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## Regulatory policy of competitive biofuel production in Ukraine

*The purpose of the article is to substantiate fundamental principles and systemic approaches regarding efficient regulation of national competitive biofuels production.*

**Research methods.** *The following scientific methods were used during the research: dialectical and analytical abstraction methods for systemizing historical pre-conditions for establishment and development of biofuel production; monographic for research of prior formation fundamentals and regulatory mechanisms for energetics policy and biofuel production; forecasting for forming conceptual principles for regulation and improvement of development strategy for competitive biofuel competitive; abstract and logical for forming theoretical generalizations and conclusion.*

**Research results.** *Algorithm of legal support and organization-economic regulation of competitive biofuel production was proposed due to the research results. Hierarchical levels of potential options for biofuel production and consumption in Ukraine were defined. Principles for consistency, adjustability, ultrastability, competence and synergy were proposed for formation and development of competitive biofuel production in Ukraine, along with generally accepted principles for state regulatory policy, which are expediency, adequacy, efficiency, harmony, predictability, transparency and consideration of public opinion.*

**Elements of scientific novelty.** *Scientific novelty of the research lies in the further developed mechanism for regulation of competitive biofuel production based on fundamental principles objective patterns, which differ from present scientific developments by providing priority to innovativeness and cluster approach.*

**Practical significance.** *Regulation instruments for biofuel production were studied, which strengthens economic and energy independence of the country, as well as provides conditions for growth of biofuel's competitiveness on the energy market. Figs.: 5. Refs.: 20.*

**Keywords:** *state regulation; economic development; energy independence; biofuel industry; competitiveness; regulation instruments.*

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**Scientific problem.** Current problem of state economic-energy policy is its ability to provide stable economic development's conditions, and the most important part of economic development — permanent economic growth. So regulatory efforts are directed more intensively to maximization of effective domestic production volume, which is the only way to increase consumption of material goods and satisfy constantly growing humanity's needs within limits of current technologi-

cal production method. Certainly, the range of problems of economic development is significantly larger, but its solution is tightly connected to defining existing production capabilities' potential and appropriate providing with accessible fuel and energy resources [7]. Due to fundamental changes in political mode and economic situation, which are characteristic for transition economy countries (as Ukraine), there is objective necessity to develop new systemic approaches, directed to energy policy's improvement and energy independence's improvement, which are one of

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the weakest links in state regulation in Ukraine. There are significant discrepancies in the formation and future operation of legislature in relation to EU standards, concerning rational usage of fuel and energy resources, which are becoming more strictly limited due to inconsistencies among centralized and regional distribution. So further effective economic development's processes in our country shall depend significantly from solving the problem of providing the country with cheap, renewable energy resources. The deficit of domestic energy source materials forces the Ukrainian government to increase their import volume. But in conditions of global hydrocarbons reserves' shortage, constantly growing prices for them, import is not enough as a solution to energy problem, which requires introduction of actionable regulatory instruments, targeted on national biofuel production's development.

**Analysis of recent research and publications.** Potential of full-scale biofuel production is characterized by significant irregularity of its realization in various countries, and their consumption efficiency, first of all, depends on actionability of government control. Regulation problems of competitive biofuel production are extensively studied in scientific work of Ukrainian and foreign scientists: P. Boucher [15], O. Varchenko [2, 3], V. Havrysh [1], C. Gamborg [16], H. Kaletnik [4], I. Kyrylenko [5], O. Litvak [8], V. Mesel-Veseliak [9], A. Mohr [17], R. Murphy [18], J. Palmer [19], O. Prutska [10], O. Stoian [12], O. Shpychak [14], W. Zhang [20] and others. But modern eurointegration processes and low consumption level of renewable energy resources, biofuels, in particular, requires further developing of methods and principles of regulation and sustainable development strategy of the national energy industry.

**The purpose of the article** - to carry out scientific and practical substantiation of basic principles and general systemic peculiarities of effective regulation of competitive biofuel production development. Study's methodology. The following methods were applied throughout the study: dialectical (systemization of world and domestic energy industry's historical development directions); monographic (research of priority foundations of energy policy and biofuel production's regulation formation and mechanisms); predictive (formation of conceptual foundations of regu-

lation and development strategy of competitive biofuels production), abstract-logical (theoretic generalizations and conclusion's wording).

