

STABILIZATION OF TRANSFORMATION PROCESSES IN THE ENERGY SECURITY MEASUREMENT SYSTEM OF UKRAINE

©2022 МАТИЧУК Л. П.

UDC 351:349.6
JEL: L94; L95; Q42; Q43

Matiichuk L. P. Stabilization of Transformation Processes in the Energy Security Measurement System of Ukraine

Radical transformations of the Ukrainian energy system also caused changes in energy policy. However, the interpreted provisions did not provide for extraordinary differences regarding the modification of energy measures in terms of individual regions. These actions subsequently caused the institutional transformation of fuel, gas, and electric power measures on the way to economic liberalization. Energy policy combines legal, organizational, financial and economic regulation in the country's national policy context. Implementation of innovative technological improvements in the FEC allows for: modernization of the energy system; improvement of infrastructure; integrating advanced foreign practices into one's own system; application of innovations following the EU legislation; introduction of hydrogen technologies and the transition to clean energy. Creation of reserves to avoid the shortage of energy resources: formation of the legislation of Ukraine regarding the reservation of oil and gas storages; creation of an Eastern European gas and oil center (hub) in Ukraine; formation of a system of increasing price competition on European markets through reservation. Assimilation of experience and formation of established norms of behavior on energy saving includes: improvement of normative and legal aspects of the regulation of economic activity by business entities; technical improvement of production processes; application of systematic monitoring and energy audit; achieving the effect of scale during the production and consumption of energy resources. The energy efficiency of the use of resources in view of their diversity and the use of FEC allows for: reliability and continuity of energy supply; pricing; normative and legal instruments of regulation; projects related to the implementation of efficient energy use; measures to preserve the environment. Diversification in the application of RES in energy segments provides for: diversifying the ties with the countries of the energy society; resuming the cooperation with Poland through the Winoujcie LNG terminal in the context of gas and energy; activating the transit of energy resources through Slovakia, Moldova, and Romania. The function of the energy system following EU legislation and modern global challenges consists in: implementation of the priorities of the Green Deal; transition to clean energy; application of hydrogen energy; establishing the infrastructure for the use of RES.

Keywords: energy sector, transformational processes, energy market, energy in Ukraine, stabilization of processes.

Bibl.: 31.

Matiichuk Liubomyr P. – PhD (Economics), Associate Professor, Associate Professor of the Department of Computer Sciences, Ternopil Ivan Pului National Technical University (56 Ruska Str., 46001, Ukraine)

E-mail: mlpstat@gmail.com

ORCID: <https://orcid.org/0000-0001-6701-4683>

УДК 351:349.6
JEL: L94; L95; Q42; Q43

Матійчук Л. П. Стабілізація трансформаційних процесів в системі забезпечення енергетичної безпеки України

Радикальні перетворення української енергетичної системи спричинили зміни і в енергетичній політиці. Проте інтерпретовані положення не передбачали особливих відмінностей між областями та регіонами щодо видозміни енергетичних заходів. Зазначені дії згодом спричинили інституційні перетворення паливно-газових та електроенергетичних заходів на шляху до лібералізації економіки. Енергетична політика комбінує в собі правове, організаційне та фінансово-економічне регулювання в контексті національної політики країни. Упровадження інноваційних технологічних вдосконалень в ПЕК передбачає: модернізацію енергетичної системи; вдосконалення інфраструктури; процес інтеграції передових іноземних практик у власну систему; застосування новацій відповідно до законодавства ЄС; упровадження водневих технологій і перехід до чистої енергії. Створення резервних запасів для уникнення дефіциту енергетичних ресурсів містить: формування законодавства України щодо резервування сховищ нафти та газу; створення східноєвропейського газового та нафтового центру (хабу) в Україні; формування системи підвищення конкуренції цін на європейських ринках шляхом резервування. Засвоєння досвіду та формування установлених норм поведінки по енергозбереженню полягає в: удосконаленні нормативно-правових аспектів регулювання господарської діяльності суб'єктами господарювання; технічному вдосконаленні виробничих процесів; застосуванні систематичного моніторингу та енергоаудиту; досягненні ефекту масштабу під час виробництва та споживання енергетичних ресурсів. Енергоефективність застосування ресурсів з огляду на їх різноманітність та застосування ПЕК передбачає: надійність і безперебійність енергетичного постачання; ціноутворення; нормативно-правові інструменти регулювання; проекти щодо реалізації ефективного застосування енергії; заходи щодо збереження довкілля. Диверсифікація в застосуванні відновлювальних джерел енергії в сегментах енергетики означає: диверсифікацію зв'язків з країнами енергетичного суспільства; відновлення співпраці з Польщею через термінал зрідженого природного газу (ЗПГ) Свіноуйсьце в контексті газу та енергії; активізацію транзиту енергетичних ресурсів через Словаччину, Молдову та Румунію. Діяльність енергетичної системи відповідно до законодавства ЄС і сучасних глобальних викликів полягає в: реалізації пріоритетів Зеленої Угоди; переході до чистої енергії; застосуванні водневої енергетики; формуванні інфраструктури для застосування відновлювальних джерел енергії.

