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		Захисно-маркетингова	Направлена на збереження позицій на ринку. Використовується підприємствами, які мають сильні ринкові і технологічні позиції, які не є першопрохідцями у випуску на ринок нововведень. Характерна для підприємств більш сильного підприємства у маркетингу, ніж у науково-дослідних і дослідно-конструкторських робіт
		Стратегія цифрових перетворень	Завдання стратегії розробити план впровадження цифрових технологій для забезпечення цифрової трансформації. Поширення і адаптація продукції за допомогою мережі інтернет.

Висновки

У висновку можна відзначити, що перехід традиційної економіки до цифрової, викликаний швидкими темпами змін, які відбуваються, виникнення нових викликів і небезпек, як і нових можливостей для ведення бізнесу вимагають дослідження нових концептуальних підходів до реалізації управлінських рішень. Таким чином, за підсумками дослідження було запропоновано авторську сукупність класифікації інноваційних стратегій за ознакою характеру реалізації інноваційної стратегії (сегментовано-атакуюча, конкурентоспроможна, оборонно-маркетингова, стратегія цифрових перетворень). Подальші дослідження будуть концентруватися на розробці підходів до формування етапів дієвого механізму реалізації інноваційної стратегії в умовах цифрових перетворень.

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Mazur Kateryna

Candidate of Economic Sciences, Associate Professor, Acting Head of the Department of Agrarian Management and Marketing, Faculty of Management and Law, Vinnytsia National Agrarian University

Hontaruk Yaroslav,

assistant of the department of agrarian management and marketing,, Vinnytsia National Agrarian University (Vinnytsia)

DEVELOPMENT OF ENERGY COOPERATIVES IN RURAL AREAS OF UKRAINE

Abstract.

The relevance of the chosen topic is due to the need to substantiate the model of development of alternative energy sources by local communities through rational energy production and economical consumption in order to ensure an adequate level of quality of life.

The study presents a theoretical justification of the processes of development of service cooperation in rural areas, a study of the basic methodological principles of evaluation of these processes, their impact on the formation of energy policy of the state.

The methodological basis of the study includes a variety of procedures and methods designed to assess the impact of the creation of energy cooperatives on the development of alternative energy sources by local communities. The following methods of scientific research are used to solve the tasks set in the scientific work: analysis and synthesis, generalization, induction and deduction, comparison, abstraction, observation.

An algorithm for calculating the cost of creating energy cooperatives is proposed.

Key words: *energy, production cooperative, alternative energy, territorial communities, biomass.*

There are changes in the world's approaches to energy policy: the transition from the outdated model of the energy sector, which was dominated by leading producers, fossil fuels, inefficient networks, imperfect competition in the markets of natural gas, electricity, coal to a new model. more competitive environment, equal opportunities for development and minimize the dominance of one of the types of energy production or sources and / or fuel supply routes. At the same time, preference is given to improving energy efficiency and the use of energy from renewable and alternative sources.

This poses new economic and technological challenges to Ukraine, but at the same time opens new opportunities for finding and implementing innovative developments in mining, fossil fuels, production, transformation, supply and consumption of energy, which necessitates the formation of a new energy policy.

Recommendations for the establishment and state registration of an agricultural service cooperative

Agricultural service cooperatives (hereinafter referred to as "cooperatives") are established and operate on the basis of the Law of Ukraine "On Agricultural Cooperation" of July 17, 1997 and the Law of Ukraine "On Cooperation" of July 10, 2003 №1087IV [6].

The general conditions for establishing a cooperative are as follows:

- the cooperative is created by its founders on a voluntary basis;
- the founders of the cooperative may be citizens of Ukraine, as well as legal entities registered in Ukraine;
- the decision to establish a cooperative is made by its constituent assembly;
- the number of members of the cooperative may not be less than three persons.

The cooperative must be built on a solid foundation. Therefore it is necessary to be very attentive at each stage on its creation. No stage can be ignored or treated with inappropriate attention, otherwise the final result of the project will be endangered [6].

The process of designing a cooperative should consist of the following stages:

1. Formation of an initiative group. This stage is to unite a sufficient number of agricultural producers who agree with the idea of creating a cooperative and decide on further action. As a rule, this consent must be approved by a signature in the memorandum of understanding.

