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"gaps", choosing the most effective theories and practices will involve the formation of a strong "disciplinary core of economics". The formation of such a core has been going on for more than 30 years. Its future development will affect the strengthening of proliferation within Ukrainian economics. The achievement of disciplinary maturity correlates with holism in economics – taking into account everything important and filling all existing gaps in both economic theory and economic practice.

The "complete disciplinarity" (if such a term can be used) of economics is so great that the whole interdisciplinary environment of economics can be characterized by very strong transdisciplinarity. Thus, interdisciplinary links with economics can be found in the formal, natural, social, technical sciences and humanities. Thus, it can be assumed that mature economics will effectively use latently existing "trade zones" with other disciplines. The relations with other academic disciplines will be established not sporadically in the form of discursive texts, but with the help of the contemporary theory of interdisciplinarity, which is widespread in the developed countries.

Conclusions. The phenomena described above relate to the efficiency increasing of Ukrainian economics. As noted, harmonization with the global dimension of economics should become a qualitatively new stage in the development of both economic knowledge and economic life in contemporary Ukraine. At the end of the second decade of the 21st century, Ukraine has a large number of economic universities. Economics within the latter is quite extensive and productive. Therefore, the next steps in its development relate to qualitative improvements, enlargement of the global publishing activity of Ukrainian economic scientists, optimization of the university departments structures, modernization of economic educational courses, establishment of cooperation between stakeholders and improvement of international cooperation in the educational environment.

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THE MAIN TRENDS IN THE DEVELOPMENT OF RENEWABLE ENERGY IN UKRAINE

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Abstract

The article is devoted to the problems of development of technologies for the use of renewable energy sources, the use of which in Ukraine will contribute to energy security and independence of the state, reduce environmental pollution, as well as Ukraine's international obligations for renewable energy development. The state of development of the renewable energy sector in the world and in Ukraine is determined. The stages of implementation, goals and objectives of the Energy Strategy of Ukraine until 2035 are described. The growth of new wind and solar stations is analyzed, it is noted that it has increased seven times and according to the Energy Strategy of Ukraine in 2035 electricity generation will be 25% of total electricity in country. The main ways to stimulate the transition to renewable energy not only at the level of production, but also by households have been identified. Recommendations on perspective directions of future development of renewable energy in Ukraine are given.

Keywords: energy, renewable energy, renewable energy sources, traditional energy sources, «green» auction, wind energy, solar energy, geothermal energy, energy consumption.

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Problem statement. At the present stage of management there are a number of global problems that negatively affect the living standards of the population. One of them is the problem of limited natural resources. Every year, the world uses more and more gas, oil and coal to meet the needs of the population, which leads to a faster depletion of these natural resources. Based on this, the question of the time for which these natural resources will be sufficient, continuing to use them in large quantities.

Ukraine is insufficiently supplied with its own energy resources, which leads to the need to purchase them in large quantities every year for the needs of both production and the population. It should be noted that one of the prerequisites for the existence of Ukraine as a truly independent state is the formation and formation of its own fuel and energy complex, which should be based on the use of renewable energy sources [1, p. 9]. Ukraine, having significant potential for the development of renewable energy sources, unfortunately uses it extremely inefficiently, as the share of "green" electricity is only about 1% of the country's energy balance. In addition, energy has accumulated many intra-industry problems, mainly due to depreciation of fixed assets. To solve these problems requires huge capital investments, which causes a continuous increase in energy tariffs.

Renewable energy over the past decade has become not only a tool for achieving the idea of low-carbon development of society, but is gaining more and more arguments in its favor as an economically viable alternative to the use of fossil fuels. Demand for renewable energy sources is constantly growing, new and existing technologies for energy production from RES are being introduced and improved.

Given the above, as well as against the background of price fluctuations in coal and petroleum products and the objective decline in activity in these industries, renewable energy has begun to be seen as a potential replacement for traditional. Investment in renewable energy, which can also be called investment in clean energy, has reached new record highs and now exceeds the global investment in fossil fuels by almost twice (about \$ 300 billion). In Ukraine, according to experts, this figure over the past three years has reached 800 million euros [2, p. 41].

According to the report of the State Agency for Energy Efficiency and Energy Saving of Ukraine, "Ukraine has every opportunity to meet 91% of its energy needs by 2050 through renewable energy sources" [3]. This highlights the relevance of scientific substantiation of current trends, problems and prospects for the development of renewable energy in our country.