Ключові слова: енергетична сфера, трансформаційні процеси, енергетичний ринок, енергетика в Україні, стабілізація процесів.

Бібл.: 31.

Матійчук Любомир Павлович – кандидат економічних наук, доцент, доцент кафедри комп'ютерних наук, Тернопільський національний технічний університет імені Івана Пулюя (вул. Руська, 56, Тернопіль, 46001, Україна)

E-mail: mlpstat@gmail.com

ORCID: <https://orcid.org/0000-0001-6701-4683>

Considering that a large share of Ukraine's energy consumption is energy imports, almost 45% of all necessary energy is obtained from abroad. The share of our country's primary energy consumption among other types of energy carriers is evidence that regenerative types of energy occupy only a small share (about three percent), which, moreover, is becoming smaller. However, the majority of primary energy consumption is covered by gas (36%) and coal (26%), followed by oil (18%) and nuclear energy (17%) in third and fourth place. In the field of electricity production, coal occupies a prominent place [4].

Therefore, the consolidated energy policy should consider the opportunities, needs, and tools for achieving energy independence goals in the direction of the implementation of the Energy Strategy until 2035.

On August 18, 2017, the Cabinet of Ministers of Ukraine approved the Energy Strategy of Ukraine for the period until 2035, «Security, energy efficiency, competitiveness» (Order No. 605-r).

An essential argument in the formation of the Strategy was the lack of a medium and long-term intermediate economic strategy for the development of Ukraine, which called into question the forecast results of the development of the energy sector [5].

A positive consequence of this Strategy is the signing of the Treaty on the Establishment of the Energy Community and the Association Agreement. In turn, these essential documents guarantee consolidation with European energy legislation and define critical goals until 2035, following the guidelines of the European Union.

As a result of the first stage of the implementation of the Strategy, the principles of the «Third Energy Package» of the EU, which envisage free gas and electricity markets, reform of state-owned energy enterprises, and increased transparency of operation and energy efficiency, are implemented into national legislation.

Currently, there are no action plans for implementing the second and third stages of the Strategy in the public domain, and there is no strategy for Ukraine's economic development, making it impossible to carry out a predictive scenario for the development of the energy sector.

Therefore, the medium and long-term target planning of the Energy Strategy of Ukraine is at the highest political level.

A large number of studies at both the theoretical and practical levels were devoted to the study of issues related to energy policy.

In a certain way, the vast majority of them reveal the main provisions that have already been highlighted in the Ukrainian Energy Strategy. Among the research scientists in this field, it is worth noting M. Korotyia, V. Lagodienko, R. Romanyuk, V. Judzhula, A. Shidlovsky, L. Yakovenko, C. Izmalkova, and others.

Among the scientists who support the opinion regarding the consolidation and socialization of energy se-

curity goals, it is worth highlighting S. Galyanta, V. Kupchak, O. Novosad, K. Pavlov, O. Pavlova, O. Strishenets, and others.

At the same time, the inertia of the economy of Ukraine and military aggression on the side of Russia brought other goals and orientations to the fore.

The *purpose* of this article is a comprehensive study, as well as the determination of aspects that act as a stabilizing factor in the transformation of the energy security system of Ukraine in the process of implementing a balanced energy policy.

The main goal is to confirm compliance with the principles of energy development acceptable in the European Union. These principles are energy efficiency, renewable energy sources, and energy saving [7].

Recently, as a result of the Ukrainian-Polish inter-governmental consultations, the Minister of Energy of Ukraine Herman Galushchenko and the Minister of Climate and Environment of Poland Anna Moskwa signed a Memorandum of Intent on cooperation in the field of energy to increase energy security in Central and Eastern Europe and renounce the supply of Russian energy carriers.

The document states that the parties support the further integration of Ukraine into the European energy market and the reform of the energy markets of Ukraine according to European principles to accelerate the unification of the electricity and gas markets of both countries. Poland supports Ukraine's intentions to become a full member of ENTSO-E [9; 22; 23].

Herman Galushchenko said that Ukraine, despite the state of war, is ready to increase the volume of electricity exports to Europe.

"Ukrainian electricity will help European countries replace Russian energy sources. After synchronization with ENTSO-E, we have already started exporting electricity to Poland and Moldova. However, we have a significant potential for increasing the volume of supplies," the minister emphasized.

The formation of energy policy should be based on the following directions of reforming the fuel and energy complex of Ukraine:

1. To implement innovative technological improvements in the fuel and energy complex.
2. To create reserve stocks to avoid an energy resource shortage.
3. Gain experience and establish established norms of energy-saving behavior.
4. Introduction of energy efficiency in the use of resources given their diversity and specificity of application in the directions of the fuel and energy complex.
5. Diversification of the use of renewable energy sources and carbonization.
6. Form the activity of the energy system following the legislation of the European Union and modern global challenges.

Implementation of innovative technological improvements in the fuel and energy complex. It is worth focusing on three measures: modernization of the energy system, improvement of infrastructure, and the gradual integration of advanced foreign practices into the system.

