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ORIGINAL PAPER

ON THE IMPLEMENTATION OF THE GOALS OF SUSTAINABLE DEVELOPMENT OF THE REGION IN THE FIELD OF ENERGY (ON THE EXAMPLE OF THE MEMBER COUNTRIES OF THE EURASIAN ECONOMIC UNION)

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Abstract. The purpose of the study is to discover the opportunities for the Sustainable Development Goals (SDGs) implementing in energy area in the Eurasian Economic Union (EAEU) member countries, taking into account the strategic importance of this sphere of management for the successful development of integration processes in the context of sustainability and competitiveness increasing of the region. The methodological basis of the study is based on theoretical concepts of sustainable economic development theory and sectoral regional integration. Quantitative analysis of statistical data, comparison methods, as well as economic and mathematical methods of forecasting were used in the process of paper writing. The importance of assessing of sustainable development indicators in the global economy is highlighted in the study, as well as the need for monitoring and analyzing of the SDGs achievement for the member countries of the EAEU. The paper describes the fuel and energy complex of the Eurasian region, underlines the priority and strategic importance of the energy sector development in it, and also analyzes the situation and opportunities for the SDG number 7 implementation, concerning possibilities to ensure access to affordable, reliable, sustainable and modern energy sources for all countries participating in the integration process in the context of common energy markets formation in the Eurasian space. A prospective assessment of the implementation of such opportunities to improve sustainability and energy security for the EAEU countries is proposed. As the main result, the forecasts for gas, oil and petroleum products markets development, as well as for the EAEU electricity market for the long-term period are made, and the possibilities of sustainable development goal implementing in the context of low-cost and clean energy obtaining are evaluated. Theoretical research in the field of sustainability indicators analysis in the world economy formed the basis on which it became possible to investigate the achievement of the SDGs in the EAEU region, to identify the problems faced by the member countries in the implementation of the SDGs in the energy sector, namely, to assess the opportunities for common energy markets development for synergistic effects obtaining in the long-term prospects from energy integration processes in order to improve the energy efficiency of energy systems distribution, to increase energy security and population well-being.
Keywords: common energy markets, energy integration, Eurasian Economic Union (EAEU) region, sustainable development, Sustainable Development Goals (SDGs) in the energy area.

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ОРИГИНАЛЬНАЯ СТАТЬЯ

О РЕАЛИЗАЦИИ ЦЕЛЕЙ УСТОЙЧИВОГО РАЗВИТИЯ РЕГИОНА В ОБЛАСТИ ЭНЕРГЕТИКИ (НА ПРИМЕРЕ СТРАН-ЧЛЕНОВ ЕВРАЗИЙСКОГО ЭКОНОМИЧЕСКОГО СОЮЗА)

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Аннотация. Представленное в статье исследование направлено на изучение возможностей реализации целей устойчивого развития (ЦУР) в части энергетики в странах-членах Евразийского экономического союза (ЕАЭС) с учетом стратегической важности этой области хозяйствования для успешного развития интеграционных процессов в контексте устойчивости и повышения

конкурентоспособности региона. Методологическая основа исследования базируется на теоретических концепциях теории устойчивого развития экономики и отраслевой региональной интеграции. При проведении исследования использовался количественный анализ статистических данных, методы сравнения, а также экономико-математические методы прогнозирования. Подчеркнута важность оценки показателей устойчивого развития в масштабах мировой экономики, а также отмечена необходимость мониторинга и анализа достижения ЦУР для стран-членов ЕАЭС. Дана характеристика топливно-энергетического комплекса евразийского региона, выделена приоритетность и стратегическая важность развития в регионе сферы энергетики. Проанализированы состояние и возможности реализации ЦУР номер 7, касающейся возможностей сделать энергию более доступной и надежной для стран-участниц интеграционного процесса в контексте формирования общих энергетических рынков на евразийском пространстве. Дана перспективная оценка реализации возможностей повышения устойчивости и энергетической безопасности для стран-членов ЕАЭС. В качестве основного результата определены перспективы интеграционного развития энергетических рынков на пространстве ЕАЭС на основе прогнозного моделирования и дана оценка возможностей реализации ЦУР в контексте получения недорогостоящей и чистой энергии. Теоретическое исследование в области изучения показателей устойчивости мировой экономики составило базу, на основе которой стало возможным проведение анализа достижения ЦУР в регионе ЕАЭС, выделение проблемы, с которыми сталкиваются страны-члены ЕАЭС в ходе реализации ЦУР в сфере энергетики, а именно оценка возможности по развитию общих энергетических рынков для получения синергетических эффектов в долгосрочной перспективе от энергетических интеграционных процессов с целью повышения энергоэффективности распределительных энергосистем, роста энергетической безопасности и благосостояния населения.
Ключевые слова: общие энергетические рынки, энергетическая интеграция, Евразийский экономический союз (ЕАЭС), устойчивое развитие, цели устойчивого развития (ЦУР) в сфере энергетики.

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In current times, the world community is on the verge of global environmental restrictions. Developing without taking into account the ecological component is no longer possible, since in this case the world is threatened with irreversible degradation of the environment. The level of development of both individual states and regional integration unions is determined not only by indicators of the well-being of society, but also by its ability to introduce innovations aimed at preserving the environment. The assessment of this level of development is carried out using generally accepted international methods based on the use of a set of criteria parameters and indicators [1-3].

