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MARKETING STRATEGIES AND PROGNOSES OF DEVELOPMENT OF THE RENEWABLE ENERGY MARKET IN UKRAINE

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ABSTRACT

Recently, unconventional and renewable energy sources have become one of the most important criteria of energy security in the world. in the past, unclaimed ways of getting energy are actual now. Efficient energy conservation can not be imagined without the use of alternative energy sources. the use of renewable energy significantly improves the security of energy supply, improves the social and economic situation.

In Ukraine, the main types of energy resources are coal, oil, gas, atomic and water energy. Recently, the search for alternative, environmentally safety energy sources have been actively pursued. Partial replacement of traditional types of fuel to biological fuel improves energy security of the country. in addition, it contributes to Ukraine's compliance with the emission reduction requirements of the Kyoto Protocol to the UN Framework Convention on Climate Change. it also provides an opportunity to obtain a guaranteed market for agricultural raw materials.

Using the strategy of deep penetration into the market enables to produce and sell more energy to consumers from already existing renewable sources in the developed markets and to increase sales volumes, market share and profits. the market development strategy implies an increase in sales due to the exit of enterprises into a new market with available goods. it encourages the use of hydro energy resources for small rivers, which in Ukraine is about 63 thousand. the result of the product development strategy is the development of bioenergy, that is, the production of electric or thermal energy from new types of raw materials. to ensure the development of renewable energy, diversification of energy supply sources plays an important role by growing new, perspective energy crops.

1. INTRODUCTION

The main task and important condition for the further development of energy in the world is the use of such types and sources of energy that would not disturb the balance in nature and replace the exhaustive reserves of organic fuel. Such sources of energy include solar radiation, wind energy, small rivers, tides, waves, biomass (wood, livestock, poultry,

food, logging, forestry, woodworking and pulp and paper industry), geothermal energy, as well as dissipated thermal energy (warm air, ocean water, seas and reservoirs). These are renewable energy sources (RES) that are continuously or periodically occurring in the environment and are an alternative to fossil fuels. the most developed types are wind power, bioenergy, solar power [1].

Ukraine relates to import-dependent energy resources of the countries, therefore, the development of renewable energy is an important factor in increasing its energy security. Reducing the import of expensive energy sources will reduce Ukraine's dependence on other states and less tangible impact of the energy crisis. in this regard, the study of the state and development of the market for renewable energy sources in Ukraine is very relevant.

In recent years, Ukraine has been following world trends and developing clean energy. to produce this new type of product there are the necessary resources and sufficient potential. Ukraine was included in the country's ranking on the attractiveness of alternative energy development published by Ernst & Young. the company's research notes that Ukraine has great potential for the development of renewable energy sources, and with the new Green Tariff Law adopted in 2009 - and favorable economic conditions for renewable energy investments. at the same time, Ukraine has the most energy-intensive economy. the energy intensity of the national income is 4-6 times higher than that of the USA, Japan and the countries of Western Europe. Consumption of conditional fuel per capita is about 6.5 tons, while in the above-mentioned countries - 4.2-5.5 tons [2].

Ukraine has significant resources for the development of renewable energy, including rivers with a powerful hydrological energy reserve, mountains and seas for the installation of wind turbines, a long sunny period of the year, and significant agricultural areas for the cultivation of biofuel crops. Combined with the favorable legislation and the use of marketing tools for the management system for renewable energy, the possibilities of ensuring the fulfillment of the tasks set in this area were increased. in addition to assessing the state of development of renewable energy, the goal is to develop marketing strategies for the development of the market for renewable energy. Marketing strategies are givenan important place in the management system in this area of activity to achieve the goals. the choice of a marketing strategy is carried out from among known practices of marketing activities of enterprises. the main objective of the strategy is to increase sales volumes, market share and profit.

Particular attention is paid to aspects such as the choice of a marketing strategy. However, in spite of positive results and certain achievements, energy-efficient policies in Ukraine are still not fully realized.

2. MATERIALS AND METHODS

The use of renewable energy sources is considered as one of the most promising ways to solve the growing problems of energy supply. the availability of an inexhaustible resource base and ecological cleanliness of renewable energy sources are decisive for their benefits in the face of limited resources of organic fuel and increasing rates of environmental pollution.

Energy sources are the basis of the independence of any state. This is especially true for Ukraine, whose industry spends 4-5 times more energy than any country in Europe, which makes products not competitive. Taking into account the low natural gas reserves in Ukraine, the economical use of electricity and the introduction of alternative sources is relevant.

In the world there is a steady tendency towards the development of renewable energy sources and the gradual replacement of their traditional generation. Regarding the development of renewable energy, Ukraine is guided by best international practices. Close cooperation with foreign countries was establishing. Memorandums of cooperation with Finland, Denmark, Slovenia, Slovakia were signed. the experience of the UK, one of the leading, economically powerful European countries is important in the issue of implementing renewable energy projects. Israel's innovative experience in this area is also very useful and necessary [3].

In 2013, the Ukrainian-Polish Center for the Development of Technologies for Renewable Energy and Energy Efficiency implemented a cooperation project between the Embassy of the Republic of Poland in Ukraine and the National Technical University of Ukraine "Kyiv Polytechnic Institute". the main goal of the project is to create and support the activities of the joint Ukrainian-Polish Center for the Development of Technologies for Renewable Energy and Energy Efficiency. it is the educational base for the study of modern technologies and their applications [4].

Ukraine need to take comprehensive measures to ensure the maintenance of environmentally sound practices to address the complex energy issue. Renewable energy sectors such as wind, solar, geothermal energy, biomass and small hydroelectric power stations are the most likely to be developed in the country. Proper structure of renewable

energy will reduce a significant part of the total demand for natural gas consumed in power industry. Biogas can also be used in thermal power engineering.