2. Project development When the initiative group is established and its members have signed a memorandum of understanding, their task will be to develop a realistic and mutually agreed project. This takes some time to think about and mature. Therefore, it is possible that the result will be slightly different from the original idea.

3. At this stage it is necessary to take into account many factors: the needs of members of the future cooperative and their opportunities for this, market conditions, sources of material base. When all these elements are defined and mutually agreed, and also

agreed between all founders, it is necessary to begin working out of the concept of the project of cooperative. This will be the concept of the project.

4. Establishment of a cooperative. Once the concept of the cooperative is developed, you can proceed to the official establishment of the cooperative. It is necessary to carefully develop the Charter, organize the Constituent Assembly and register the cooperative. In parallel, it will be necessary to plan and prepare the economic activities of the cooperative in the initial period.

5. The state registration of a cooperative shall be carried out in accordance with the procedure provided for the state registration of business entities and shall be carried out in accordance with the requirements of the Law of Ukraine "On State Registration of Legal Entities and Individual Entrepreneurs" of May 15, 2003.

6. A cooperative is considered established and acquires the rights of a legal entity from the date of its state registration. In order to register a cooperative, a number of consecutive steps must be performed.

The first step is to agree with the registration body on the name of the cooperative. The name must reflect its organizational and legal form and not be identical to the name of another legal entity. When writing the name of the cooperative in the charter and minutes of the constituent assembly, only capital letters of the Ukrainian alphabet are used, for example: correct spelling - AGRICULTURAL SERVICE COOPERATIVE "DZHERELTSE", abbreviated name SOK "DZHER"; • misspelling - Agricultural Service Cooperative "Dzhereltse", abbreviated name SOK "Dzhereltse".

The second step is to hold a constituent assembly of the AOC, which raises the following issues:

1. On the establishment of the AOC and approval of its Charter. When developing the Statute of the cooperative should use the order of the Ministry of Agrarian Policy of May 21, 2013 №315 "On approval of the Model Statute of the agricultural service cooperative" [7].

2. Election of founders and chairman of the cooperative.

3. Appointment of the cooperative responsible for state registration.

4. Determining and approving the legal address of the cooperative.

The cooperative can be registered at the place of residence of one of the founders and the address will be confirmed by a photocopy of his passport. You can also enter into a lease agreement for the premises where the cooperative will be located.

Step three - to conduct state registration, the founder authorized by the meeting must personally submit the following documents to the state registrar:

- registration card for state registration, which is filled in by typewritten or handwritten in block letters;
- a copy of the decision to establish a cooperative (a notarized copy of the minutes of the constituent assembly);
- two copies of the cooperative's charter;
- a document certifying the payment of the regis-

tration fee for the state registration of the cooperative (a copy of the bank receipt or a copy of the payment order with the bank's mark).

The person who registers the cooperative must have a passport and identification number. Within three working days from the date of receipt of documents, the state registrar must issue an extract on the state registration of the cooperative and one copy of the original charter with the mark of the state registrar on the state registration of the cooperative.

Step four - registration of the cooperative in the regional department of statistics.

Step five - to certify 2 copies of the charter with a notary (which are necessary for opening a current account and when registering in the district joint state tax inspection of the Main Department of the Ministry of Revenue in Vinnytsia region).

Step six - registration of the cooperative in the district joint state tax inspection of the Main Department of the Ministry of Revenue in Vinnytsia region. The district joint state tax inspection must specify which documents must be submitted.

The seventh step is to make a seal.

Step eight - opening a bank account.

The last stage of building a cooperative is the beginning of the cooperative's activity. Even after registration, the cooperative exists only *de jure*, because it is necessary to start its economic activity. It is necessary to develop the Rules of internal economic activity of the cooperative, as well as a business plan. It is necessary to gradually strengthen the material base of the cooperative, increase its number, put into practice cooperative principles, namely: each member of the cooperative must pay share and entrance fees, commit, and devote part of their time and energy to participate in the management of the cooperative.

Energy cooperatives are associations of citizens, enterprises and organizations whose goal is to implement various local projects in the field of renewable energy. Most often, such associations focus their efforts on decentralized, environmentally friendly and independent of companies and concerns, energy production [8].

FEAO gives an example of areas in which an energy cooperative can operate:

energy production (solar energy, wind energy, biogas, cogeneration, ie combined heat and power production);

sale of alternative energy (electricity, heat, gas);

purchase and operation of power grids;

services aimed at efficient use of energy (consulting, energy saving of buildings, implementation of various energy efficiency projects), etc. [8] ..