On the eve of the war, the US planned to invest about 1.5 billion dollars in energy complexes over the next decade, mainly in compressor stations and the transformation of the entire network infrastructure, the most powerful in Europe, into a more efficient network.

The application of innovative developments had a transformative effect on the gas market of the European Union and can do the same in Ukraine. Currently, we can consider the prospects of imports from terminals for liquefied gas in Turkey, Greece, Croatia, and Poland.

Direct consumption of gas that enters Europe as a liquid is one way to connect to this new infrastructure. However, Ukraine's role may also be to connect liquefied natural gas terminals in the Baltic, Adriatic, and Black Seas with the most extensive gas storage facilities in Europe [9].

The main postulates of this direction should be: supporting projects of renewable energy sources through the use of biomass and biogas through quotas and subsidies; create a solid biofuel market and start commercialization as a strategic energy resource; to create a transparent, competitive environment of the centralized heat supply system; minimize taxes on CO₂ emissions for boiler houses, thermal power plants, and thermal power plants that use biomass; serving the domestic market by maintaining the transit of energy resources through Ukraine under the situation's safety conditions; apply technological innovations following EU legislation and the global requirements of the EU Green Agreement. Implement changes in the infrastructure of the energy market through hydrogen technologies and prioritize climate change. The main goal of these innovations should be the transition to clean energy [10–12].

To create reserve stocks to avoid an energy resource shortage. Considering the fuel and energy crisis in Ukraine, the total increase in the price of oil, and the excitement on the market, the formation of reserves will have a significant stabilizing and security value.

Currently, Ukraine does not have legislation on the strategic supply of oil, which would regulate the application of the reservation of this strategic resource in the event of supply interruptions. The country can strengthen its capacity by gradually building oil reserves to at least 90 days of net imports or 61 days of domestic consumption by 2025 (the International Energy Agency's recommended minimum safe reserves).

For this, the issue of creating an East European gas center in Ukraine should be reviewed with other European countries. This will become a tool for further reforming the European gas market. A similar situation will occur with creating a reserve for gas resources. Ukrainian

gas storage can become a reserve for US and Norwegian gas in Europe. Undoubtedly, this will influence Europe's gas and oil price regulations [21].

Assimilation of experience and formation of established norms of energy-saving behavior. Under the conditions of the events taking place in our country, energy saving is one of the most critical tasks. Ensuring economic and military resistance to the enemy is possible only through the policy of increasing energy resources and intensive economic growth.

The normative manifestation of energy-saving behavior of business entities is the Law «On Energy Saving» dated July 1, 1994, No. 74/94-BP [3].

Using the latest energy-saving processes allows limiting the permissible energy consumption in new houses, thereby making the concept of an energy-saving house a standard. In most developed countries, such a practice already exists when developers have received engineering and construction standards and requirements on how to ensure efficient energy consumption in residential buildings, office centers, and some industries.

The industry has highly massive potential for the introduction of energy saving. Scientific studies show that in Germany, the industry can save energy by ten billion euros every year due to better energy savings in production processes [13; 14].

To achieve these goals, the German Federal Government is developing incentives to ensure energy savings in the economy. For example, when forming a state order for enterprises, the German government pays attention to energy-saving equipment used in production [4].

Energy conservation includes legal, organizational-scientific, and technological-economic measures aimed at using energy resources through the active use of renewable energy sources [1].

Energy saving operates with the following measurement parameters: improvement of regulatory and legal aspects of economic activity regulation by business entities; technical improvement of production processes in terms of energy-saving equipment measures; application of processes of systematic monitoring and energy audit of energy resources; scale effects during the production and consumption of energy resources; search and introduction of innovative technologies; search and introduction of renewable energy sources; application of the system of automated commercial accounting of consumption of energy resources objects; application of the thermal protection optimization system for buildings and infrastructure facilities; development of the institutional provision of energy-saving means [5–7; 16; 17].

Introduction of energy efficiency in the use of resources given their diversity and specificity of application in the areas of PEC. It consists in reducing energy consumption to fulfill economic and business goals. For consumers, this means minimizing costs for utility services;

for entrepreneurs, it manifests itself in achieving competitive advantages by reducing costs and using the latest energy technologies. The state benefits from the saving of fuel and energy resources, in particular gas export, and the improvement of the level of the industry.

The unique value of energy efficiency is concentrated in the favorable impact on the environment, as emissions of harmful greenhouse gases into the atmosphere are limited, etc. By the way, energy efficiency processes are manifested at all stages of the production cycle of promoting energy resources. We are talking about extraction, processing, transportation, consumption, etc. [24; 26].

In a broad sense, energy efficiency is a rational and practical use of fuel and energy resources at the current level of technological development and the limitation of eco-destructive impact. The generalized result of the energy efficiency assessment is the efficiency ratio of the energy resources needed in the living environment.

The experience of specific countries importing energy resources forms a model of their economic development exclusively through a strengthened energy efficiency policy. Between the concept of energy efficiency and the impact on energy security, a mediating influence on consumer demand, price policy, investment capacity, and the formation of free capacities are considered in a certain way [31].