The adopted Law of Ukraine "On Energy Saving" defines the legal, economic, social and environmental bases of energy saving. the law refers to unconventional sources of energy of periodic action, in particular, the energy of the sun, the Earth, the energy of the seas, oceans, rivers. Attention is also drawn to the need to educate the population in the field of energy conservation. Existing alternative energy sources, unlike traditional ones, which include thermal, hydraulic and nuclear power plants, are environmentally safe, have no harmful waste polluting the atmosphere, land, water, and therefore they are the future.

Increasing the use of renewable energy in the energy balance of Ukraine is one of the most important directions of its energy policy. to achieve the set goals, an important place in the management system in this area of activity is given to marketing strategies. Marketing strategy is a generalized model of the long-term course of action on marketing activity of the enterprise, which is reflected in the complex of measures that it carries out in accordance with the developed strategic marketing plan in the form of a set of defined prospective goals and methods of their realization through the use of resources. That is, it is a scenario of the company's behavior regarding the positioning of its own product in the target markets, its promotion and service demand for the product.

Marketing strategy is a program of the activity of the enterprises in the target markets, which determines the principal solutions to achieve the objectives. This will increase the level of diversification of energy sources, which will contribute to strengthening the energy independence of the state. in addition, the decline in the use of traditional fuel and energy resources will affect the improvement of the natural environment.

An estimation of the dynamics of the development of renewable energy sources for the period 2010-2016 was made using statistical methods of research, and the potential for renewable energy generation from renewable sources up to 2020 was calculated using correlation analysis and using the Excel table editor.

3. RESULTS and DISCUSSION

3.1 ASSESSMENT OF THE STATE OF DEVELOPMENT OF RENEWABLE ENERGY SOURCES

In the world there is a steady tendency towards the development of renewable energy sources and the gradual replacement of their traditional generation. as of the end of 2016, the renewable energy sector in Ukraine has 170 companies and 291 energy facilities already. 132 solar power plants, 125 small hydroelectric power stations, 16 wind power plants (WPPs) and 18 power plants producing electricity from biomass and biogas are among the energy objects (Fig. 1). in 2016, the largest increase was shown by solar power - 36 new entities and 47 new power generating facilities.

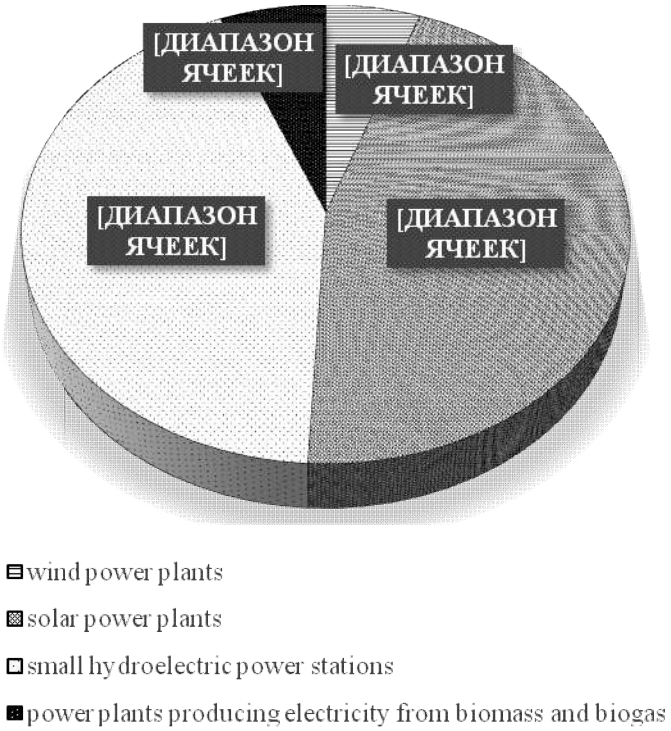

Fig. 1. Amount of electricity producers in Ukraine with RES, units

In recent years, there have been a steady increase in installed capacity of renewable energy sources. 120.6 MW of power was put into operation, of which 99.1 MW - solar and wind power facilities, 11.6 MW - small hydropower objects and those producing biomass and biogas energy were built about 3 MW each. the average annual capacity growth rate is 31%. This enables consumers to produce and sell more energy from renewable sources and to increase sales volumes, market share and profits.

The installed capacity of renewable energy sources tends to increase annually, while the volumes of electricity production in certain periods were decreased [3] (Table 1).

The conducted research shows that the dynamics of solar power generation is the largest among renewable energy sources in Ukraine and there is a tendency for annual growth of solar power plants capacity. the installed capacity of solar power stations increased from 3 MW in 2010 to 530 MW in 2016. the volume of electricity generated by solar power plants during this period increased from 0.5 to 492 million kWh. at the same time, the average number of hours of work of stations at full capacity in recent years have decreased to 928 hours per year, which corresponds to the utilization rate of installed capacity at 10.6%. According to the research data, the theoretically possible potential of solar energy in the territory of Ukraine is 63.01 t. o. e. / year. the technically achievable potential is 29.63 t. o. e. / year, or 33.77 kWh / year. the use of solar radiation is expedient for the development of thermal and electric energy and possible throughout the territory of Ukraine.