This business model is relatively new, but is just beginning to develop in Ukraine, while abroad the benefits of energy cooperatives are already being actively used.

The most famous energy cooperative in Ukraine was established in Slavutych. The history of the "Sunny City" began in 2018 with the idea of building a solar power plant "in a fold" [8] ..

Under Ukrainian law, an energy cooperative is a legal entity established to produce, procure or

transport fuel and energy resources and provide other services to meet the needs of its members or the local community, as well as to make a profit.

The total cost of the project in Slavutych was 150 thousand euros, and you could join it by purchasing a share worth 15 thousand hryvnias. First of all, this opportunity was offered to the residents of the city.

In total, the cooperative attracted 97 investors, including the regional enterprise Agency for Regional Development. To house the station, which has a capacity of about 200 MW, the organization leased the roofs of three municipal buildings in the city center: the Energetik House of Culture and the Minsk and Lux shopping centers.

"In June 2020, the station began commercial generation, and for the first month of operation earned about 107 thousand hryvnia," - says the chairman of the energy cooperative Andriy Zinchenko. According to preliminary calculations, the project should pay off in seven years. In addition, the cooperative directs 5% of its net profit to city projects in Slavutych.

Of course, energy cooperatives are not a Ukrainian invention. They are most common in the United States. There, cooperatives operate in a different format - mostly they own electricity grids and supply energy to consumers. In the 1930s, electricity was already actively used in cities, but not in villages: it was not profitable for companies to lay networks in sparsely populated regions of the country.

Therefore, energy cooperatives began to appear actively after the adoption of the law on electrification of rural areas in 1936. He allowed to receive federal loans for the construction of power grids, and such funding came to cooperatives created by local residents.

Most of these organizations still work today. Cooperatives own 42% of the power grid in the United States and serve 12% of the population. At the same time, they also produce 5% of the country's electricity and are gradually increasing the share of RES. If in 2010 solar power plants in cooperatives had an installed capacity of only 35 MW, in 2018 - 916 MW [8] ..

In Ukraine, by the way, NEC Ukrenergo and regional distribution system operators (companies formed on the basis of former regional power companies) are responsible for transmission, distribution and maintenance of networks, and this area is considered a natural monopoly.

In the EU, the creation of energy cooperatives is seen as a positive phenomenon. In particular, the draft Directive on the organization of the electricity market (part of the reform package "Clean Energy for All Europeans") states that the spread of technology and consumer activity have turned energy cooperatives into an efficient and cost-effective way to meet energy needs and services sphere and participation at the local level.

In addition, the Directive defines the rights that states must provide to local energy communities. Among them - the right to own or rent networks, access to organized markets without discrimination, and

for shareholders of such cooperatives - the ability to retain the rights of household consumers.

The largest distribution of energy cooperatives today is in Germany. The active development of RES projects was stimulated by the "green tariff" introduced in 2000, and in the next few years the organizational requirements for cooperatives were also simplified. The number of new associations reached its peak in 2011. After the abolition of the fixed tariff in 2012, this trend declined.

At the same time, the public energy sector is considered to be one of the drivers of the country's transition to RES, especially in the early stages. In 2012, 46% of green capacity in the country belonged to citizens and cooperatives. In 2016, this number dropped to 42%.

There are still about a thousand energy cooperatives in Germany. About 60% of them use solar stations, 30% - wood, 20% - wind stations, and 9% - biogas (one cooperative can have several areas of work).

Energy cooperatives have also developed in other European countries. For example, according to REScoop.eu in 2020, there were about 650 cooperatives in Denmark, 400 in Austria, and about a hundred in the Netherlands and Sweden. Dozens of cooperatives also operated in Spain, Belgium, the United Kingdom and France.

It is worth noting that energy cooperatives are created not only for the joint construction of SES, wind farms or power grids. They can have different tasks. For example, the community comes together to buy fuel at wholesale prices, install equipment for biogas production, grow energy crops, insulate homes, and more.

Such an organizational system can become one of the important elements of decentralization and offers several advantages. In particular, economic. First of all, the cooperative structure allows you to build the necessary infrastructure without attracting foreign investors or expensive loans. This is usually not possible for individual residents or small companies.