Analysis of recent research and publications. Important aspects of the development of renewable energy have been the subject of research by a number of

foreign and Ukrainian scientists. Among Ukrainian scientists: Kaletnik G.M., Goncharuk I.V., Babyna O.M., Doronina I.I., Kozlokov O.Y., Kotulskaya O.V., Ryazanova N.O., Tokarchuk D.M., Ulyanichenko O.V., Chudovska V.A. etc. comprehensively consider the state, problems and prospects of development of renewable energy in Ukraine. Given the growing role of the country's energy security and the need to reduce dependence on imported energy, the issue of innovative development of renewable energy sources requires further research.

Goals setting. The purpose of this study is to analyze the current state of renewable energy in Ukraine and substantiate promising ways to replace traditional energy and ensure energy independence.

Presentation of the main material of the research. There is a steady trend in the world towards the development of renewable energy sources (RES) and their gradual replacement of traditional generation. In 2015, global investment in RES amounted to a record 349 billion dollars. For the first time, the share of renewable energy in newly installed capacity in the world was over 50%. In the EU, a similar figure in 2016 was 87%. The fact of inflowing record investments and rapid development of RES occur despite the lowest oil and gas prices in 13 years, which confirms the irreversibility of the trend of transition to renewable energy sources in the world.

Renewable energy plays an important role in responding to both the global climate and the global need for development by providing affordable energy services and improving energy security. Renewable energy has now taken a leading place in the development of the general energy sector and our country. Thus, since the beginning of 2014, investment revenues in this area amounted to more than 2 billion euros, while on the basis of traditional energy for the past five years, no new project has been implemented.

Renewable or inexhaustible energy resources are energy flows that are constantly or periodically operating in the environment. Renewable energy sources include energy from the sun, wind, seas and oceans, heat from the earth, biomass, small rivers and secondary resources that exist permanently or periodically in the environment. Their main common feature is practical inexhaustibility and ecological purity. For almost all RES (except geothermal) the source of energy in the vast majority is the sun [4, p. 59].

According to leading energy scientists, at the turn of 2030-2040, the structure of the world's energy will change significantly. The use of traditional hydrocarbon sources will decrease sharply and the role of renewable energy sources will increase. Qualitative shifts towards renewable sources are already noticeable, which is manifested in large-scale state programs of a number of industrialized countries. Indicators of renewable energy development in the world are shown in Table 1.

Table 1

Indicator	2017	2018		
Investments (billion USD)	326	289		
Electricity				
Renewable energy capacity (including hydropower), GW	2,197	2,197		
Renewable energy capacity (excluding hydropower), GW	1,081	1,081		
Heat supply				
Installed capacity of solar water heaters, GW	472	472		
Transport				
Ethanol production (annual), billion liters	104	112		
Production of biodiesel FAME (annual), billion liters	33	34		
Production of HVO biodiesel (annual), billion liters	6,2	7,0		
Policy				
Countries with national / regional / municipal RES targets	179	169		
Countries with 100% renewable energy targets 57				

Source: [5; 6]

Large-scale political commitments have played an important role in increasing the share of RES in electricity generation. In 2018, 135 countries applied regulatory policies on RES in electricity, namely through: preferential tariffs, quotas for utilities. For comparison: in 2010 such a policy was applied in only 75 countries.

The strategic vision of governments, investment in research and development, and industrial strategy have made it possible to reduce global spending on renewable energy technologies and attract private sector funding. Given the success of innovative countries (USA, EU countries (Sweden, Austria, Finland, Germany, Portugal, Spain), Japan, China), renewable energy technologies, along with effective integrated policies and business models, have spread around the world. [7, p. 26].

Ukraine's energy sector, unlike most foreign ones, is still based mainly on the use of gas, which significantly reduces the degree of energy stability and independence of the country's economy.

The problems of the power industry of Ukraine include:

1) reduced reliability of electricity supply due to high depreciation of fixed assets and lack of investment for their renewal (currently fixed assets are worn by 50% in the main network complex, 65-70% - in generation, up to 70% - in the distribution network complex);

- 2) lag in the development of modern technologies;
- 3) the presence of cross-subsidization;
- 4) the complexity of the technological connection of consumers to electrical networks [8, p. 175].

Over the past two years, the growth of new wind and solar stations has increased sevenfold and according to the Energy Strategy of Ukraine in 2035, electricity generation should be 25% of total electricity generation in the country [9, p. 118].

In general, the dynamics of renewable energy development in Ukraine according to the data of the State Agency for Energy Efficiency and Energy Saving and the State Statistics Service and can be examined in Table 2.

Pursuant to the decision of the Council of Ministers of the Energy Community of 18.10.12 № D / 2012/04 / MCEnC, according to which Ukraine has undertaken to implement Directive 2009/28 / EC of the European Parliament and of the Council on the promotion of the use of energy produced from renewable energy sources sources by the order of the Cabinet of Ministers of Ukraine dated 01.10.2014 № 902-r approved the National Action Plan for Renewable Energy for the period up to 2020, according to which Ukraine had to achieve the share of energy obtained from renewable sources (targets, table 2).