Tab.1. Dynamics of capacity and production of electricity from renewable sources in Ukraine [3]

	Renewable energy facilities	2010	2011	2012	2013	2014	2015	2016
1	Installed capacity of solar power plants, MW	3	188	372	748	411	431	530
2	Production of electricity by solar power plants, million kWh. *	0,5	30	334	563	485	475	492
3	Capacity of wind power plants, MW	77	146	194	334	426	426	437
4	Electricity production by wind power plants, million kWh. *	49	89	257	637	1172	974	925
5	Capacity of small hydroelectric power stations, MW	62	71	73	75	80	87	90
6	Electricity production by small hydroelectric power plants, million kWh. *	193	203	172	286	251	172	189
7	Capacity of biomass power plants, MW	4	4	6	17	35	35	39
8	Electricity production by biomass power plants, million kWh *	-	10	18	32	60	77	80
9	Capacity of power plants on biogas, MW	-	-	-	7	14	17	20
10	Power generation by biogas power plants, million kWh *	-	-	-	5	40	64	89
	Production of energy from renewable sources, million kWh. (lines 2 + 4 + 6 + 8 + 10)	242,5	332	781	1523	2008	1762	1775

In terms of ecology, solar power during operation does not have a significant negative impact on the environment, and therefore may have very little restrictions on its implementation. the projected reduction in carbon dioxide emissions in 2020 for solar energy will amount to about 5619 thousand tons. Regarding social characteristics, it should be noted that the quantitative forecasting of the creation of additional jobs is about 3.46 thousand people.

At present, wind power is the most advanced type of renewable energy in Ukraine. the dynamics of wind power generation capacity growth in 2010 - 2016 was stable and in 2016 the wind power capacity was at 437 MW, compared with 77 MW in 2010. During this period, the country had been installed more than 11 MW of new capacity. Electricity generation at wind power plants decreased somewhat and by the end of 2016 it was 925 million kWh, which corresponds to 2117 hours of full capacity. the installed capacity utilization rate is 24.2%.

In the small hydropower sector, installed capacity is growing at a slow pace. During the last four years, only 17 MW were put into operation. the highest level of electricity generation was achieved in 2013, which amounted to 286 million kWh. in connection with the decrease of water level in the rivers, the generation of electricity by small hydroelectric power stations have decreased over the past 3 years from 251 to 189 million kWh. as of the end of 2016, performance indicators remain low - 2,100 hours of full-time operation, which corresponds to a utilization rate of 24%. the advantage of small hydropower is small capital expenditures, cheap and environmentally friendly energy, availability of sufficient scientific and technical and production potential in the country, and experience in using equipment.

The next sources of alternative energy are biomass and waste. Ukraine has significant potential for both of these resources, because in a country with developed agriculture, waste can well serve as a raw material for biomass and biofuels. Therefore, in order to reduce the dependence on energy imports, bioenergy is developing here, i.e. the production of electricity or thermal energy from biomass. in 2014, 18 MW of new power generation from biomass was put into operation. However, biomass projects have almost never been implemented in the last two years, and in 2016 only one 3.5 MW power plant was introduced. Production of electricity from biomass increased by 10 times during the investigated period. in 2016, biomass stations worked at a total capacity of 2051 hours, which corresponds to a utilization rate of 23.4%.

Positive results in the production of biofuels are obtained by Ukrainian producers. So, the company "Myronivsky Hliboproduct" is engaged in the processing of sunflower, the product of processing which is sunflower husk granular. Using sunflower husk as a solid biofuel of high quality, the company 100% satisfies its own needs for biofuels, and also sells it to consumers both in the Ukrainian market and abroad [5].

The «Myronivsky Hliboproduct» company in 2017 presented a new project on the construction of a biogas plant in a poultry farm. the total capacity of the power plant

will be 20 MW. the first stage of the electric power station with a capacity of 10 MW willbe introduced in 2017-2018, the second also with a capacity of 10 MW - in 2019-2020. the idea of the project is the complete utilization of chicken litter and the production of biogas from it for electricity generation. the total investment for this project is up to 50 million dollars. This station will replace 87 million m^3 gas per year [6].

The production of alternative energy sources based on the processing of household waste is carried out by a separate subdivision of PJSC "Kyivenergo", a waste recycling plant "Energia" in Kyiv, which processes about 230 tons of solid waste per year. as a result of garbage processing, more than 150 thousand Gcal of heat per year were produced. it is used for heating and hot water supply in a residential area, which saves more than 30 million m^3 of natural gas per year [7].

By the end of 2018, the plant "Energy" will be modernized, which will result in an increase in the utilization of solid domestic wastes up to 20% (from 235 to 280 thousand tons per year), and heat energy production - up to 60% (to 360 thousand Gcal / year). Thus, the plant "Energia" will be able to provide more than 300 high-rise buildings (120 thousand apartments) with hot water and hot water in the winter, and in summer with hot water - 700 (about 280 thousand apartments). in total, in 2015-2018, investments in the development of the enterprise will amount to 210 million UAH.

As a source of energy, biogas is also using, which obtained from biomass. the growth of power facilities that produce electricity from biogas started in 2013, when the first 7 MW were installed. Over the past 4 years, 20 MW of biogas power was put into operation. Electricity production at biogas stations is steadily increasing. According to the results of 2016, the stations completed a total capacity of 4450 hours, which corresponds to a utilization rate of 51% [3].

Geothermal energy is a rather promising source of energy for Ukraine. the most favorable conditions for the use of geothermal waters exist in Zakarpattya, but even in these areas, no more than 2% of the potential is used. Geothermal water can be used for heating and hot water supply. Promising direction is the construction of Geotechnologies, which are environmentally friendly and cost effective with low payback periods (less than 5 years) [8].

