries of the world (kg.o.e./\$)

Ukraine has high energy content as compared to other countries in the world. It dictates the need to increase energy saving level, including renewable energy. Thus, in 2005, TPES/Population index for Ukraine was 2,74, and TPES/GDP – 3,37. The respective indices of power supply and use efficiency in the EU member states were 3,99 and 0,19 respectively. It means that national economy and households are too power-intensive, though natural conditions in the EU are close to Ukrainian. Such a gap in the energy supply can be removed by the development of alternative energy. In January 2011 the abovementioned indices (TPES/GDP and TPES/GDP) were 3,05 and 4,25 respectively. It means that power consumption in Ukraine is growing.

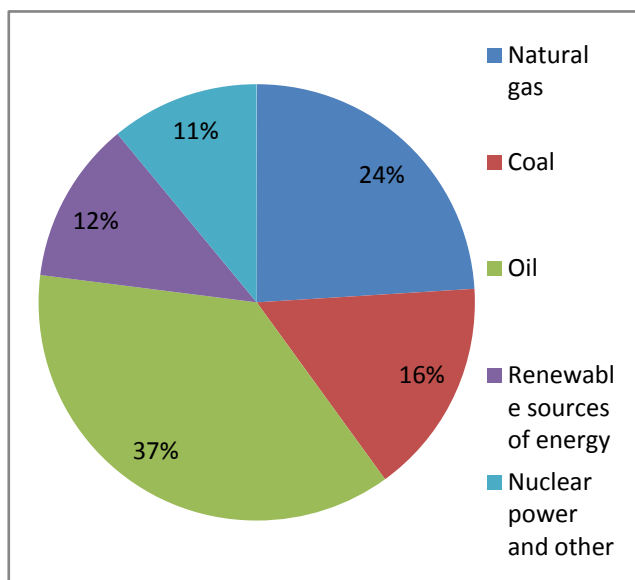


Fig. Breakdown of total primary power consumption in the European countries, 2010

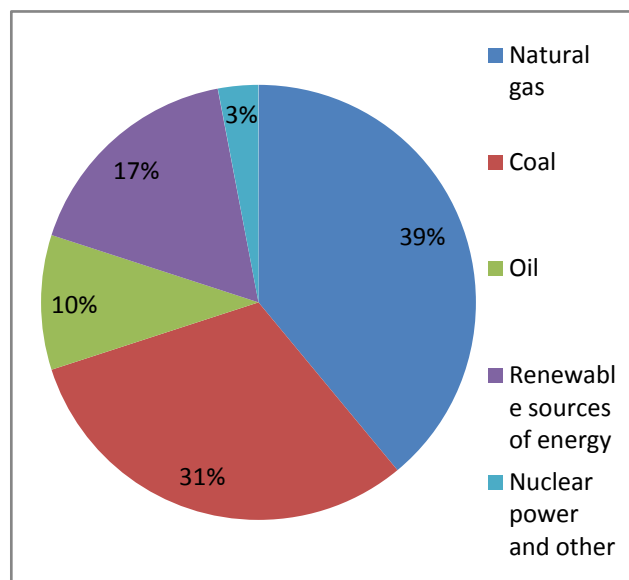


Fig. Breakdown of total primary power consumption in Ukraine, 2010

Total primary energy consumption in the European countries and Ukraine has been broken down by energy types. In the figure above we can see that the share of renewable energy consumption in Ukraine is lower than in Europe while energy-intensity is higher.

The share of the natural gas, coal and nuclear energy in the Ukrainian national energy balance is much higher than that at the European and global levels; and the use of oil and renewable energy sources does not meet global indicator.

According to specialists' assessment, global economic potential of renewable energy sources is about 20 billion tons annually, which is 2 times higher than the annual production volume of the entire global organic fuels.

Oil and gas make up more than 60% in the total balance of primary energy consumption in Ukraine. Over the past years domestic production satisfied the country's need for the natural gas at 24-27%, and oil – 17-20%.

Use of alternative fuel types, including industrial, shale and natural gas from small nonconforming gas, gas condensate and oil deposits, accompanying gas, coalmine methane is an important element of sparing of the fuel and energy resources in Ukraine.

One of the important measures to develop renewable and unconventional energy in Ukraine was the elaboration the Program for state support to the development of unconventional and renewable energy sources, and small-scale hydro-and thermal energy" approved by Resolution of the Cabinet of Ministers of Ukraine No.1505 of December 31, 1997, which provided for their intensive development. However, the level of actual replacement volumes of conventional fuel and energy resources due to implementation of unconventional and renewable energy source (URES) based equipment is much lower than the plan – only about 11% of planned performance has been accomplished. It is explained by limited financial provision and lack of clear strategy and stimulating policy for the renewable energy in Ukraine. For the time

being, practical use of renewable energy makes up only insufficient share in total energy consumption of Ukraine (about 1 %).