Table 2

Dynamics of renewable energy development in Ukraine

	Dynamics of tenewable energy development in extrane		
Years Goal (planned indicators)	The share of RES in total energy con-	The share of RES in total energy	
	sumption in accordance with the State	consumption according to the State	
	Agency for Energy Efficiency	Statistics Service	
	dicators)	Real share (actual indicators)	
01.01.2011		2,9	2,0
01.01.2012	3,8	2,9	2,0
01.01.2013		3,1	2,0
01.01.2014		3,4	2,7
01.01.2015	5,9	3,9	2,6
01.01.2016	6,7	4,9	3,0
01.01.2017	7,4	5,8	3,8
01.01.2018	8,3	6,7	4,0
01.01.2019	9,1	7,0	4,4

Source: formed by the author on the basis of data [10; 11]

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Thus, according to Table 2, the indicators of the State Agency for Energy Efficiency regarding the share of RES in total energy consumption are more optimistic than the indicators of the State Statistical Service of Ukraine. Thus, statistical data show that the growth rate of renewable energy in the total energy consumption of Ukraine is insignificant and at this stage RES are unable to compete with traditional energy sources. In addition, these indicators are significantly inferior to the corresponding indicators in foreign countries.

According to the above-mentioned National Action Plan, Ukraine needs to achieve the share of energy obtained from renewable sources in final energy consumption in 2020 at 11%, of which:

- in the heating sector 12.4%;
- in the electricity sector 11%;
- in the transport sector by 10% [7, p. 28].

As part of the implementation of the Energy Strategy of Ukraine until 2035, it is planned to reduce the energy intensity of the economy by 2 times by 2030 and increase the production of renewable energy sources. Stages of implementation, goals and objectives of the Energy Strategy of Ukraine until 2035 are shown in Table 3 [12].

The study of information on current wind and solar power plants in Ukraine allows us to note that the vast majority of wind farms are concentrated in three regions: Mykolaiv, Kherson and Zaporizhia. The most powerful is the Botiyevskaya wind farm, which is located in the village of Botiyevo, Priazovsky district. Its capacity is 200 MW, built in 2012. With constant operation of this wind farm for about 20 years, it is possible

to save 34.8 million tons of coal. Each year of operation of the station allows to reduce harmful emissions by approximately 730 thousand tons of CO₂.

Regarding solar power plants, the leaders in this field of renewable energy in Ukraine are Zaporizhia region (152 MW), Mykolaiv region (132 MW), Odessa and Kherson regions (272.11 MW) and Kyiv region (76.3 MW).

Recently, there has been considerable interest in the use of solar energy by private households. According to the State Agency for Energy Efficiency, the number of domestic solar power plants in Ukraine has increased 375 times over the past 4 years, and since the beginning of 2019, 1,400 Ukrainian families have installed domestic SES. In total, as of July 1, 2019, the number of private SES is approximately 12 thousand units with a total capacity of 280 MW [10].

The development of wind farms and SES in Ukraine was ensured by administratively set high tariffs. Thus, today the tariff for solar electricity is 12-14 eurocents per 1 kWh, and wind - 4.5-10 eurocents. For comparison, the tariff for electricity generated by Ukrainian nuclear power plants is about 1.7 eurocents, and for electricity from thermal power plants - about 5.5 eurocents. Therefore, from the end of 2018 in the energy sector there was a question about the need to introduce auctions in the "green" energy. The system of "green" auctions operates in many countries and allows to reduce prices for "green" energy. The main idea of "green" auctions is to determine the lowest price for electricity consumers [9, p. 119].

Table 3 Stages of implementation, goals and objectives of the Energy Strategy of Ukraine until 2035

Stages	Purposes	Task
		completion of the implementation of electricity markets in accordance with the requirements of the Third Energy Package;
I Reforming the ene sector by 2020		institutional integration of energy infrastructure with the integrated gas transmission system of Europe ENTSO-G and implementation of a number of measures for synchronization of the integrated energy system of Ukraine with the integrated energy system of Europe ENTSO-G; increase in the share of RES to 11% in final energy consumption, which is 8% of the total primary energy supply (ZPPE, calculated as the sum of production (production), imports, exports, international bunkering and changes in energy resources in the country), in particular by stable and predictable policy in the field of stimulating the development of RES and in the field of
		attracting investments; increasing the use of RES to 25% of the volume of ZPPE of Ukraine;
II Optimization and in- novative development of energy infrastruc- ture by 2025		integration attraction of investments in the RES sector, development of distributed generation, in particular development and beginning of implementation of the plan of introduction of "smart Grids" and creation of the branched infrastructure for development of electric transport;
Ensuring sustainable III development until 2035		innovative development of the energy sector and construction of a new generation;
		ensuring investment in new generation capacity to replace decommissioning capacity the choice of the type of generation will depend on the forecast price situation for fuel and the intensity of development of each type of generation, which will increase the level of competition between them;
		from the introduction of smart technologies to equalize consumption peaks; increasing the share of RES in the structure of ZPPE to 25%.