3.2 FORMATION OF MARKETING STRATEGY FOR RENEWABLE ENERGY MARKET DEVELOPMENT

A marketing strategy is a fundamental medium to long-term solution with appropriate ways and means that guide the targeting and direct individual marketing efforts to achievethe goal. They are global areas of activity that require specificity through planning marketing activities and is a kind of plan according to which the company specifies how it will succeed, that is, the production and marketing of products in a particular market.

The choice of marketing strategy is carried out from among known practices of marketing activities of enterprises. the main objective of the strategy is to increase sales volumes, market share and profit. the type of marketing strategy depends on which product is manufactured - the new product in the company'snomenclature, whether it is already available, which the company already manufactures and sells, and from the market - existing, that is, the one in which the company is already operating or new for that market enterprise. According to this model there are four alternative strategies aimed at marketing objectives:

- strategy of deep penetration into the market;
- strategy of market development;
- product development strategy;
- diversification strategy [9].

3.2.1 A STRATEGY OF DEEP PENETRATION INTO THE MARKET

The strategy of deep penetration into the market implies an increase in sales volume, market share and profits on existing markets due to available goods. This strategy is effective when the market is still expanding or not saturated. There are two ways to achieve greater market penetration. the first option for realizing this goal is available consumers. in this case, it is about increasing their desire to use the product offered. the second direction is attracting new consumers who have not used this product before. a firm can also penetrate into the market, as well as by persuading consumers to use more goods.

One of the most renewable energy industries in the world is solar power. it is based on the transformation of energy emitted by the Sun into other forms of energy, in particular, into electricity or heat. Solar energy is extremely environmental, since it does not have any

impact on the environment. with the help of solar energy, part of the electricity can be provided by private sector residents. For this purpose, photoelectric elements are used which are located on the roof of the house. in private homes for the production of heat in the system of hot water used solar collectors.

In the example of other European countries, Ukraine has a system of stimulating the development of renewable energy. it includes "green" tariffs denominated in euro, differentiated by type, capacity and terms of commissioning of energy facilities. by the end of 2016, the installed capacity of renewable energy facilities in Ukraine, working under the "green" tariff, amounted to 1118 MW of which 48% provide the power of solar power plants, the capacity of wind power plants is 39%, the capacity of small hydroelectric power stations is equal to 8% and 5% is the capacity of power plants producing electricity from biomass and biogas [3] (Figure 2). This allows using existing potential in the country to increase the production of energy from renewable sources, which ensures a deep penetration of the market.

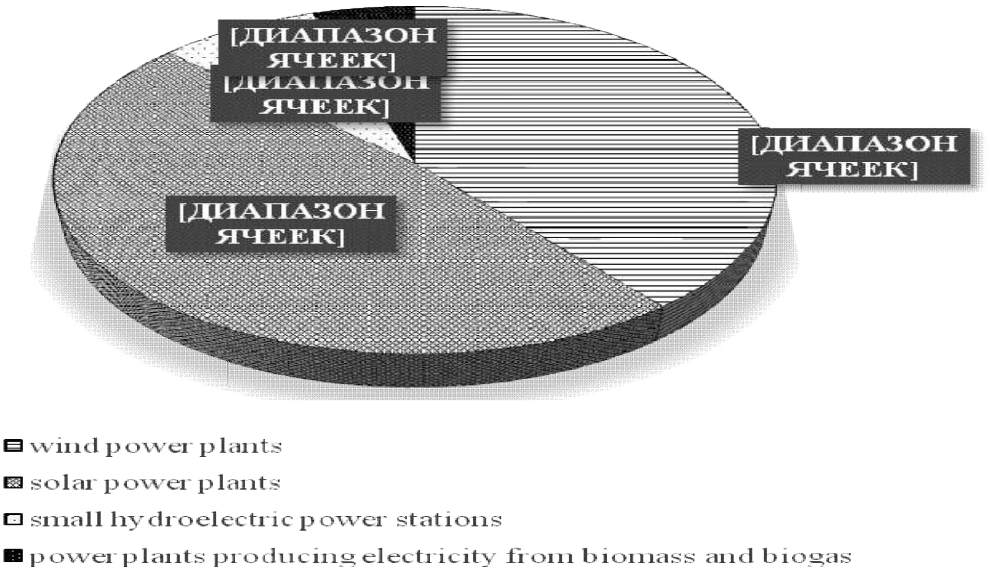

Fig. 2. Structure of the capacity of the objects of renewable energy sources operating at the "green" tariff in Ukraine, MW, % [3]

The strategy of deep penetration of the market also involves the intensification of advertising activity in order to attract new consumers into the consumption of goods. to familiarize producers, consumers and investors with the potential of their renewable energy potential and its positioning, Ukraine participates in specialized exhibitions.

In November 2016 the IX International Specialized Exhibition "Energy Efficiency, Renewable Energy - 2016" was held in the International Exhibition Center of Kyiv. the exhibition was attended by 97 enterprises, who presented at the exhibition their

work.in general, the exhibition demonstrated the products of producers of Ukraine, Australia, Belgium, Great Britain, Israel, the Netherlands, Germany, Turkey, France, Japan and others. the purpose of the exhibition is to find ways to reduce energy costs, implement energy saving policies and energy saving measures in all sectors of the economy, develop alternative energy sources, attract investment in renewable energy, and create a competitive market in this area.

In 2017, Ukraine became an honorary participant in the large-scale International Specialized Exhibition EXPO 2017. "Energy of the Future", which took place in Kazakhstan. at the national stand there were Ukrainian startups: Ukrainian wind generator, solar thermal concentrator, blinds producing electricity, and a passive house sample that consumes minimal energy. Also, developed renewable energy projects that are promising for investment attraction were demonstrated.