If the efficiency gains have a short-term effect, an increase in spare capacity should be expected soon. This generates incentives for investment activity in increasingly powerful institutions [25; 27].

The situation changes over a long period, as pricing is carried out spontaneously, which indicates the neutral impact of the energy efficiency policy on the entire energy system due to the lack of investment. With another increase in demand, there is an increase in prices and investments in capacity [20].

Achieving an energy-efficient state is possible in two ways. The first involves using natural energy sources (solar batteries, water, windmills, etc.).

From the production point of view, the increase in energy efficiency is directly related to the active development of cogeneration. Cogeneration is a comprehensive concept that includes the simultaneous combination of heat and electrical energy production. Of heat with technological means of various electrical types. As a result of the application, it is possible to achieve 80-90 percent savings in fuel use.

Thanks to the application of cogeneration, the heat generated in smaller volumes affect the environment. The unit of measurement of energy efficiency is Gcal. The most desirable effect of heat transfer is the full use of primary energy in the cells of the economic environment [8; 28-30].

At the same time, energy efficiency is a systemic concept and is formed from five consecutive steps: reli-

ability and continuity of energy supply; pricing; regulatory and legal instruments of regulation; implementation projects for efficient use of energy; measures to preserve the environment.

Most scientists who deal with the issue of energy claim that, by implementing a comprehensive and effective policy, it is possible to reduce the energy intensity of the industry to the EU level.

The Ministry of Energy and Coal Industry is the primary departmental body responsible for the efficient and rational use of energy and its renewable sources starting from 2019, and the State Energy Efficiency Agency within the Ministry is the central government body responsible for promoting energy efficiency and further development of energy-efficient renewable technologies energy sources.

The implementation of active energy efficiency measures in Ukraine takes place mainly with the help of the participation of international financial institutions (International Monetary Fund), such as the World Bank Group, the European Bank for Reconstruction and Development, the European Investment Bank, KfW – the German State Development Bank, the United States Agency for International Development (USAID), the Global Climate Partnership Fund also operates in Ukraine. The Ministry of Regional Development counts several projects of the World Bank (including the energy efficiency of district heating), KfW – the German State Development Bank, and the European Investment Bank in 2016 alone, which at that time amounted to 1.4 billion USD. USA [2].

Currently, it is possible to list partially or fully implemented energy efficiency projects. Because of the substantial unexploited reserves of unconventional oil and gas deposits, the government is actively pursuing legislative changes to increase investment opportunities to make these reserves attractive for investors Attracting foreign companies for attractiveness.

In June 2012, the government offered tenders for Oleska and Yuzivska sites and areas of Foros and Scythia part of the Black Sea shelf, allowing exploration and production of natural gas, shale gas, coal gas, coalbed methane, crude oil, and gas condensates for 50 years. In August of the same year, the government chose ExxonMobil and Royal Dutch Shell to organize work on developing the Skifska deep-sea natural gas field in the Black Sea, together with the Romanian OMV Petron and the national joint-stock company National Joint-Stock Company Nadra Ukrainy. However, this project was implemented partly due to the occupation of Crimea by the Russian Federation [15; 19].

The launch of the Odesa-Brody pipeline opened the possibility of extending it to Płock (about 371 km) and Gdańsk in order to be able to supply Polish refineries. The Odesa-Brody pipeline functionally reflects the concept of direct deliveries. In contrast, Sarmatia, a pipeline company registered in Poland, is responsible for the

project to continue the transit function. Based on this, a consortium was created that united five shareholders: the Azerbaijani SOCAR, the Georgian Oil and Gas Corporation, the Lithuanian Klaipėdos Nafta, and the Polish PERN Przyjazn S. A. and Ukrainian Ukrtransnafta [18].

However, this project was also stopped due to the termination of the transit of Russian gas through the territory of Ukraine. The development of this oil pipeline is an urgent need.

Diversification processes in the direction of energy cooperation with other countries. Diversification is a method of achieving energy balance and forms an understanding of energy freedom and independence of the country in terms of energy resources.

The objective conditions for the emergence of diversification today are competition. Since the end of the 20th century, energy consumption has proliferated due to population growth and technological progress. It is essential to create a network of diversification sources and ways of connecting them since there is a significant separation between production processes and locations of consumption of energy resources.

The basis of diversification processes should be considered the observance and improvement of the energy security levels of countries and the transition to more sustainable and energy-consolidated development models. The specified circumstance is designed not only to consider the challenges and demands of society in terms of energy resources but also to ensure a balance of nature conservation and biodiversity. Therefore, diversification is a way of limiting the use of fossil energy resources, limiting energy dependence based on carbonization.

Under the conditions of a total fuel and energy crisis, our country, more than ever, needs foreign supplies of fuel because. Before the full-scale war with Russia, our country was already essentially working on reducing natural gas and nuclear fuel supply. However, it remained significantly dependent on supplies of Russian oil and petroleum products. The current Energy Strategy of Ukraine was aimed at achieving maximum diversification of the supply of primary energy resources by 2035. The basis of these processes is the increase in electricity production from renewable sources.