Programs for energy saving and renewable energy in Ukraine are supported by regulatory legal acts including:

- Energy saving laws;
- Interstate standards;
- Harmonized foreign standards;
- State standards for renewable energy sources;
- Sectoral guiding documents.

As already mentioned, Ukraine is currently implementing the state-level target energy efficiency program for the period of 2010-2015, which implementation corresponds to the stages of implementation of Ukraine's energy strategy for the period till 2030 as the core document in the energy efficiency and energy saving sphere.

State target economic program for energy efficiency is intended to be the basis for improvement of the state administration and regulation mechanism in the sphere of energy efficiency, energy saving and alternative energy; optimization of the structure and scope of energy consumption; optimization of the state's energy structure in the sphere of energy efficiency and renewable energy by way of implementation of economic and financial mechanisms for realization of energy technologies, reduction in technological cost and loss of energy resources as a result of equipment modernization and reconstruction, introduction of modern energy efficient technologies.

Renewable energy sources for realization in the territory of Ukraine call, first of all, for the technical and technological support. The latter, in turn, requires financial resources. Therefore, unconventional and renewable energy sources represent today an important line of modernization of the fuel and energy complex for the development and introduction of the energy efficient equipment and resource saving technologies using local resources. Besides, they ensure energy and environmental security of the country.

Following is the list of major reasons for the use of renewable energy sources):

- exhaustible conventional energy resources of the fuel and energy complex);
- ensuring environmental security;
- conquering of global markets for unconventional energy equipment;
- saving own energy resources;
- higher rate of consumption of raw materials for non-energy use of hydrocarbons.

EU directives provide that by 2020: the share of renewable power sources will grow from today's 6,5% to 20%; the share of bio-fuel in the total consumption of transport fuel will grow to 10 %.

A considerable share of global renewable power industry uses the energy of wind. Leading countries of Europe have made wind energy one of the largest power suppliers. The share of wind energy in the power energy supply is as follows: Denmark – 20%, Portugal – 15%, Spain – 14%, Germany – 9%. Average operating hours of a wind-driven power plant per year in the nominal load mode varies from

country to country and depends heavily on wind conditions. In the leading European countries this indicator for the onshore wind driven power plants (year average) is as follows: UK – 2100 hrs, Denmark – 1750 hrs, Germany – 1314 hrs.

According to classification of the global wind energy association, Ukraine ranks 37 among 82 countries in terms of wind-energy development leaving behind Luxembourg, Latvia, Russia and other countries. Prsnovodnenska wind power plant (Southern Crimea) demonstrates the best operational performance with the average annual hours in the nominal load mode about 1180. As of January 1, 2011, the total installed capacity of wind power plants registered in Ukraine reached 95,32 MW.

Experts of the International Energy Agency (IEA) assess that with the current trends of technology development in place solar energy industry will be able to generate about 9000 GW h/year as soon as in 40 years. This is 20-25% of the total energy needed capable of ensuring the reduction in CO₂ emissions at the rate of 6 billion tons annually.

Solar energy comprises the following spheres:

- Power generation using photoelectric converters and solar thermodynamic power plants (using steam turbine technology);
- Heat production for heat supply to the facilities using solar energy collectors and passive solar cell systems.

As regards solar power energy sector, over the past years production and introduction of photoelectric solar power plants have been widespread.

The major factor influencing the economic performance of thermal and power production using the energy of the sun is the cost of basic energy system equipment.

According to the European experts, by 2040 renewable energy sources might cover 50% of the global energy consumption. Suffice it to say that solar energy which arrives to the Earth every year, exceeds 100 times all the existing global stock of fossil fuel. The U.S. Environmental Protection Agency says the during the next 20 years renewable energy sources will be able to meet 1/3rd of the global energy demand as compared to current 1/17th. According to the forecast of the European Commission, the demand to power energy in Europe by 2030 will increase approximately by 400 GW and reach 1118 GW; by 2030 the import of oil will grow from 76 to 88%, and import of gas – from 50 to 81%.

In April 2009 Ukraine adopted Law of Ukraine No.1220-VI “On amending the Law of Ukraine “On Power Energy” regarding stimulation of the use of alternative energy sources” [2]. Subject to the abovementioned Law, “green” tariff will be introduced from January 1, 2030. The rate of “green” tariff for power energy from wind-driven power plants is calculated by way of multiplying of the retail tariff for the second class consumers for January 2009 by the special coefficient of the “green” tariff for each of the wind driven power plant facilities subject to their installed capacity. The “green” tariff coefficient for the electric power generated by wind-driven power plants whose installed capacity exceeds 2000 kW, makes up 2,1. The rate of “green” tariff for the electric power producers from wind energy in 2010 is 120 kopeck per 1 kW/hour (excl. VAT). The green tariff coefficient for the electric power generated by wind-driven plants put into operation (or significantly modernized) after 2014, 2019 and 2024 is cut by ten, twenty and thirty percent

respectively off its basic rate.