Modern equipment and materials in the field of energy efficiency are presented in all directions of renewable energy: solar, wind, hydropower, energy crops growing, production of thermal and electric energy from agricultural waste, etc. Participation of Ukraine in the exhibition gives an opportunity, on the international level, to present potential in the field of renewable energy, as well as to attract potential investors to work in Ukraine [10].

3.2.2 MARKET DEVELOPMENT STRATEGY

The market development strategy is also a form of increase in the volume of production and sale of market share and profit, but the penetration of the company into new markets is due to the discovery of new areas of use of the product, the emergence of new segments of the market, the entry of new territorial markets and the offering of goods through new channels of sales. This strategy involves an increase in sales due to the exit of enterprises into a new market with the available goods. in the renewable energy market, it is expedient to use two alternatives, including access to new geographic markets and targeting new market segments.

In order to encourage the generation of electricity from renewable sources, in 2008 a "green tariff" program was introduced in Ukraine. Under this project, the state undertakes to buy at the stations operating on renewable energy sources, electricity at the "green tariff" by 2030. This creates conditions for the coverage of new segments of the energy market.

In order to stimulate the implementation of "green" projects, the Law of Ukraine of 04.06.2015 № 514-VIII was adopted, which improved the system of "green tariffs".as a result, already in 2016, in Ukraine, 120 MW of new facilities are installed working under the "green" tariff, which is 4 times more than in 2015.

The validity of the adopted law is confirmed by the fact that it has become a powerful incentive for the population to engage in alternative energy sources. Recently, there is a positive dynamics of demand for solar panels by the population. Since the beginning of this Law, the demand of "solar" electricity has increased by 40-50% quarterly and sometimes by 70%. More than 1,300 families actually fully meet their energy needs due to the energy of the sun already. in addition, households that have installed solar panels in 2017 can realize the surplus of generated electricity[11].

In addition, Ukraine has powerful small hydro energy resources, which are about 63 thousand. Their potential is up to 28% of the overall hydropotential of Ukraine. Small hydropower allows the use of significant hydropower potential of small rivers and tributaries, water supply systems, and irrigation with the electricity supply to the grid. Its development makes it possible to develop new geographic markets and solve energy supply problems in remote rural areas, in particular the territories of Western Ukraine, where micro and mini-hydroelectric potentials could become the basis for their energy supply. the advantages of small hydroelectric power stations include a relatively small amount of investment and a short construction period, which allows you to accelerate the profit, provide a minimum impact on the environment, reliability and proximity to the consumer [2].

3.2.3 STRATEGY OF PRODUCT DEVELOPMENT

The strategy of product development involves an increase in sales due to existing and new products in existing markets. One of the types of renewable energy along with solar, hydro and wind energy is bioenergy. This is the production of electrical or thermal energy from biomass ie from waste from plant growing, animal husbandry, forestry, from the organic part of industrial and domestic waste. For Ukraine, bioenergy is one of the strategic directions for the development of the renewable energy sector, given the high dependence of the country on imported energy resources, first of all, on natural gas and the high potential of biomass available for energy production. Unfortunately, the pace of bioenergy development is still far behind the European ones. Among alternative energy sources, biomass is only about 2%,

but it has a great potential and is one of the most promising sources of clean energy in Ukraine.

The advantages of using the potential of biomass and household waste are quite significant, as raw materials in the form of garbage and various kinds of waste are available practically throughout the territory of Ukraine. it is also important that modern biofuel plants are relatively compact and can use different types of raw materials. This allows them to be located in close proximity to objects that are planned to provide energy or heat at the expense of these resources. Biomass plays a very important role as a source of thermal energy for the heating of private homes and cooking, especially in the countryside.

According to the international network REN21, biomass fuels in 2016 occupies 14% of the total world consumption [1]. by producing heat and electricity from biomass, in 2016 Ukraine produced biofuels that could replace 3.7 billion cubic meters of gas in the energy sector. About two thirds of this volume Ukraine consumes for its own needs, the rest - it exports. According to the National Renewable Energy Action Plan by 2020 biofuels should be replaced by 7.2 billion cubic meters of gas. That is, it is approximately the amount that the state pours into its underground gas storage facilities each year in the winter [12].

Also, biomass can be used to produce biogas, where methane is 55-75%, which allows it to be used as fuel, generator gas, other types of gaseous fuels, which greatly facilitates the further process of transportation, use of fuel and replacement of traditional natural gas, which implies the application of the strategy product development.

The production of energy from biogas is not harmful to the environment, since it does not cause additional emission of greenhouse gas CO2 and reduces the amount of organic waste. Unlike wind and solar energy, biogas can be obtained regardless of climatic and weather conditions, and unlike fossil fuels, biogas in Ukraine has a very large renewable potential.

3.2.4 DIVERSIFICATION STRATEGY

An important task for Ukraine in increasing energy independence is the diversification of energy by increasing alternative fuels and using renewable energy sources. in the energy market, it is advisable to use a strategy of concentric diversification. This type of strategy implies that the company begins to produce new products that are technologically

or marketing-related with existing products. Thanks to the development of new technologies, in large numbers began to receive energy from biowaste.

The raw material for the production of solid biofuels is waste from the woodworking industry (sawdust, cod), straw of wheat and legumes, sunflower husk, and the like. Receipts of such raw materials are unstable and seasonal in nature, which adversely affects the performance of solid biofuel plants. Therefore, special attention should be paid to ensuring the raw materials of producers of solid biofuels due to the growth of new types of high-yielding trees and perennials, which will enable to receive a given quantity of biomass of the required quality annually. Growing of special energy crops is the result of diversification of sources of raw materials supply for energy production.