In light of recent military events, Ukraine should focus on various types of interaction with its European neighbors in the context of military confrontation, but also the direction of the energy commonwealth. Poland, Slovakia, Romania, and Moldova should be noted in this sense. Activation of joint efforts is mutually beneficial for all countries.

The Swinoujscie LNG terminal is concentrated in Poland, which is a relatively new source of energy supply. Ukraine and Poland have already agreed on cooperation agreements, implemented virtual connection points, and agreed on the issue of capacity allocation at auctions. At

the same time, for the Poles, access to underground gas storage in Ukraine on the border territories, provided the war ends will have an extremely advantageous position.

Before the war, mutually beneficial energy relations with Slovakia developed exceptionally actively, which is still a strategically important partner, as the transit rate from Ukraine to the EU was 68% and 65% of imports into Ukraine. Today, a high probability of cooperation is relevant in relations with Slovakia, particularly in the direction of virtual and reverse flow and allocating capacities at auctions.

There is a vast field for cooperation between Ukraine and Romania mainly due to the tangentiality of the borders and through the Trans-Balkan Corridor. Today, a significant number of checkpoints between Ukraine and Romania will contribute to improving the Trans-Balkan gas pipeline. The functioning of mutually beneficial cooperation in the gas sector will allow additional income from the transit and, at the same time, increase the level of energy security of both countries.

Ukraine has unique energy relations with Moldova, as both countries are members of the European Energy Community. However, the military actions on the territory of our country created a series of obstacles that do not allow the use of the Ukrainian HTS for transit. The restoration of energy relations is possible as long as the war on the territory of Ukraine is over.

Act following EU legislation and global requirements. Ukraine seeks to contribute to the priorities of the EU Green Deal. However, it is known that natural gas will continue to play a vital role in the decarbonization of Europe in the coming decades. The International Energy Agency estimates global gas demand for about 40 percent of total energy consumption over the next twenty years.

Ukraine's large gas transportation and transit network will play an essential role in one way or another in Europe's path to decarbonization by 2050. The energy transportation industry is considering its role beyond facilitating the switch from coal to gas. As new technologies such as hydrogen storage and transit emerge, Ukraine must be ready to deploy its infrastructure to combat climate change. Together with the United States and the EU, there is an opportunity to accelerate the transition to clean energy.

CONCLUSIONS

Therefore, the energy policy, as a stabilizing factor in the transformation of the energy security system of Ukraine, will combine the following context in its content: the introduction of innovative technological improvements in the fuel and energy complex; creation of reserve stocks to avoid shortage of energy resources; assimilation of experience and formation of established norms of behavior on energy saving; the energy efficiency of the use of resources because of their diversity and use of the fuel and energy complex; diversification in the use

of renewable energy sources in energy segments; shape the activity of the energy system following the legislation of the European Union and modern global challenges. ■