**Research results.** Structural changes within world economic system condition necessity of developing and introduction into the economy of efficient regulatory instruments, which must be based on market economy's patterns and laws, as well as correspond to adequate government regulation principles. That activity requires appropriate state policy formation, aimed at the coordinated connection of price, tax, financial and budget policies, which are targeted at achievement of appropriate state priorities through introduction of actionable items in the legal sphere, scientific sphere, as well as social-ecologic sphere. In order to constantly grow domestic and international competitiveness of the national economy and provide high profitability for some industry's branches, an important state's mission is development and introduction of macroeconomic policy, which involves direct protectionism and granting subsidies to particular industry's branches, encouraging their competitiveness and economic stability. Regulation's efficiency in this particular context must be seen in tax subsidies, state insurance of foreign private investments, encouraging innovation technologies' transfer through private communication; new technical, technological and economic support programmers' development; transparent differentiated approach in foreign investments' engagement within efficient activity of certain industry's branches; stimulation of capital outflow from low-profit and non-perspective economy's branches.

General requirements of the global economy in fuel and energy resources are defined by the following processes: population growth ratio, economic growth ratios all over the world, development level of scientific and technical progress. Leading world experts are predicting unavoidable growth of global energy consumption, which will happen simultaneously with the expansion of urbanization processes and explosive growth of industrial production. Such a situation requires thoughtful usage of classic energy carriers while employing energy-saving technologies, as well as transition to renewable energy sources' usage. Biofuels are placed on the top in general structure of renewable energy sources during

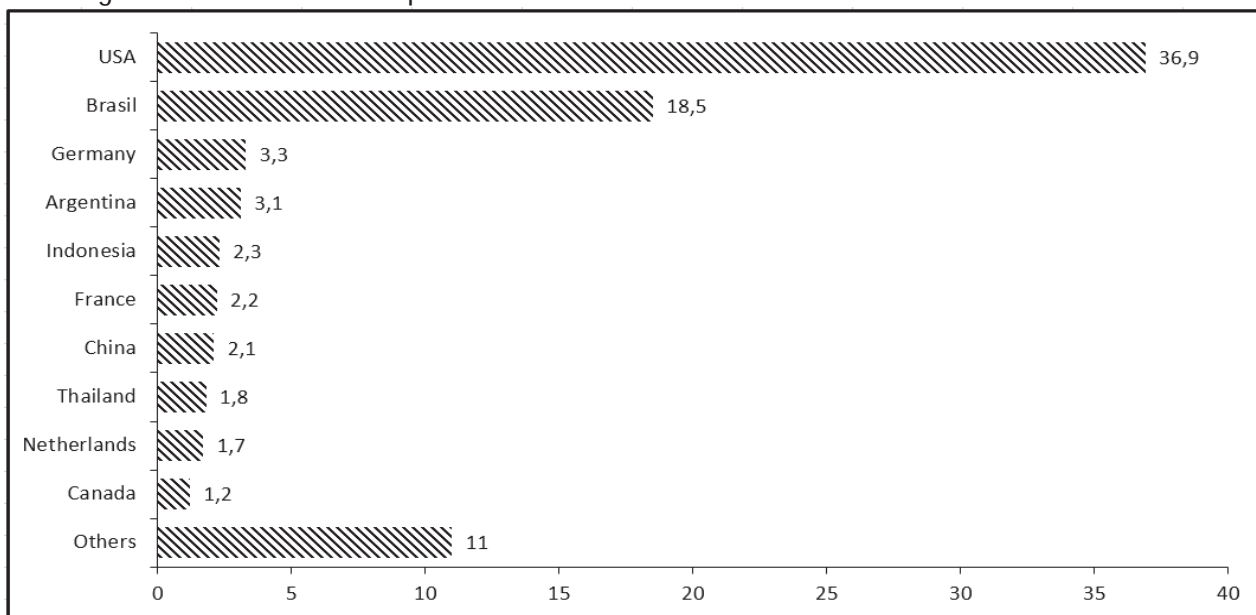
current development stage, they are viewed upon as an important resource for energy sources' diversification and providing energy security.

World biofuel industry is characterized by the presence of wide array of legislative support for bioenergy industry, as well as by state programmes' presence, which are directed on increase of biofuel volume's production in particular country (and biofuel market share). In order to stimulate biofuel production, a complex of means exists, which includes legislative regulation, indicative planning of production volume, tax benefits, budget support, etc [3]. It is practical to mention that state involvement and state control in the energy sector take place in all developed countries of the world. The more powerful is the country's economy, the more attention is granted to state control of ever-growing energy resources' expenses, which make significant share of the product's cost.