The soil-climatic conditions of most regions of Ukraine are favorable for the cultivation of perennial energetic plants capable of intensively transforming the sun's energy into the energy mix of biomass. These plants are not demanding soil fertility, do not require significant use of fertilizers and pesticides, prevent soil erosion, promote the preservation and improvement of agro-ecosystems and provide low cost of biomass. This allows cultivating energy plants on low-yielding lands.

New promising energy crops for Ukraine are miscanthus, and millet-like or spiced (Panicum virgatum). These perennial crops have been grown for many years in America, Canada and Western Europe as a source of bioenergy. Compared to other crops, miscanthus is the most efficient plant for the production of solid biofuels. in this plant, the yield of dry biomass is about 25 t / ha, high calorific value. One ton of dry mass of miscanthus is equivalent to 400 kg of crude oil, 1.7 tonnes of wood, 515 m3 of natural gas, or 620 kg of coal. the mescanthus stems have high energy value. the experience of growing the miscanthus in Ukraine shows that from the plantation of the miscanthus, two years after the laying, it is possible to collect annually 20-25 tons of dry mass per hectare over the next 20 years.

As a power culture for the production of solid biofuels, it is also advisable to use Panicum virgatum. Its insensitivity to the moisture content and nutrients in the soil, high natural resistance to diseases and pests, allows you to obtain stable yields of dry biomass on low-yielding land. Grown in the zone of insufficient humidification of Ukraine Panicum virgatum, has a height of 1.0 to 2.5 m, and the yield of dry biomass - from 7 t / ha to 14,2 t / ha depending on the varietal characteristics. the harvest of biomass Panicum virgatum can be harvested for 15 years. Among the trees whose biomass can be used on solid biofuels, the species of fast-growing willow species (Salix Viminalis) is best suited [13].

Biomass, which is grown regularly, and its use as a source of energy is not accompanied by a decrease in the number of green plantations in the region, is recognized as a renewable resource and is considered to be environmentally neutral, that is, has a zero balance of carbon dioxide emissions.

To ensure the diversification of renewable energy sources, it is necessary to support scientific and technological developments in new areas such as hydrogen energy, use of the Black Sea gas hydrates, etc.

3.3 RENEWABLE ENERGY DEVELOPMENT POTENTIAL

Ukraine has a significant potential for the development of renewable energy sources as technically feasible and economically feasible. According to the international agency IRENA, the technical potential of renewable energy sources is 408.2 GW (excluding large hydroelectric power plants). IRENA's REmap program consists of a series of renewable energy road maps for each country. Road maps of renewable energy development show how to increase the use of renewable energy sources and at the same time to obtain significant socio-economic and environmental benefits.

This paper assesses the economically feasible of using of renewable energy sources in Ukraine by 2030. Economic feasibility of its using was calculated on the basis of comparison of the cost of using renewable and traditional energy sources. it is forecasted that due to the proliferation of technologies and the scale of the effect, much of the technology of renewable energy sources are already now or will be cheaper by 2030 than traditional energy sources. According to REmap 2030, the share of renewable energy in total final energy consumption could reach 21.8%, and the total installed capacity of such power plants could reach 23.3 GW. According to the results of the analysis, proposals are made regarding how it is possible to maximize the potential of renewable energy sources. the biggest is the technical feasibility of using wind and solar power stations [14].

According to the IRENA International Renewable Energy Agency project, in Ukraine, the total technical potential of renewable energy production per year is over one million GWh. the largest share is wind power - almost 859 thousand GWh. (Fig. 3) [14].

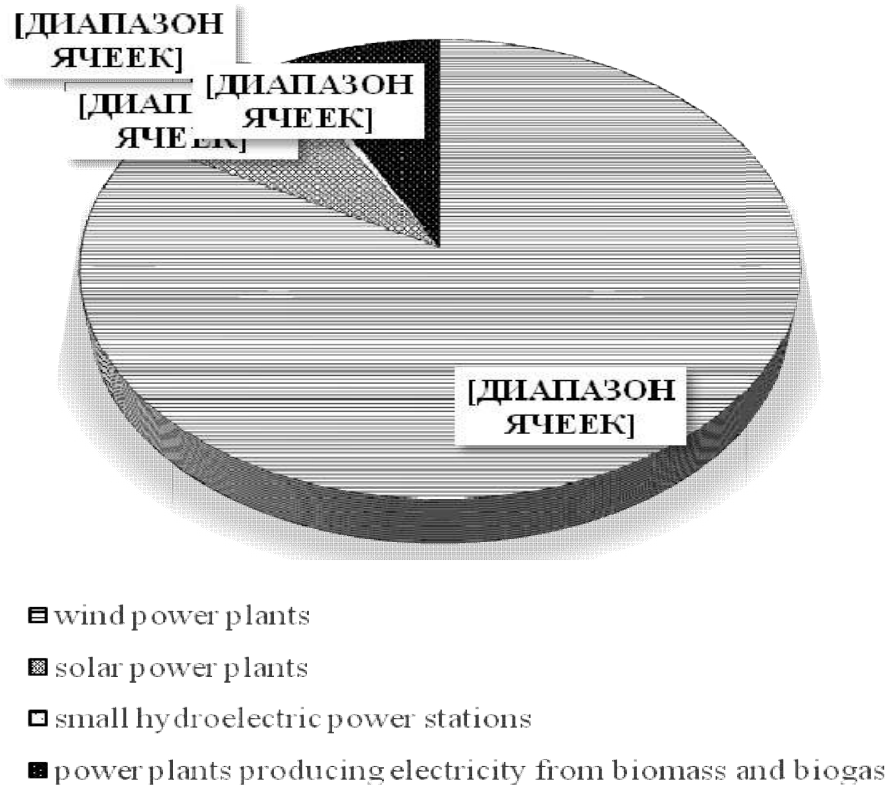

Fig. 3. Technical potential of electricity generation from renewable sources ths. GWh, [14]