In addition, such a system reduces community dependence on large energy companies and fossil fuels that may rise in price. By using local energy resources, you can save, and by selling surplus electricity from RES - you can even make money on the "green" tariff.

Communities receive other economic benefits. Research shows that utility or cooperative projects can bring 12 times more value to the community than private companies. This is associated with job creation and increased income for local investors, who typically spend their earnings within the community.

Cooperatives are not profit-oriented. Regardless of the number of shares, each member of the association receives one vote in decision-making. This ensures that they work to meet the interests of the community.

In addition, energy cooperatives are more environmentally friendly: the community is switching to renewable energy sources, using local resources (such as agricultural waste) and reducing the need to transport energy.

In addition to the "Sunny City" in Slavutych, several other energy cooperatives have been formed in Ukraine, although these are still isolated cases. For example, in the village of Losyatyn in the Ternopil region there is a cooperative "Berry Land", whose main activity is growing strawberries and raspberries. However, the members of the association have also discovered an energy direction: raspberry stalks, which used to be simply burned in the fields, are now being turned into briquettes for heating houses. The community received funding from the United Nations Development Program to purchase the necessary equipment.

Several small cooperatives operate in the Kharkiv region: both with solar panels and with rapeseed bio-fuel. The establishment of an energy cooperative was also announced in Berezdivska OTG of Khmelnytsky region. The local association plans to produce fuel briquettes from straw.

One of the possible reasons for the slow spread of energy cooperatives in Ukraine is legal. The activities of cooperatives are determined by the laws "On Cooperation" and "On Consumer Cooperation". The concept of "energy cooperative" appeared in 2019 in the law "On Alternative Energy Sources", which also defines the features of the "green" tariff for such organizations [6-7].

Under such conditions, cooperatives can emerge and function, although not all aspects of their activities, such as the setting of tariffs for participants, the creation of micro-networks or the participation of self-government bodies, are now sufficiently regulated. In 2017, a separate bill on consumer energy cooperatives was also presented, but this initiative was not successful.

On the other hand, relevant organizations, such as the Ecoclub, note that cooperatives do not emerge due to low levels of social activity and trust between people, as well as low awareness in this area. "With a smart approach, cooperatives are a very good model. But there are almost no successful examples in Ukraine, people are not familiar with such projects, - says Andriy Zinchenko. - Of course, there are difficulties in creating a cooperative: you need a good team, discipline, calculations. But in Germany the process is not easier. We are often asked questions, so now we are preparing a textbook that will explain how to actually create an energy cooperative in Ukraine "[8].

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Energy cooperatives in Germany operate on very different models. In addition to those who earn on the "green tariff from solar energy, there are hundreds of energy cooperatives that provide locals with heat, electricity, network services. Many of them were created by residents of one street in order to install central heating on it using local raw materials. However,

there are also quite large cooperatives that operate with significant electricity generation capacity.

Energy cooperatives have also gained considerable popularity in Denmark, the Netherlands, Sweden, Australia, and the United Kingdom. But the movement of energy cooperatives has gained special power in the United States. According to the Touchstone Energy Cooperatives Association, which has 750 members, energy cooperatives are present in 46 states. Together, they form the largest energy grid in the United States, providing energy to the millions of Americans who co-own it. Most of them have no idea that somewhere in Ukraine the only option to get electricity is to join the regional power network. The history of some energy cooperatives dates back to the 40s, 30s, or even 20s of the XX century.

Energy cooperatives certainly cannot solve all the problems of the energy sector in Ukraine. However, they can be an important solution for a huge number of people and communities, large and small communities, who will be able to provide themselves and others with energy resources and create a new quality of life without a paternalistic hope for the state.

Energy cooperatives are a good mechanism for transforming trust in each other into an effective mechanism for moving from an overly centralized post-Soviet energy model to a more localized one that relies primarily on local resources and creates jobs, new economic models and opportunities for community residents. .

Service cooperation is the basis for the development of rural areas. Cooperative organizations provide a variety of services to farmers, personal farms and rural populations in the areas of gas and water supply, maintenance of other engineering structures, provision of housing and communal, repair and construction, logistics, information and consulting, tourism and recreation and other services. The urgency of the development of service cooperation in rural areas intensifies the justification of the need for development of alternative energy sources by local communities through rational energy production and economical consumption

in order to ensure an adequate level of quality of life.