BIBLIOGRAPHY

1. Вишневецький В., Александров І., Половян О. Системно-динамічне моделювання розвитку старо-промислових регіонів. *Економіка України*. 2010. № 7. С. 37–49.
2. Децентралізація та енергоефективність: стан реалізації ключових реформ країни / Міністерство регіонального розвитку, будівництва та житлово-комунального господарства України. URL: https://www.minregion.gov.ua/wp-content/uploads/2016/08/Detsentralizatsiya-y-energoefektivnist_final_2.pdf
3. Коваленко М. А. Стратегія реформування промислового комплексу регіону: теорія та практика : автореф. дис. ... д-ра екон. наук : 08.00.05. Херсон, 2009. 35 с.
4. Розенбергер К. Політика України в галузі енергетики / Представництво фонду Конрада Аденауера в Україні. Київ, 2012. 28 с. URL: https://www.kas.de/c/document_library/get_file?uuid=0ff395f1-5626-4300-6e5f-98815dfc091c&groupId=252038
5. Купчак В. Р. Державна політика розвитку економіки регіону в системі проектного управління інвестиціями. *Ефективна економіка*. 2013. № 8. URL: <http://www.economy.nayka.com.ua/?op=1&z=4219>
6. Купчак В. Р., Павлова О. М., Павлов К. В., Лагодієнко В. Р. Формування та регулювання регіональних енергетичних систем: теорія, методологія та практика : монографія. Луцьк, 2019. 346 с.
7. Лагодієнко В. В., Павлов К. В., Павлова О. М., Саркісян Г. О. Інноваційна діяльність на регіональних туристичних ринках: модернізація та регулювання : монографія. Луцьк, 2022. 402 с.
8. Маляренко В. А. Енергозбереження – пріоритетний напрямок розвитку і вдосконалення комунальної енергетики. *Інтегровані технології і енергозбереження*. 2006. № 3. С. 19–30. URL: http://library.kpi.kharkov.ua/files/JUR/ite_2006_3_Malyarenko_Enerhozberezhennya.pdf
9. Міністерство енергетики України. URL: <http://mpe.kmu.gov.ua/>
10. Павлов К. В., Павлова О. М. Формування та регулювання конкурентних відносин на регіональних ринках житла України : монографія. Луцьк, 2019. 542 с.
11. Павлов К. В., Павлова О. М., Купчак В. Р. Пріоритетні напрями державного регулювання конкуренції: вітчизняний та зарубіжний досвід. *Економічний часопис Східноєвропейського національного університету імені Лесі Українки*. 2019. № 1. С. 14–20. DOI: 10.29038/2411-4014-2019-01-14-20
12. Галянт С. Р., Новосад О. В., Павлова О. М., Павлов К. В. Інвестиційно-інноваційна спрямованість газорозподільних підприємств регіону. *Інтернаука. Серія: «Економічні науки»*. 2020. № 1. DOI: <https://doi.org/10.25313/2520-2294-2020-1-5424>
13. Павлова О. М. Товарна форма організації суспільного виробництва в умовах розвитку національної економіки України (другої половини XVII – кінця XVIII ст.) : монографія. Луцьк : Терен, 2019. 480 с.
14. Писанко С. В., Павлова О. М., Павлов К. В. Роль та значення інвестиційно-інноваційних процесів в електроенергетичній галузі регіону. *Український журнал прикладної економіки*. 2020. Т. 5. № 3. С. 320–328. DOI: <https://doi.org/10.36887/2415-8453-2020-3-35>
15. Прем'єр-міністр: Вперше Уряд підписує угоди про розподіл продукції із переможцями відкритих та прозорих аукціонів / Урядовий портал. 31.12.2020. URL: <https://www.kmu.gov.ua/news/premyer-ministr-vpershe-uryad-pidpisuye-ugodi-pro-rozpodil-produkciyi-iz-peremozhcyami-vidkritih-ta-prozorih-aukcioniv>
16. Стрішенець О. М. Світові тенденції розвитку економіки енергетики у XXI ст.: адаптація до українських реалій. *Економічний часопис Східноєвропейського національного університету імені Лесі Українки*. 2016. № 1. С. 73–79.
17. Стрішенець О. М., Павлов К. В. Особливості конкурентних відносин на регіональних ринках нерухомості. *Науковий вісник Ужгородського університету. Серія «Економіка»*. 2016. Вип. 1. Т. 2. С. 35–38.
18. Укртранснафта. URL: <https://www.ukrtransnafta.com/>
19. Уряд підписав угоди щодо розподілу ділянок на видобування газу // Економічна правда. 31.12.2020. URL: <https://www.epravda.com.ua/news/2020/12/31/669689>
20. Addressing climate change and fuel poverty – energy measures information for local government / Department for Business Enterprise and Regulatory Reform. 2007. URL: <https://www.thenbs.com/PublicationIndex/documents/details?Pub=DBERR&DocID=283962>
21. Bielawski M. International Dimension of Ukraine's Energy Security and North Stream-2 / Razumkov Centre. 31.10.2019. URL: <https://razumkov.org.ua/en/comments/international-dimension-of-ukraine-s-energy-security-and-north-stream-2>
22. ENTSO-E. URL: <https://uk.wikipedia.org/wiki/ENTSO-E>
23. ENTSO-E. URL: <https://www.entsoe.eu/>
24. Pavlov K., Korotia M. Determination and Management of Gas Distribution Companies' Competitive Positions. In : *Advances in Manufacturing, Production Management and Process Control / Mrugalska B., Trzcielinski S., Karwowski W., Di Nicolantonio M., Rossi E. (eds.). AHFE 2020. Advances in Intelligent Systems and Computing*. 2020. Vol. 1216. P. 302–309. DOI: https://doi.org/10.1007/978-3-030-51981-0_38
25. Romanyuk R., Pavlov K., Pavlova O. Features of Development and Prospects of Transformation of the Electricity Industry of the Region. *Інтернаука. Серія «Економічні науки»*. 2021. №1. DOI: <https://doi.org/10.25313/2520-2294-2021-1-6854>
26. Коротя М. І., Павлов К. В., Павлова О. М. Регулювання діяльності регіональних газорозподільних підприємств України : монографія. Луцьк, 2020. 256 с.
27. Optimization of multi-channel queuing systems with a single retail attempt: Economic approach / Pryshchepa O., Kardash O., Yakymchuk A. et al. *Decision Science Letters*. 2020. No. 9. P. 559–564. URL: http://www.growingscience.com/dsl/Vol9/dsl_2020_22.pdf
28. Integral estimation of the competitiveness level of the western Ukrainian gas distribution companies /

- Pavlova O., Pavlov K., Horal L. et al. Accounting. 2021. Vol. 7. Iss. 5. P. 1073–1084.
DOI: 10.5267/j.ac.2021.3.001
29. Pavlov K., Pavlova O., Romaniuk R., Pysanko S. Prospects of implementation of a new model of functioning of the electric power industry south-east region of Ukraine. *Znanstvena Misel Journal*. 2021. Vol. 50. Iss. 1. P. 21–27.
30. Pavlov K., Pavlova O., Kupchak V. Integral Indicators Based on Competitiveness Capacity Characteristics of Regional Real Estate Markets of Ukraine. *Journal of Competitiveness*. 2019. Vol. 11. Iss. 3. P. 87–108.
DOI: 10.7441/joc.2019.03.06
31. Cornelissen S., Dehue B., Wonink S. Summary of approaches to account for and monitor indirect impacts of biofuel production / Ecofys. Convention on Biological Diversity. 2009. 76 p. URL: <https://www.cbd.int/agriculture/2011-121/EU-Ecofys-sep11-en.pdf>