The abovementioned order of stimulation of wind power generation will be applied on condition that starting from January 2012 the specific gravity of raw materials, fixed assets, works and services of Ukrainian origin in the value of construction of the respective wind-driven power plant's facility generating power from the wind will not be less than 30%, and starting from January 1, 2014 – 50%. In recent years, the actual tariff on eclectic power has been growing significantly. Considering that the Law on the green tariff provides for its reduction, approximately in 2014 both tariffs will equalize. And thereafter the green tariff will even be lower than conventional.

According the data provided by the State Agency for Energy Efficiency, green tariff has been granted to 46 enterprises [3]. Six firms, of which five are subsidiaries of Active Solar Company, have been granted the tariff for wind power generation. The largest ones are “Vitroenergoprom”, “Wind park Novoazovsky” and state-run “Donuzlav wind-driven power plant. Other 34 companies enjoying the green tariff and generating power are small hydraulic power plants, and two companies generating power from biomass. The rate of green tariff varies depending on the specificity of each company's business. The rate of the green tariff is equal to the double average power energy tariff. In the process of tariff adjustment the UAH/EUR exchange rate is applied as of the day of their setting.

Additional condition for solar power plants is the use, starting from 2011, of solar modules with the specific gravity of Ukrainian materials and raw materials in the price being at least 30%, and from 2014 - 50%. The producers of “green” power can sell it to consumers at the contractual prices or in the wholesale electricity market through Energorynok state-run company.

For the time being, consumers do not buy power at the green tariff directly, because the state has not created any mechanism to offset the difference between green and normal tariffs. Consequently, the wholesale market, under the law on power energy, purchases all the power generated from alternative sources. Then the power is sold to energy supplying companies at the weighted average price.

The highest green tariff in Ukraine is set for power generated at wind-driven and sola power stations. It is particularly due to the cost of the equipment. The rate of the green tariff in Ukraine is as good as the same tariffs in many European countries. For example, in July the green tariff in Ukraine for the power generated by solar power stations makes up UAH 5,34 per kW/hour, i.e., 0,47 eurocent at the NBU exchange rate. Meanwhile the same green tariff in Germany was set at 0,29-0,55 eurocent per kW/hour, and in Austria 0,29-0,46 eurocent, in Italy - 0,36-0,44 eurocent, in Spain - 0,32-0,34 eurocent. In July 2011 Ukrainian wind-driven power plants sold green power at UAH 1,29 per kW/hour or 0,11 eurocent. In Germany it costs 0,13-0,15 eurocent, in Austria - 0,073 eurocent, in Italy - 0,3, and in Spain - 0,073 eurocent.

See below the potential of the renewable energy industry in Ukraine broken down by types of power generation.

The potential and specific weight of major renewable energy sources in Ukraine

№	Renewable energy sources	Electric capacity of the renewable energy sources, billion, kW/hour per year	Specific weight in the total volume of renewable energy, %	Volume of renewable energy, million t./year	Specific weight in the total volume of hypothetical fuel of renewable source, %
1.	Wind energy	79.8	13.6	28	26.9
2.	Solar energy, including:	38.2	6.5	6	5.8
2.1.	– electric	5.7	1.0	2	1.9
2.2.	– thermal	32.5	5.5	4	3.8
3.	Small-scale hydropower	8.6	1.5	3	2.9
4.	Bioenergy, including:	178	30.3	40.0	29.8
4.1.	– electric	27	4.6	10.3	9.9
4.2.	– thermal	151	25.7	20.7	19.9
5.	Geothermal energy	97.6	16.6	12	11.5
6.	Ambient energy	146.3	24.9	18	17.3
	Total	586.7	100	104	100

Territorial factor is the main external cause determining the prospectiveness of development of the certain line of renewable energy. Technological factor ranks second because this sphere is science-intensive and requires specific knowledge and skills.

References

1. Заможне суспільство, конкурентоспроможна економіка, ефективна держава : ПРОГРАМА ЕКОНОМІЧНИХ РЕФОРМ НА 2010 – 2014 роки. - Комітет з економічних реформ при Президентові України / Електронне жерело: http://www.president.gov.ua/docs/Programa_reform_FINAL_1.pdf

2. Закон України № 1220-VI «Про внесення змін до Закону України «Про електроенергетику» щодо стимулювання використання альтернативних джерел енергії» / Електронне джерело: <http://zakon4.rada.gov.ua/laws/show/1220-17>

3. State Agency for Energy Efficiency: <http://saee.gov.ua/archives/2279>.