Ukraine uses a variety of energy sources for its own needs, such as oil, natural gas, coal, nuclear and hydropower, wind and solar energy, and so on. Traditionally, the most popular in Ukraine today are fossil resources: natural gas and coal, which together account for more than 60% of the domestic energy balance. At the same time, in recent years, due to changes in prices, technologies and global trends, the share of other types of energy in consumption is gradually increasing. In addition, today there is reason to expect their further growth with a corresponding decrease in the share of fossil fuels in the energy balance of the country. Availability of all these resources in Ukraine, creation of a competitive market environment and conditions for the systematic development of the resource base for nuclear energy, modernization of generating capacity and replacement of raw materials with alternative fuels, further exploration and production of hydrocarbons, including unconventional, and more efficient use of potential in the field of renewable energy will contribute to the gradual strengthening of Ukraine's position in the rational production of energy and its economical consumption.

Ukraine's energy strategy for the period up to 2035 "Security, energy efficiency, competitiveness" provides that by 2025 the reform of Ukraine's energy sector will be largely completed, the priority targets for security and energy efficiency will be achieved, its innovative renewal and integration with the EU will be ensured.] ..

The use of domestic scientific, technical and technological achievements with the maximum involvement of the local component will also contribute to the innovative development of the economy, scientific and educational potential, increase employment, reduce dependence on imported resources and more.

The key quantitative and qualitative characteristic of the Energy Strategy of Ukraine is the structure of the total primary energy supply (Table 1).

Table 1

Structure of the total primary energy supply of Ukraine, %

Sources of primary energy supply	2015 p. (факт)	2020 p. (прогноз)	2025 p. (прогноз)	2030 p. (прогноз)	2035 p. (прогноз)
Coal	30	22	16,1	14,3	12,5
Natural gas	28,9	29,3	31	30,8	30,2
Petroleum products	11,6	11,5	9,2	8,2	7,3
Atomic energy	25,5	29,3	32,2	29,7	25,0
Biomass, biofuels and waste	2,2	4,9	6,9	8,8	11,5
Solar and wind energy	0,1	1,2	2,4	5,5	10,4
HPP	1,1	1,2	1,1	1,1	1,0
Thermal energy	0,6	0,6	1,1	1,6	2,1
Total	100	100	100	100	100
including fossil resources	96	92	88	83	75
including renewable resources	4	8	12	17	25

Source: [12]

To form the structure of the overall primary energy supply, economic and mathematical models, generalized expert assessments, as well as indicative indi-

cators that Ukraine must achieve in accordance with its international commitments in the field of RES development and climate change were used.

Table data. I show that the share of the electricity sector, which uses solid biomass and biogas as an energy resource, will increase, which will be due to both the relative sustainability of production (if there is a resource base) and the tendency to form local generating capacity. Preference will be given to the simultaneous production of heat and electricity in cogeneration plants and the replacement of hydrocarbon fuels.

An important measure to achieve strategic goals in the sector of alternative energy sources is to increase the use of biomass in the generation of electricity and heat by:

- stimulating the use of biomass as a fuel in enterprises where biomass is a residual product;
- informing about the possibilities of using biomass as a fuel in individual heat supply;
- promoting the creation of competitive biomass markets.

According to the Law of Ukraine "On Priority Areas of Innovation" and the Energy Strategy of Ukraine until 2035 "Security, Energy Efficiency, Competitiveness", the introduction of energy efficient, resource-saving technologies, development of alternative energy sources is recognized as one of the strategic areas of innovation.

In particular, the Energy Strategy of Ukraine until 2035 "Security, Energy Efficiency, Competitiveness" provides:

- ensuring the implementation of projects to decentralize energy supply at the local level (based on the use of renewable energy, "smart grids", improving energy efficiency);
- creation of conditions for the formation of a system of logistics and infrastructure for the collection of biological raw materials and its further transportation;
- promoting the development of local energy initiatives, in particular small and medium-sized enterprises in the energy sector and the establishment of energy cooperatives.

Energy cooperatives are associations of citizens, enterprises and organizations, the purpose of which is, as a rule, the implementation of various local projects in the field of renewable energy [4-5]. Most often, such associations focus their efforts on decentralized, environmentally friendly and independent energy production from companies and concerns. They are a form of so-called public participation / activity, ie the participation of citizens in certain political processes and political decision-making, mainly at the regional and municipal levels.