REFERENCES

- “Addressing climate change and fuel poverty - energy measures information for local government”. *Department for Business Enterprise and Regulatory Reform*. 2007. <https://www.thenbs.com/PublicationIndex/documents/details?Pub=DBERR&DocID=283962>
- Bielawski, M. “International Dimension of Ukraine's Energy Security and North Stream-2”. *Razumkov Centre*. October 31, 2019. <https://razumkov.org.ua/en/comments/international-dimension-of-ukraine-s-energy-security-and-north-stream-2>
- Cornelissen, S., Dehue, B., and Wonink, S. “Summary of approaches to account for and monitor indirect impacts of biofuel production”. *Ecofys. Convention on Biological Diversity*. 2009. <https://www.cbd.int/agriculture/2011-121/EU-Ecofys-sep11-en.pdf>
- “Detsentralizatsiia ta enerhoefektyvnist: stan realizatsii kliuchovykh reform krainy” [Decentralization and Energy Efficiency: The State of Implementation of the Country's Key Reforms]. *Ministerstvo rehionalnoho rozvytku, budivnytstva ta zhytlovo-komunalnoho hospodarstva Ukrainy*. https://www.minregion.gov.ua/wp-content/uploads/2016/08/Detsentralizatsiya-y-energoefektivnist_final_2.pdf
- ENTSO-E. <https://uk.wikipedia.org/wiki/ENTSO-E>
- ENTSO-E. <https://www.entsoe.eu/>
- Haliant, S. R. et al. “Investytsiino-innovatsiina spriamovanist hazorozpodilnykh pidpriemstv rehionu” [Investment and Innovation Orientation of Gas Distribution Companies in the Region]. *Internauka. Seriya: «Ekonomichni nauky»*, no. 1 (2020).
DOI: <https://doi.org/10.25313/2520-2294-2020-1-5424>
- Korotia, M. I., Pavlov, K. V., and Pavlova, O. M. *Rehuliuвання діяльності регіональних газорозподільних підприємств України* [Regulation of the Activities of Regional gas Distribution Enterprises of Ukraine]. Lutsk, 2020.
- Kovalenko, M. A. “Stratehiia reformuvannya promyslovoho kompleksu rehionu: teoriia ta praktyka” [The Strategy of Reforming the Industrial Complex of the Region: Theory and Practice]. *avto-ref. dys. ... d-ra ekon. nauk : 08.00.05*, 2009.
- Kupchak, V. R. “Derzhavna polityka rozvytku ekonomiky rehionu v systemi proektnoho upravlinnia investytsi- iamy” [The State Policy of Economic Development of the Region in the System of Project Investment Management]. *Efektivna ekonomika*, no. 8 (2013). <http://www.economy.nayka.com.ua/?op=1&z=4219>
- Kupchak, V. R. et al. *Formuvannya ta rehuliuвання регіональних енергетичних систем: теорія, методологія та практика* [Formation and Regulation of Regional Energy Systems: Theory, Methodology and Practice]. Lutsk, 2019.
- Lahodiienko, V. V. et al. *Innovatsiina діяльність на регіональних туристичних ринках: модернізація та регулювання* [Innovative Activity in Regional Tourism Markets: Modernization and Regulation]. Lutsk, 2022.
- Maliarenko, V. A. “Enerhozberezhennia – priorytetnyi napriamok rozvytku i vdoskonalennia komunalnoi enerhetyky” [Energy Conservation Is a Priority Area of Development and Improvement of Communal Energy]. *Integrovannyye tekhnologii i energoberezhennia*, no. 3 (2006): 19-30. http://library.kpi.kharkov.ua/files/JUR/ite_2006_3_Malyarenko_Enerhozberezhennya.pdf
- Ministerstvo enerhetyky Ukrainy. <http://mpe.kmu.gov.ua/>
- “Premier-ministr: Vpershe Uriad pidpysue uhody pro rozpodil produktsii iz peremozhtsiamy vidkrytykh ta prozorykh auktsioniv” [Prime Minister: For the First Time, the Government Is Signing Agreements on the Distribution of Products with the Winners of Open and Transparent Auctions]. *Uriadovyi portal*. December 31, 2020. <https://www.kmu.gov.ua/news/premyer-ministr-vpershe-uryad-pidpisuye-ugodi-pro-rozpodil-produktsiyi-iz-peremozhchymy-vidkritih-ta-prozorih-auktsioniv>
- Pavlov, K. et al. “Prospects of implementation of a new model of functioning of the electric power industry south-east region of Ukraine”. *Znanstvena Misel Journal*, vol. 50, no. 1 (2021): 21-27.
- Pavlov, K. V., and Pavlova, O. M. *Formuvannya ta rehuliuвання конкурентних відносин на регіональних ринках збуту України* [Formation and Regulation of Competitive Relations in the Regional Housing Markets of Ukraine]. Lutsk, 2019.
- Pavlov, K. V., Pavlova, O. M., and Kupchak, V. R. “Priorityetnyi napriamy derzhavnoho rehuliuвання konkurenttsii: vitchyzniani ta zarubizhnyi dosvid” [Priority Directions of the State Regulation of Competition: Domestic and Foreign Experience]. *Ekonomichnyi chasopys Skhidnoievropeiskoho natsionalnoho universytetu imeni Lesi Ukrainky*, no. 1 (2019): 14-20.
DOI: 10.29038/2411-4014-2019-01-14-20
- Pavlov, K., and Korotia, M. “Determination and Management of Gas Distribution Companies' Competitive Positions”. In *Advances in Manufacturing, Production Management and Process Control*, 302-309. *AHFE 2020. Advances in Intelligent Systems and Computing*, 2020.
DOI: https://doi.org/10.1007/978-3-030-51981-0_38
- Pavlov, K., Pavlova, O., and Kupchak, V. “Integral Indicators Based on Competitiveness Capacity Characteristics of Regional Real Estate Markets of Ukraine”. *Journal of Competitiveness*, vol. 11, no. 3 (2019): 87-108.
DOI: 10.7441/joc.2019.03.06
- Pavlova, O. et al. “Integral estimation of the competitiveness level of the western Ukrainian gas distribution companies”. *Accounting*, vol. 7, no. 5 (2021): 1073-1084.
DOI: 10.5267/j.ac.2021.3.001