Also, the energy strategy for the development of renewable energy sources in Ukraine is reflected in the adopted National Renewable Energy Action Plan for the period up to 2020. This is a system of measures to reduce the consumption of natural gas and the development of renewable energy. it identifies the economic and technological objectives and key actions that need to be taken to expand renewable energy production and use, and envisages the predominant development of renewable energy and energy efficiency. According to the National Development Plan, the technical feasibility of using wind and solar power stations by 2020 will be 2.3 GW. the total capacity of renewable energy facilities will be at 5.8 GW.One of the key goals of the National Plan is to achieve 11% of final consumption in 2020. This is to be achieved first of all through the use of wind and bio-power plants, which are projected to produce 5.9 and 4.2 thousand GWh. in 2020.

Annual CO2 emission savings can amount to 3.5 million tons [15] (Table 2).

Achievement of the goals envisaged by the National Action Plan for Renewable Energy Development should be supported by the development of possible scenarios for the development of the energy market. the main variants can be:

1. Increasing energy efficiency and energy saving by modernizing residential buildings and increasing their energy efficiency.

2. Increase of the share of renewable energy sources in the energy balance of Ukraine.
3. Diversification of energy supply sources

Tab.2. Estimation of potential and forecast of development of installed capacity of renewable energy sources in Ukraine, GW [15]

№	Renewable energy facilities	National Plan, 2020		Renewable Energy Institute of the National Academy of Sciences of Ukraine, 2030.	
		established power, GW	Energy produced ths. GWh	established power,ГВт	Energy produced ths.ГВт*год
1	Wind power plants	2,3	5,9	10,0	30,0
2	Solar Power Plants	2,3	2,4	4,0	4,9
3	Small hydroelectric power plants	0,2	0,3	0,3	0,6
4	Bio-power plants	1,0	4,2	1,6	7,0
5	Geothermal power station	0,02	0,1	0,5	3,0
Together		5,8	12,9	16,4	45,5
Annual saving of CO2 emissions, million tons		-3,5		-10,0	

Source: Data of the National Renewable Energy Action Plan for the period up to 2020.

The full implementation of the provisions of this National Action Plan will enable Ukraine to increase its energy independence by increasing the share of energy from renewable sources in the overall energy consumption of Ukraine. in addition, the National Action Plan defines an intermediate target to reduce energy consumption by 5% to 2017. the achievement of these indicators is planned through the implementation of measures in the four main sectors of final energy consumption - the residential sector, which is expected to have the greatest effect, the service sector, industry and transport. Consequently, independence from traditional energy can be achieved by reducing overall energy consumption, implementing renewable energy sources and diversifying energy supply sources.

According to the calculations of the Institute of Renewable Energy of the National Academy of Sciences of Ukraine, the largest potential for development have wind power, the installed capacity of which can reach 10 GW in 2030, and annual production of electricity - 30 ths. GWh. Bioelectric power plants can increasecapacity to 1.6 GW, and energy production up to 7 ths. GWh. Under the condition of fulfillment of the forecast of the institute of renewable energy, the annual saving of CO2 emissions can reach 10 million tons.

According to the conducted research and assessment of the state of development of renewable energy for the period 2010-2016. (see Table 1), the forecast of the potential for the development of energy from renewable sources was made. Using the Excel spreadsheet editor, a linear trend graph is obtained that illustrates the relationship between periods and energy production and th e determination coefficient (R2), which is calculated automatically. in the presented graph, R2 = 0,829, which classifies the connection between the values as high, that is, the constructed model is adequate to the actual data (Fig. 4).