Energy cooperatives provide citizens with the opportunity to contribute to the implementation of the concept of the so-called energy transition or energy turnaround, ie the transition from non-environmental use of non-renewable energy resources (coal, oil, gas, nuclear fuel, etc.) to energy through alternative and renewable energy sources. energy, etc.). In addition, energy cooperatives create opportunities to invest and invest in local and regional energy projects.

There are many different models of energy cooperatives - from those created exclusively by individuals, ie the so-called energy cooperatives of citizens, to

communal cooperatives, the members of which are communes (communities), communal enterprises and energy cooperatives of citizens.

Energy cooperatives operate, as a rule, in the following areas: energy production (solar energy, wind energy, biomass, cogeneration, ie combined heat and power generation); sale of alternative energy (electricity, heat, gas); purchase and operation of power grids; services aimed at efficient use of energy (consulting, energy-saving rehabilitation of buildings, implementation of various energy efficiency projects), etc.

Energy cooperatives adhere to the principles set out by the International Cooperative Alliance in 1995: voluntary and open membership, democratic membership control, cost-effective membership, autonomy and independence, training, improvement and information, cooperation with other cooperatives, and caring for society.

Abroad, in Europe and the United States at present, energy cooperatives are not even an alternative to the services of state monopolies, but full-fledged players in the energy market.

In Germany, for example, there are now more than 700 energy cooperatives, providing half of the country's renewable energy capacity. Most are designed to equip homes with solar panels in order to meet the personal needs of farms and earn money by selling electricity at a "green tariff".

A successful well-known example: the Friedrich-Wilhelm Raiffeisen Energie cooperative in Bavaria built a solar power plant for its members. In the United States, 904 energy cooperatives form the largest energy network in the United States, providing energy to 42 million Americans, who co-own 42% of the country's power lines. Another interesting example: Piedmont Biofuels Cooperative www.biofuels.coop/ in Pittsburgh provides its members with biodiesel, which is made from food waste - oil that remains from frying food in fast food. Widespread energy cooperatives are also in Austria, Denmark, the Netherlands, Sweden, Great Britain [4-5].

In Ukraine, the energy cooperative allows citizens to meet their needs (both individual and joint) related to energy consumption, in particular: providing themselves with electricity, heat, fuel (wholesale purchase of firewood, pellets, gasoline); provision of services related to energy efficiency (purchase of energy auditors, insulation services for housing or facilities); electricity production from almost any energy source; heat production (both for members of the cooperative separately and in projects to create heating systems for individual streets or districts in villages and cities); financing the purchase by members of the cooperative of power plants (boilers, batteries, solar panels, etc.) [4].

The simplest example of an energy cooperative in Ukraine is a number of households that came together to buy a shredder. This simple device costs from UAH 25,000, but not every household in Ukraine can afford to buy it. In addition, such an individual owner will be idle for 90% of the time [4].

Given that the energy cooperative is a non-profit organization, ie created without a profit, it is entitled

to state support, which can take the following forms: funding from the state budget, guaranteeing the purchase of surplus energy at a "green tariff", a special simplified regime use or transfer of ownership of land.

The energy cooperative operates in a market that is in a state of natural monopoly and related markets, so the law must regulate the peculiarities of its operation. We are talking about the disclosure of public information, exemption from licensing, free tariffs, the right to sell energy produced from alternative sources to households, defining the activities as operators of small and closed electricity distribution systems, establishing guarantees of unimpeded access to electricity and heat. It is also advisable to develop special loan packages for similar projects for agricultural energy cooperatives from banking institutions.

It is necessary to form a state energy policy that will increase the demand for energy innovations and create favorable conditions for cooperation between the state and private investors.

Currently, legal regulation in the field of energy cooperatives is carried out by the laws "On Cooperation" and "On Consumer Cooperation", "On Electricity", "On Heat Supply", "On the Principles of the Electricity Market", "On State Regulation in the Sphere of

Utilities". It is necessary to adopt the Law of Ukraine "On Energy Cooperation", which should define the content of the concept of "energy cooperative" and its legal status, features of economic activity of the cooperative and the means of state regulation.

Today, the development of rural areas is one of the most important tasks for the state. As of January 1, 2021, there are 883 urban-type settlements and 28,378 villages in Ukraine. Relatively new forms are also being created - united territorial communities, in 2019 there were 686 units.