Source: [12]

Also, to stimulate the development of renewable energy, the Law of Ukraine "On Amendments to Certain Laws of Ukraine on Ensuring Competitive Conditions for Electricity Production from Alternative Energy Sources" of 04.06.2015 № 514-VIII [13] was adopted, according to which:

- 1. The "green" tariff is pegged to the euro.
- 2. The "green" tariff for electricity from biomass and biogas was increased by 10% to € 12.39 ct / kWh.

It should be noted that today the level of "green" tariffs in Ukraine is one of the highest in Europe.

- 3. The requirements for the local component have been abolished and a surcharge to the "green" tariff of 5 and 10% has been introduced for the use of Ukrainian-made equipment at the level of 30 and 50%.
 - 4. Introduced "green" tariff:
 - for geothermal electrical installations;
- for solar and wind power plants of private households with a capacity of up to 30 kW.

The Law of Ukraine "On the electricity market" from 13.04.2017 № 2019-VIII [14] provides for the possibility of concluding long-term contracts for the purchase of electricity produced at a "green" tariff, until 2030

The Law of Ukraine "On Amendments to Certain Laws of Ukraine on Ensuring Competitive Conditions for Electricity Production from Alternative Energy Sources" of April 25, 2019 № 2712-VIII [15] was also adopted, which provides for the transition from 2020 to a new auction system for renewable electricity.

In 2019, crowdfunding was launched in Slavutych, the task of which is to raise funds for the first solar cooperative in Ukraine, which was named "Sunny City". In particular, it will be a solar power plant that will sell the generated electricity at a green tariff. According to the calculations of the initiative group, the solar cooperative will fully pay for itself in 6-7 years, and by 2030 (when the green tariff expires) the profit per share will be at least 50% [16, p. 395].

Thus, promising areas for future development of renewable energy in Ukraine are:

- 1) study of the potential use of renewable energy sources and the problems of energy DE carbonization;
- 2) integration of systems using renewable energy sources into energy systems and forecasting their operation:
 - 3) integrated use of renewable energy sources;
- 4) new technologies of "smart" energy systems and energy storage systems;
- 5) development of environmentally friendly transport;

6) quality education [16, p. 43].

The development of renewable energy sources is an ambitious strategic priority that requires significant resources and will determine the main trends and directions of development of the national economy in the future. Implementation of the conceptual principles of innovation and investment support for the development of alternative energy sources will contribute to energy independence of the national economy, strengthening intersectional ties and the formation of stable clusters in the national economy and increasing its competitiveness, innovation and investment, improving living

standards, promoting Ukraine. to significantly improve the investment climate [17, p. 55].

It is profitable to invest in alternative energy sources: in the coming years this area in Ukraine will be actively developed. The business related to green energy in our country is quite profitable. The founders of startups in this area receive benefits in the form of grants, benefits and high profits. But at the moment, domestic entrepreneurs who have ties to the highest echelons of power, or foreign investors continue to invest in green energy. However, this market in Ukraine is actively developing and there is enough space in it. The state should only control the process of forming an alternative energy market to prevent monopolization.

Conclusions. Thus, the solution to the issue of gaining energy independence lies in the plane of renewable energy sources, such as solar, wind, hydro, bioenergy and others. Energy from such sources is considered green because it is available from nature and does not harm the environment (or its impact on the environment is minimal), can be used forever and in any corner of the Earth. That is why it is renewable and safe. From time to time, dependence on imported energy resources leads to serious economic and political conflicts that significantly affect the national security of Ukraine, inhibits economic growth. That is why there is a great need to find ways to reduce this dependence, especially in light of the depletion of natural energy resources. Innovative ways of development for Ukraine are energy efficient technologies that pollute the environment less and are more efficient. That is why the development of practical mechanisms to improve the investment and business climate in the country should be a priority in this area, which will allow the inflow of both domestic and foreign investment in the renewable energy sector of the country. In addition, it is possible to create special preferential conditions for the operation of venture and grant funds in the field of renewable energy. Funds from international grants in the field of renewable energy development can be an effective source of renewable energy, so it is worth supporting the initiatives of domestic scientists to participate in international programs for the development of renewable energy.

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