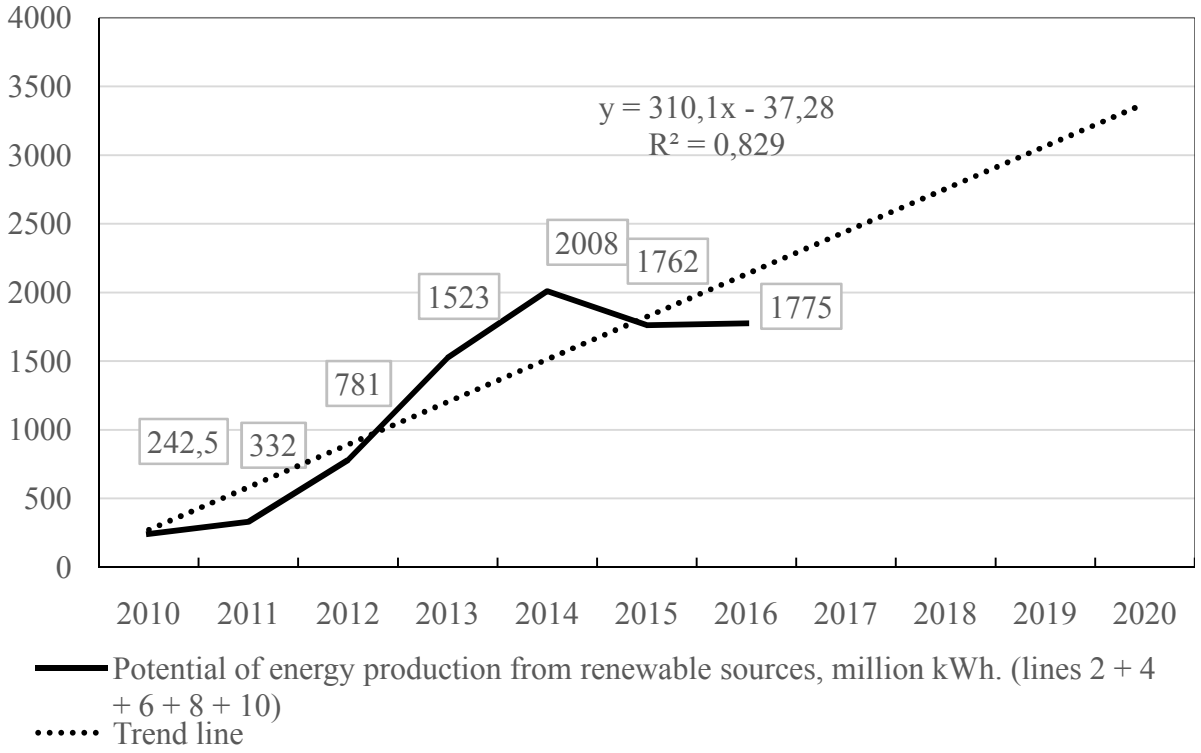

Fig.4. Prediction of energy production from renewable sources in Ukraine*

*) calculated by the author

Taking into account the obtained trend equation y = 310,16x - 37,826, the forecasted indicators of energy production from renewable sources for 2017-2020 were calculated, according to which production in 2017 will be at 2,444 million kWh, in 2018 - 2754,2, in 2019 - 3064,3, and in 2020 - 3374,5 million kWh. Compared to 2016, projected growth in 2020 will be 58% (Table 3).

The factors contributing to the development of renewable energy are further reducing the cost of technology and the cost of renewable energy power plants. by 2025, a significant reduction in the cost of installing power plants is projected, which will reduce costs for

the installation of solar power plants by 57% over the past 10 years, and the cost of installing wind power plants by 13% [3]. These measures meet the requirements of the marketing strategyof deep penetration into the market. the necessary elements that should become the pledge of renewable energy development in Ukraine should be the stabilization of the economic situation and the continuation of existing economic incentives in the form of "green" tariffs. Taking into account these conditions, and taking into account the existing technical potential, Ukraine will be able to provide almost half of the country's electricity needs already in 2030.

The study showed that Ukraine is interested in the development of renewable energy sources and the gradual replacement of their traditional generation, as it relates to import-dependent energy from countries. However, in addressing this problem, the marketing tools for the development of the energy market are not yet sufficiently used.

For the production of energy from all types of renewable sources in each region of Ukraine there are the necessary resources. at the same time, there are many problems facing the development of alternative energy, in particular:

1. Low confidence in the system of stimulating the development of renewable energy sources. to increase confidence it will be expedient to implement more predictable government policy in this area. This can be achieved by developing a long-term vision and sector development strategy, taking into account the market participants' proposals.

2. Barriers to entry on market. Support for pre-project studies in the form of grants and technical assistance, simplification and optimization of permit procedures is important to reduce barriers.

Tab.3. Calculation of the predicted value of energy production from renewable sources, 2010-2020 years*

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Production of energy production from renewable sources, million kWh. (lines 2 + 4 + 6 + 8 + 10)	242,5	332	781	1523	2008	1762	1775	-	-	-	-
Trend line	272,87	583,03	893,19	1203,4	1513,5	1823,7	2133,8	2444	2754,2	3064,3	3374,5

*) calculated by the author

In order to realize the potential of biofuel production in Ukraine, it is necessary to develop the widest possible cooperation between Ukrainian and foreign workers in the industry and to carry out a permanent exchange of knowledge and experience.

Consequently, the future is for alternative energy sources, because they are safe and not related to harmful emissions. the advantage is also autonomy, the absence of the need to transmit energy over long distances, which is accompanied by its large losses and pollution of the environment. Partial replacement of traditional types of fuel with biological improves energy security of the country. in addition, it contributes to the fulfillment of Ukraine's emission reduction requirements under the Kyoto Protocol to the UN Framework Convention on Climate Change. it also provides an opportunity to obtain a guaranteed market for agricultural raw materials.

Thus, the existing potential of alternative energy sources in Ukraine, its scientific and industrial potential allow in the near future to significantly increase the rate of increase in the use of renewable energy sources in the country. but for this, according to the experience of European countries, it is necessary to create conditions for stimulating the development of alternative energy, increase of investment activity in this sphere, involving both own and foreign investments.

4. CONCLUSION

In recent years, Ukraine has been following world trends and developing clean energy. For the production of energy from all types of renewable sources in each region of Ukraine there are the necessary resources. in addition, attracting the best practices of the countries of the world, a favorable legislative field for investors is being developed, which will be able to attract their attention to this sphere. Increasing of using of renewable energy in the energy balance of Ukraine is one of the most important directions of its energy policy. in recent years, Ukraine has experienced a gradual increase in installed capacity of renewable energy sources.

To achieve the goals, an important place in the management system of this area of activity is given to marketing strategies. the study showed that Ukraine is interested in the development of renewable energy sources and the gradual replacement of their traditional generation, as it relates to import-dependent energy from countries. However, marketing tools for the development of the energy market, in addressing this problem, are still used not enough.

In order to ensure Ukraine a decent place in the production and distribution of new renewable energy sources in the future, it is necessary to support scientific and technological developments in new fields such as hydrogen energy, use of Black Sea gas hydrates, etc., as well as to increase the economic and technical characteristics of those types of renewable energy sources, which are already in use. it is important to realize the need for a wide-ranging implementation of energy-efficient measures and their inclusion in the energy development strategy for renewable energy. Large-scale implementation of renewable energy sources in Ukraine will allow us to make a significant step in protecting the environment and reducing the country's energy dependence..

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