During 1990-2020, the population of Ukraine decreased by more than 9 million people, including the rural population - more than 3.9 million people. As of January 1, 2019, the rural population was about 13 million people.

According to the table. 2, the level of gasification of rural settlements is insufficient at the present stage only 14733 villages are gasified.

Gasification of villages is quite expensive. However, there is an alternative way - the creation of straw boilers for central heating and hot water supply. The fuel can be waste from the cultivation of cereals and oilseeds.

Table 2

The level of gasification of settlements in Ukraine, 2017-2020

	2017	2018	2019	2020
Number of settlements that have water supply:				
bridge	456	457	457	397
urban-type settlements	775	761	758	570
rural settlements	6312	6225	6292	4709
gasified only with natural and natural and liquefied gas:				
bridge	424	427	429	388
urban-type settlements	631	637	646	562
rural settlements	14391	14688	15175	14733
gasified only with liquefied gas:				
bridge	29	28	26	19
urban-type settlements	190	186	177	155
rural settlements	12362	11998	11497	9981

Studies in the field of dry straw combustion have shown that its energy efficiency / energy value from combustion is 15 megajoules per 1 kg, and the energy value from burning coal is formed at the level of 25-27 megajoules per 1 kg. On average, 2 kg of straw is approximately 1 kg of coal in terms of energy consumption. Straw is a source of thermal energy, the technology of which is already well developed as well as the technology of use for burning fuel, coal, wood, briquettes and more.

Today, enterprises in neighboring Poland have an efficient use of straw in boiler houses. It should be noted that put into operation in Poland (by BIOS-BUD Spzo.o.) central heating boilers, which are heated by straw biomass, reach 80% efficiency [11].

According to statistics, the level of overproduction of straw in Ukraine, which can be used in energy, is 32 million tons, which in energy equivalent is 16 million tons of coal. These data show that the energy use of straw can be a strategic element in replacing

imported energy sources.

Energy use of excessive straw production would reduce natural gas imports by 12 million m³ of gas per year. Possible savings in Ukraine could amount to 4 billion US dollars a year. In addition, the introduction of activities related to the production of thermal energy from straw, makes it possible to use labor, which is concentrated near raw materials, which in turn can improve living standards among rural residents [7].

It should be noted that measures related to the energy use of straw are supported by funds allocated by the European Union for environmental protection, air protection, as well as the creation of new professions in development programs [8].

There are similar enterprises in Ukraine. Block-modular boiler plants are the most important direction of production of MPVF "Energetik". Fully automated hot water boilers with heat output from 0.25 to 12.6 MW are created on the technological basis of hot water boilers.

The main purpose of the modular boiler room is the production of hot water supplied to the hot water supply and heating systems. Block-modular boiler room can be used as a backup and installed on a light basis directly near the heat consumer, as well as be an independent source of heat supply. The block module is an insulated and safe metal block equipped with the main and additional boiler equipment which provides full automation of process of production of thermal energy.

The set of equipment of gas modular boiler-houses contains the water-heating copper provided with the automated system of control and safety; special equipment for gas supply, regulation and accounting; system of pumps for various purposes; automatic equipment unit; heat exchanger; shut-off valves; flues and chimney; at the request of the customer - a shower and a bathroom [9]. The automatic equipment of modular gas boiler-houses guarantees the termination of gas supply during creation of an emergency mode (in case of decrease in pressure of an air stream, extinguishing of a flame in a fire chamber, interruptions with supply of electric energy).

Start-up and shutdown also occur automatically. Combustion products are removed in gas block boilers through heat-insulated flues and chimneys, their dimensions correspond to the characteristics of the boiler unit.

The fire safety system provides for the presence of a fire alarm system and an automated fire extinguishing system.

The main advantage of modular solid fuel boilers is the absolute mobility associated with the lack of connection to the main gas communications and ease of transportation. Their design and small size facilitate the movement of any mode of transport - truck or rail. Transportation of modular solid fuel boilers is carried out together with the installed equipment in assembled form. This significantly reduces the installation time at the destination [9].