As opposed to that, insufficient state control causes increased negative processes' risk in the country's economy and disregard of legislative standards, which are in operation in the fuel and energy sector [6].

In general, such factors as constant oil prices growth, demands to decrease CO2 emissions, endeavour to increase the level of energy consumption efficiency and energy independence of certain countries, endeavour to create new workplaces, all these things drive countries to introduce measures, directed on biofuel production's support.

Leaders in biofuel production are USA (36.9 millions of tonnes of oil equivalent), Brazil (18.5 millions of tonnes of oil equivalent) and Germany (3.3 millions of tonnes of oil equivalent) (figure 1). Quantity of produced biofuel in the world grew significantly throughout recent 17 years: 9.2 million of tonnes in 2000, 84.1 million of tonnes in 2017.



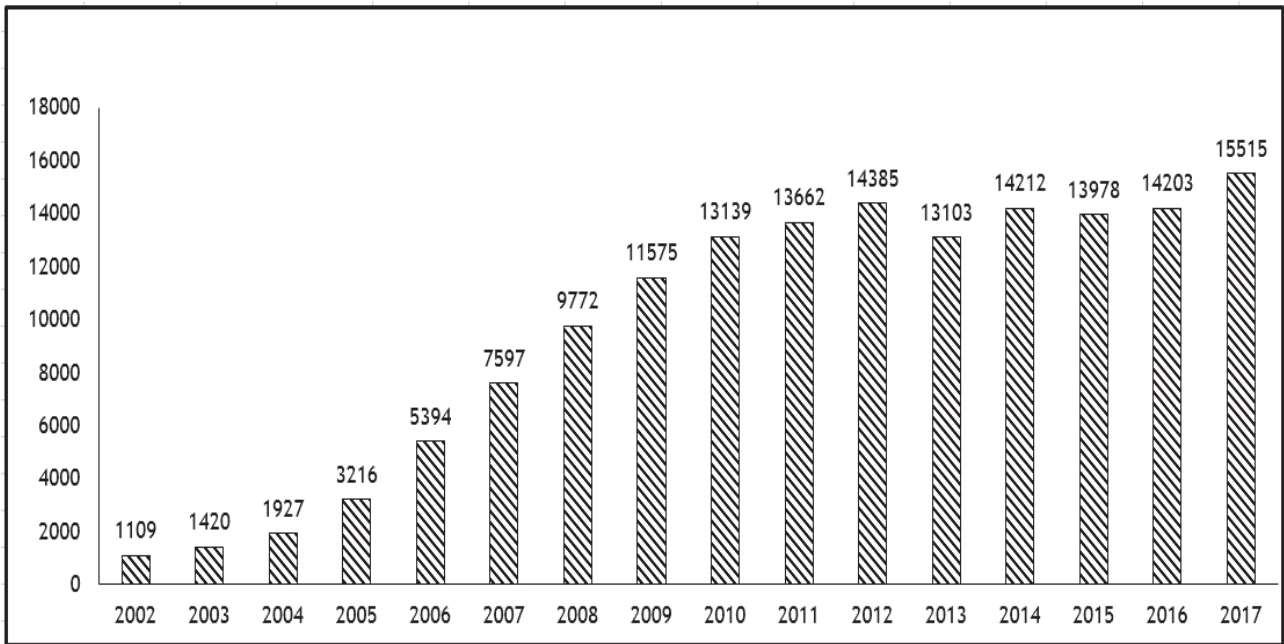
**Figure 1. World leaders in biofuel production, millions of toe**

Sources: Biofuel Market Reports 2019 : Trends, Analysis & Statistics.