- Pavlova, O. M. *Tovarna forma orhanizatsii suspilnoho vyrobnytstva v umovakh rozvytku natsionalnoi ekonomiky Ukrainy (druhoi polovyny XVII – kintsia XVIII st.)* [The Commodity Form of the Organization of Social Production in the Conditions of the Development of the National Economy of Ukraine (The Second Half of the 17th – the End of the 18th Century)]. Lutsk: Teren, 2019.
- Pryshchepa, O. et al. "Optimization of multi-channel queuing systems with a single retail attempt: Economic approach". *Decision Science Letters*. 2020. http://www.growingscience.com/dsl/Vol9/dsl_2020_22.pdf
- Pysanko, S. V., Pavlova, O. M., and Pavlov, K. V. "Rol ta znachennia investytsiino-innovatsiinykh protsesiv v elektroenerhetychnii haluzi rehionu" [The Role and Significance of Investment and Innovation Processes in the Electricity Industry of the Region]. *Ukrainskyi zhurnal prykladnoi ekonomiky*, vol. 5, no. 3 (2020): 320-328. DOI: <https://doi.org/10.36887/2415-8453-2020-3-35>
- Romanyuk, R., Pavlov, K., and Pavlova, O. "Features of Development and Prospects of Transformation of the Electricity Industry of the Region". *Internauka. Seriya «Ekonomichni nauky»*, no. 1 (2021). DOI: <https://doi.org/10.25313/2520-2294-2021-1-6854>
- Rozenberher, K. "Polityka Ukrainy v haluzi enerhetyky" [Policy of Ukraine in the Field of Energy]. *Predstavnytstvo fondu Konrada Adenauera v Ukraini*. Kyiv, 2012. https://www.kas.de/c/document_library/get_file?uuid=0ff395f1-5626-4300-6e5f-98815dfc091c&groupId=252038
- Strishenets, O. M. "Svitovi tendentsii rozvytku ekonomiky enerhetyky u XXI st.: adaptatsiia do ukrainskykh realii" [World Economics of Energy Trends: Implementation to Ukrainian Realities]. *Ekonomichnyi chasopys Skhidnoievropeiskoho natsionalnoho universytetu imeni Lesi Ukrainky*, no. 1 (2016): 73-79.
- Strishenets, O. M., and Pavlov, K. V. "Osoblyvosti konkurentnykh vidnosyn na rehionalnykh rynkakh nerukhomosti" [Peculiarities of Competitive Relations in Regional Real Estate Markets]. *Naukovyi visnyk Uzhhorodskoho universytetu. Seriya «Ekonomika»*, vol. 2, no. 1 (2016): 35-38.
- "Uriad pidpysav uhody shchodo rozpodilu dilianok na vydobuvannia hazu" [The Government Signed Agreements on the Distribution of Plots for Gas Extraction]. *Ekonomichna pravda*. December 31, 2020. <https://www.epravda.com.ua/news/2020/12/31/669689>
- Ukrtransnafta. <https://www.ukrtransnafta.com/>
- Vyshnevskiy, V., Aleksandrov, I., and Polovian, O. "Systemno-dynamichne modeliuвання rozvytku staropromyslovykh rehioniv" [System-dynamic Modeling of the Development of Old Industrial Regions]. *Ekonomika Ukrainy*, no. 7 (2010): 37-49.