The only resource that is used almost completely is sunflower husk. All plants for the production of sunflower oil provide themselves with thermal energy by burning the husk, and two of them even generate electricity from it and sell it to the general grid. A quarter or a third of the husk is spent on it, and the rest is granulated or briquetted and sold for export (additional income from such exports in Ukraine as a whole is up to \$ 20 million per year). Areas of grain crops for the 2020 harvest, amounted to 27637.7 thousand hectares. Cereal production had a clear upward trend between 2001 and 2020, but by-products in the form of straw residues were hardly used. S. Degodyuk calculated the approximate yield of straw in the cultivation of certain types of cereals (Table 3).

Table 3

Yield of straw and other crop residues

Culture	Conversion factor for straw
Winter and spring wheat	1,6
Winter wheat and spring	2,0
Winter and spring barley	1,3
Oat	1,5
Corn for grain	1,6
Millet	1,5
Buckwheat	3,0
Fig	2,0
Sunflower	2,0
Rapeseed	2,0
Soy	1,5

Source: [2]

By calculations, we determined that in 2018, Ukraine produced 99 million tons of cereal straw and

more than 24.4 million tons of sunflower straw (Table 4).

Table 4

The volume of straw output in Ukraine, 2018, thousand tons

Cultures	Production volume	Straw yield
Cereals and legumes	61916,7	99066,72
Sunflower	12235,5	24471

Source: [12].

Energy use of straw is less than one percent, and for waste corn and sunflower (except husks), then the use is simply zero. Thus, energy-dependent Ukraine does not use a fuel resource worth 3-4 billion dollars.

For example, take a small boiler house with a capacity of 3 MW, which operates only in the heating season, ie 180 days a year (boilers that work all year round will be more profitable). We will assume that the boiler house works on granulated straw (pellets), which are twice as expensive as baled straw. One ton of fuel will cost, for example, UAH 1,600. with deliv-

ery to the boiler room. To get 1 gigacalorie of heat you need to burn 310 kg of fuel, ie spend about 500 UAH. Fuel and all other operating expenses for the heating season will amount to approximately UAH 4.5 million. If you sell heat for 1100 UAH. per gigacalorie, the gross income will be UAH 8.5 million. If taxes and depreciation are taken into account, the net cash flow will be UAH 3.5 million. for the season. A 3 MW straw boiler house will cost \approx 6 million UAH if the boiler equipment is manufactured in Ukraine [1].

Therefore, the transfer of villages to straw heating can be a way out to provide district heating. In the

table. 5 shows the calculation of the cost of creating energy cooperatives.

Table 5

The cost of creating energy cooperatives

Number of non-gasified villages	13645
The cost of construction of 1 boiler room	UAH 6 million
The total cost of building boilers in non-gasified villages	UAH 81.9 billion
State participation in the project	UAH 41.9 billion
Participation of the rural population in non-gasified villages (over 7 million people live in non-gasified villages)	UAH 40 billion
Financial participation per 1 household (1750000 households)	22857 UAH

As of 2020, 13,645 villages in Ukraine are still non-gasified. Gasification of these villages will amount to UAH 81.9 billion. (at the rate of \approx UAH 6 million per boiler house). The planned participation of 1 household will be about 23 thousand UAH, which is not such a high price compared to the cost of connection to gas networks and the purchase of gas boilers [12].

The creation of energy cooperatives will allow government agencies to solve the problem of costly gasification of villages and reduce the country's energy dependence. To implement this plan, it is necessary to develop organizational and economic principles for the establishment of such enterprises, as well as appropriate universal design and estimate documentation for the construction and creation of boilers and relevant heating networks within rural areas. The system of taxation and crediting of energy cooperatives that implement innovations should be formed in such a way as to promote the attraction of investment resources in the construction and modernization of the material and technical base of cooperatives and their associations in rural areas.

Conclusions. Energy cooperatives must first meet their own needs in the energy they produce, and sell the surplus to the grid, using the rules of the "green tariff". The creation of energy cooperatives in rural communities (especially remote villages), where there are problems with constant energy supply, is very important. Thus, the use of biomass resources for heat and electricity production can become a new source of income for rural communities.

The creation of energy cooperatives will increase the share of service cooperatives and their associations; improving the financial and economic performance of their activities; ensuring the diversification of services to residents of the territorial community; stimulating the integrated development of rural areas; improving the quality of life, increasing employment and incomes of peasants.

It should be noted that the management of the development of energy cooperatives should be based on the concentration of efforts and funds aimed at the innovative development of the institution of service cooperatives as a basis for the development of rural areas.

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