European Union is craving to achieve 20% share of end consumption of renewable energy until 2020, 27% until 2030. Transition to a low-carbon energy system is a key element for EU countries, which have worked out several political documents and instruments, directed on the promotion of renewable energy sources. Key elements on EU level regarding renewable energy include directives, in particular, Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (2009). EU support is quite significant, which includes

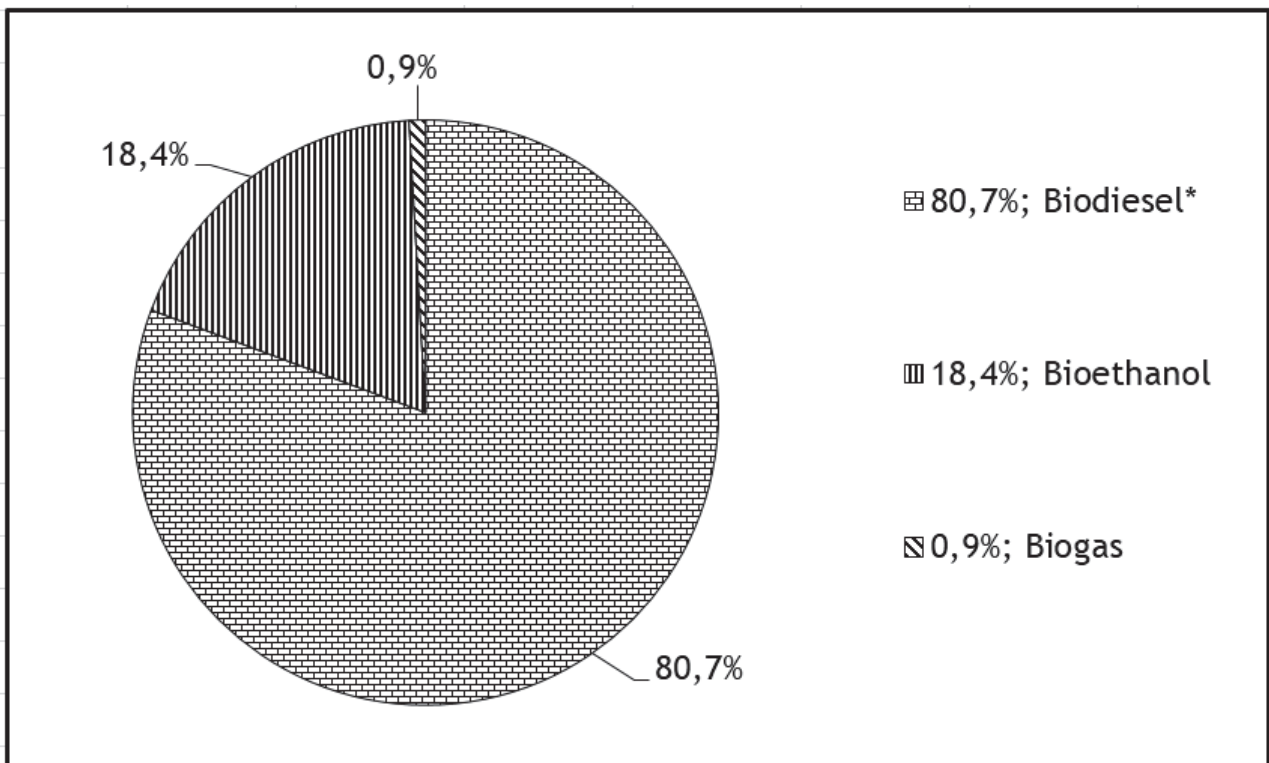
funding of scientific studies and innovations. In particular, "Horizon 2020" innovation and research framework programme support research and developments in light electricity, concentrated solar energy, wind power, ocean power, hydropower, geothermal power, renewable heating and cooling, storing of energy, biofuel and alternative types of fuel.

EU consumption of biofuel by vehicles is currently 15515 million of toe (figure 2). Biodiesel makes 80.7% share, 18.4% - bioethanol and 0.9% - biogas (figure 3).



**Figure 2. Biofuel consumption dynamics (liquid and biogas) by vehicles in EU, millions of toe**

Sources: Data from 2002 to 2015 (Eurostat 2018), data for 2016 to 2017 (EurObserv'ER 2018 - see methodological note).



**Figure 3. Total biofuel consumption shares by vehicles in EU, % (2017)**

\* Consumption of pure vegetable oil included in the biodiesel figure.

Source: EurObserv'ER 2018.

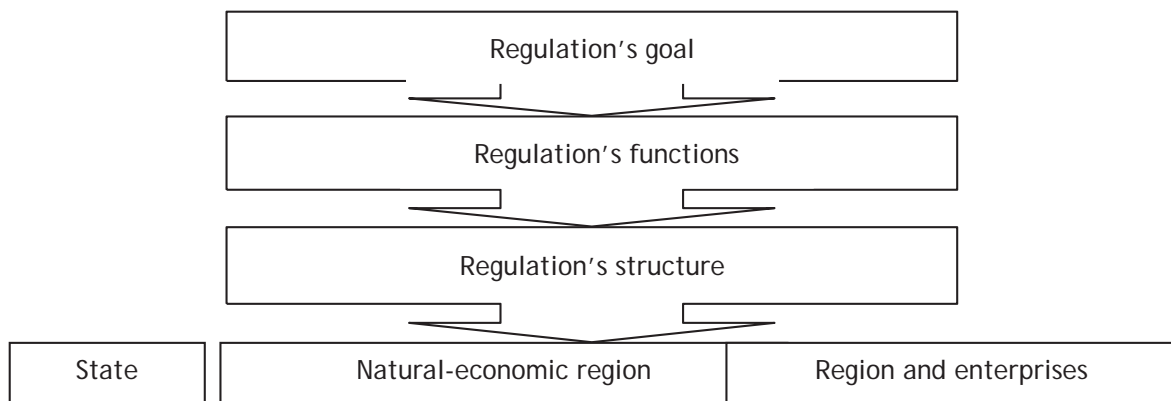
Significant growth of energy efficiency of Ukrainian national economy is one of the main methods to provide national security, budget fulfilment, growth of domestic products' competitiveness on the domestic and international market, solutions for social problems.

Introduction of energy-saving technologies may decrease volume of energy resources' import and deflate political pressure on our country by oil and natural gas exporters. Apart from that, reducing energy share in products' cost enables Ukraine to increase its

competitiveness on foreign markets. One of the ways to solve the mentioned problem is further targeted development of renewable energy sources. Their unconditional advantages are endless: nature and environmental safety, so EU countries are transitioning to using biomass energy; wind, solar and water-generated power. Share of renewable energy sources in some countries' energy budget is 40% and even more. In 2017, Ukraine featured only 3.8%. First of all, in order to provide efficient development of the biofuel industry, it is necessary to create an appropriate legal and economic foundation, as well as organize serial production of required equipment for various biofuels production. Further legislative acts of Ukraine must provide legal regulation for real biofuel market formation on the basis of usage of efficient and transparent mechanisms for stimulation of biofuels' pro-

duction and consumption, which must go along with government support. This is actually conditioned by the following: development and introduction of targeted and consistent national policy in biofuel production will enable Ukraine to become a valid participant of global markets of biofuel.

These problems, which were mentioned above, require general substantiation of national policy's strategic vectors in formation of biofuel production, carrying out of institutional reform and infrastructure's transformations, setting up of efficient operation of regional and national biofuel production, investment policy's transformation, formation of financial and industrial-financial organizations of various levels in order to support biofuel production. Precise algorithm of legal regulation of biofuel production on various levels is on figure 4.

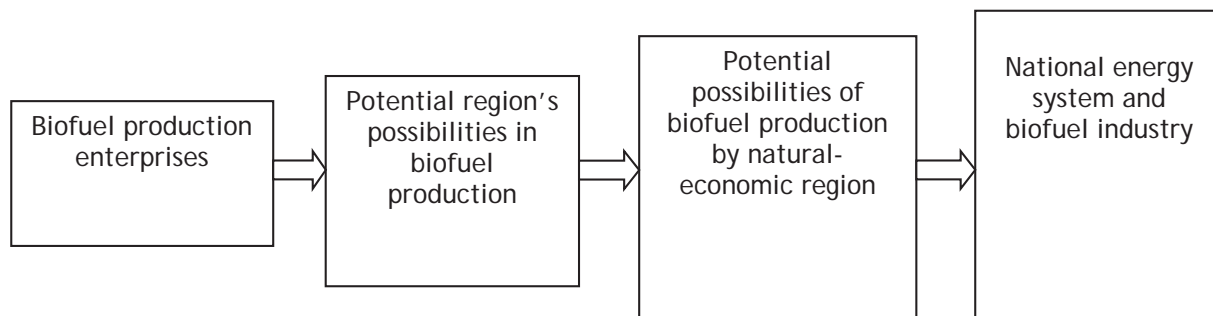


**Figure 4. Algorithm of legal regulation of biofuel production's competitive development**

Source: Developed by the authors.

Main means of set goal's realization will be the following: motivation of biofuel production due to tax and financial policy; standardization and legislative documents; information and technical support; technological development and commercialization; estimation of production capabilities and growth of management's influence. Domestic industry is characterized by significant technical underdevelopment and low innovation activity of economic subjects, as a result, there is an elevated technological and energy dependence from other countries. In order to carry out economic wonder while being a member of WTO and attempting to acquire EU membership, main development vectors must be directed to the organization of innovation-investment activity, accumulation and application of scientific, technological, resource

and intellectual potential. Efficient consumption of energy and fuel resources must be treated as an important part of the social-economic and industrial mechanism, which is working to overcome economic crisis in our country's economy, because significant deficit of energy resource is connected to its economic and energy independence, as well as competitiveness of its products. So, some of the main directions are introduction of resource-saving and energy-saving technologies, usage of alternative and renewable energy sources and raw materials in technological processes, exploitation of industrial technologies of biofuels production. Hierarchic levels of discovering potential production capabilities and consumption of biofuels in Ukraine are given on figure 5.



**Figure 5. Hierarchic levels of discovering potential production capabilities and consumption of biofuels in Ukraine**

Source: Developed by the authors.

Maintaining of mentioned development will allow growth of domestic biofuel industry's manufacturing capacity, which shall facilitate the increase of biofuel consumption in domestic energy structure. On the legislative level, Ukrainian government supports future development of renewable energy sources, establishing so-called "green tariffs" legally. But it is necessary to carry out an urgent estimation of most renewable sources' competitiveness from the suppliers' point of view, as well as their efficiency for the national economy. Precise analysis is required, market distortions are to be avoided if possible, industry's cross-subsidization is to be avoided also. The most important systemic features must be: accessibility of various energy sources and their cost specification (financial and economic), production cost, future price tendencies, ecological estimation, accessibility of "know-how", local conditions, etc. The decisive role in biofuel production's growth is in national energy security's support, the formation of a product's competitiveness and acceleration of Ukraine's economic growth processes. Main limiting factors of full-scale biofuel industry's establishment in Ukraine currently could be distributed to the following groups [11]: 1) investment attractiveness of biofuel raw materials' growing for further export; 2) imperfect and under-regulated legislative foundation in renewable energy industry; 3) absence of biofuel market's infrastructure and institutional unreadiness of the majority of customers to their usage; 4) high economic and organizational level of the biofuel market's operation requires high profitability growing and non-stop supply of energy biological raw material. In a broad sense, state regulation policy is a distinctive part and relatively independent direction within state economy control, which is based on certain

principles, applies specific methods, which are directed at increase of social-economic system's performance and anticipates cooperation of public authorities, local administration, economic subjects, their unions, society in order to coordinate interests and achieve economic development's goals [13]. State regulation of economic activity (including biofuels' production) is carried out due to the application of main control methods: economic, legal and administrative. According to Law of Ukraine "On the principles of regulatory policy in economic activity", main principles of state regulation policy are: 1) expediency - necessity's substitution of economic relations regulation in order to solve existing problem; 2) adequacy - correspondence of forms and level of economic relations' state regulation to demand of solving a problem and market requirements, taking into account all acceptable alternatives; 3) efficiency - achievement of maximum positive results due to minimally possible expenses of economic subjects' resources, citizens' and state's resources; 4) balance - regulatory activity is to support balance between interests of economic subjects, citizens and state; 5) predictability - consistency in regulatory activity, its conformity to state policy's goals and regulatory acts preparation plans, which enables economic subjects to plan their activity; 6) transparency and taking public opinion into account - openness for individuals and companies (and their unions) concerning actions of regulatory authorities, obligatory review of proposals and initiatives, submitted by individuals and companies in lawful manner, by regulatory authorities; obligatory and timeliness bringing to the notice of individuals and companies (concerned parties) of regulatory documents; informing the public about carrying out regulatory activity.

**Conclusion.** So national economy's energy efficiency growth requires urgent means, which shall provide the following: carry out transition to competitive domestic and international energy markets; shape up efficient internal infrastructure; introduce transparent market rules within energy sector; increase financial discipline level and level of responsibility regarding timely payments for used energy resources, also avoidance of counter-trading; introduce mechanisms of non-payment risks insurance; provide systemic control of price-making processes in energy sector; introduce mixed government-market regulation system of energy market's subjects

activity; carry out systemic control of natural monopolies' activity; increase renewable energy sources' share in national consumption structure, with priority to biologically sourced fuel types.

Abidance of suggested principles of government regulatory policy will allow intensive development and establishment of competitive biofuel production in Ukraine, create favourable conditions for bringing investments in agricultural industry, introduction of innovative technologies and modern experience of efficient operation of agriculture on the diversity and industry clustering principles.

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#### **Климчук О.В., Ходаківська О.В. Регуляторна політика конкурентоспроможного виробництва біопалив в Україні**

**Мета статті** - обґрунтувати засадничі принципи і загальносистемні підходи щодо ефективного регулювання розвитку національного конкурентоспроможного виробництва біопалив.

**Методика дослідження.** Використано наступні наукові методи: діалектичний та аналітичних узагальнень (систематизація історичних передумов становлення і розвитку біопаливного виробництва); монографічний (дослідження пріоритетних засад формування і механізмів регулювання енергетичної політики та виробництва біопалив); прогностичний (формування концептуальних засад регулювання й удосконалення стратегії розвитку конкурентоспроможного виробництва біопалив); абстрактно-логічний (теоретичні узагальнення та формулювання висновків).

**Результати дослідження.** Запропоновано алгоритм нормативно-правового забезпечення та організаційно-економічного регулювання розвитку конкурентоспроможного виробництва біопалив. Визначено ієрархічні рівні вишукування потенційних можливостей виробництва та споживання біопалив в Україні. Для формування й розвитку конкурентоспроможного виробництва біопалив в Україні, окрім загальноновизначених принципів державної регуляторної політики, якими є принципи доцільності, адекватності, ефективності, збалансованості, передбачуваності, прозорості та врахування громадської думки, запропоновано використовувати принципи послідовності, гнучкості, гомеостатичності, компетентності та синергізму.

**Елементи наукової новизни.** Удосконалено механізм регулювання розвитку конкурентоспроможного виробництва біопалив на основі базових принципів і загальносистемних закономірностей, що відрізняються від наявних наукових розробок наданням пріоритету інноваційності та кластерним підходом.

**Практична значущість.** Розглянуто регуляторні інструменти процесу виробництва біопалив, що посилює економічну й енергетичну незалежність країни та створює умови для зростання конкурентоспроможності біопалив на енергетично-му ринку. Рис.: 5. Бібліогр.: 20.

**Ключові слова:** державне регулювання; економічний розвиток; енергетична незалежність; біопаливна індустрія; конкурентоспроможність; регуляторні інструменти.

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**Климчук А.В., Ходаковская О.В. Регуляторная политика конкурентоспособного производства биотоплив в Украине**

**Цель статьи** - обосновать основные принципы и общесистемные подходы по эффективному регулированию развития национального конкурентоспособного производства биотоплив.

**Методика исследования.** Используются следующие научные методы: диалектический и аналитических обобщений (систематизация исторических предпосылок становления и развития биотопливного производства); монографический (исследование приоритетных принципов формирования и механизмов регулирования энергетической политики и производства биотоплива); прогностический (формирование концептуальных основ регулирования и совершенствования стратегии развития конкурентоспособного производства биотоплив), абстрактно-логический (теоретические обобщения и формулирование выводов).

**Результаты исследования.** Предложен алгоритм нормативно-правового обеспечения и организационно-экономического регулирования развития конкурентоспособного производства биотоплива. Определены иерархические уровни изыскания потенциальных возможностей производства и потребления биотоплив в Украине. Для формирования и развития конкурентоспособного производства биотоплив в Украине, кроме общепризнанных принципов государственной регуляторной политики, которыми являются принципы целесообразности, адекватности, эффективности, сбалансированности, предсказуемости, прозрачности и учета общественного мнения, предложено использовать принципы последовательности, гибкости, гомеостатичности, компетентности и синергизма.

**Элементы научной новизны.** Усовершенствован механизм регулирования развития конкурентоспособного производства биотоплив на основе базовых принципов и общесистемных закономерностей, что отличаются от имеющихся научных разработок предоставлением приоритета инновационности и кластерным подходом.

**Практическая значимость.** Рассмотрены регуляторные инструменты процесса производства биотоплив, что усиливает экономическую и энергетическую независимость страны и создает условия для роста конкурентоспособности биотоплив на энергетическом рынке. Илл. : 5. Библиогр. : 20.

**Ключевые слова:** государственное регулирование; экономическое развитие; энергетическая независимость; биотопливная индустрия; конкурентоспособность; регуляторные инструменты.

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