One such methodology involves assessing the indicators of the attainability of the Sustainable Development Goals (SDGs), developed in 2015 by the UN General Assembly as a "Plan for a Better and More Sustainable Future for All". The final document "Transforming Our World: the 2030 Agenda for Sustainable Development" contains 17 global goals and 169 corresponding tasks aimed at achieving a favorable socio-ecological and economic effect for the world community [4, 5].

The Eurasian Economic Union (EAEU) is a dynamically developing international organization that supports the vector aimed at achieving the goals and objectives of sustainable development both at the national level of the EAEU member states and within the framework of common Eurasian integration processes [6, 7].

The Supreme Eurasian Economic Council pays special attention to the implementation of Sustainable Development Goal number seven (SDG 7) – "to provide access to affordable, reliable, sustainable and modern energy for all" – through the formation of a common Eurasian energy market. Expansion of energy cooperation is seen as an opportunity to improve the collective energy security of the EAEU member states, i.e. strengthening their protection against energy shortages when using energy flows, balancing energy capacities, redistributing energy, etc., as well as the competitiveness of the Eurasian region in the long term [8-11].

In this regard, it is of scientific interest to study the already achieved effects in the direction of ensuring the energy sustainability of the economies of the EAEU member countries, as well as forecasting additional, integration energy benefits.

Specialists have identified such components of energy integration as technical, technological, functional, organizational, informational and software [12, 13]. At the same time, there are two main prerequisites for the energy unification of countries: 1) growing volumes of demand for energy resources in parallel with the economic growth of developing economies – an opportunistic prerequisite; 2) a rapid transition to the latest technologies, including in the field of energy (for example, the use of deep-sea mining technologies, the use of renewable energy sources (RES), etc.) in developed countries – a change in the technological order [2, 14].

Historically, since the days of the USSR, the energy sector has been dominant in the EAEU member countries, and today a vast experience has been accumulated in the production and distribution of energy with the preserved infrastructure, production facilities and huge energy potential. In 2009, the

"third energy package" was adopted, aimed at increasing energy efficiency and decarbonizing the economy in the Eurasian space, according to which it is expected to increase energy efficiency by 30% and reduce harmful emissions into the atmosphere by 30-40% [15].

Along with the developed normative legal acts of the supranational level, all EAEU member countries have their own national sets of regulations aimed at introducing resource-saving technologies, increasing energy efficiency, and developing alternative energy. At the same time, each of them, occupying certain positions in the world ratings of sustainability, counts on their increase due to the integration effects from the development of energy cooperation.

In the rating of 193 countries of the Sustainable Development Solutions Network (SDSN) in 2020 [16], the EAEU member countries occupy quite optimistic places, although in relation to the rating of 2018, partly under the influence of external unfavorable factors, such as the COVID-19 pandemic, sanctions policy in in relation to Russia, the general global turbulence, etc., many indicators determining the rating have decreased: Belarus has the highest position – 18th place (in 2018 – 21), followed by Kyrgyzstan – 52nd place (49), Russia – 57th place (62) , Kazakhstan – 65th place (46), Armenia – 75th place (43).

If we consider the results of achieving SDG 7, we can note that it is marked in the SDSN rating in green (which means its implementation) only in Armenia. At the same time, according to the data of the Statistical Committee of the Republic of Armenia, by 2030 the country has been set tasks to ensure the availability of reliable, technologically modern and at the same time inexpensive electricity supply, as well as to increase the share of renewable energy sources in the national energy structure and double the energy efficiency indicator. In Belarus and Kazakhstan, there is a significant level of carbon dioxide emissions from electricity generation, as well as from fuel combustion, which does not allow the implementation of SDG 7. The implementation of projects for the commissioning of the Belarusian NPP and the Kazakhstan NPP should contribute to solving these problems. In Kyrgyzstan, improvements have been noted in achieving SDG 7, but challenges remain to ensure that clean fuels and cooking technologies are available to the population. In Russia, the situation is gradually improving, but its characteristics are not sufficient to achieve SDG 7, since the country has a higher than normal level of emissions of harmful gases into the atmosphere. This is a systemic defect in almost all EAEU member countries.

Currently, the Eurasian Economic Commission (EEC) is constantly monitoring and evaluating the achievement of EAEU SDG 7, on the basis of which vectors for improving environmental performance are outlined, including through the development of alternative energy. It is envisaged that the emerging common energy markets should be open in order to freely participate in them by enterprises of the EAEU member states and represent a built system in which companies for the extraction, transportation and processing of various energy resources will interact on the basis of direct contracts and exchange trading. At the same time, the main goal of energy integration in the EAEU is determined by the course towards sustainable development of economies, which, according to EEC experts, should contribute, first of all, to increase the level of energy security and the quality of life of the population of the EAEU member countries [6, 7, 17]. Achieving these goals will give the EAEU relevance in the global economy.

An increase in the level of energy security in the EAEU space is possible due to the effective redistribution of energy resources, their optimal balancing, stability in the event of any unforeseen fluctuations in the market (*Fig. 1*). The forms and scale of such redistribution are determined by the type of energy resources – they can be owned and purchased, which, in turn, predetermines the status of the country as a net consumer or net producer, and also necessitates the development of alternative energy.

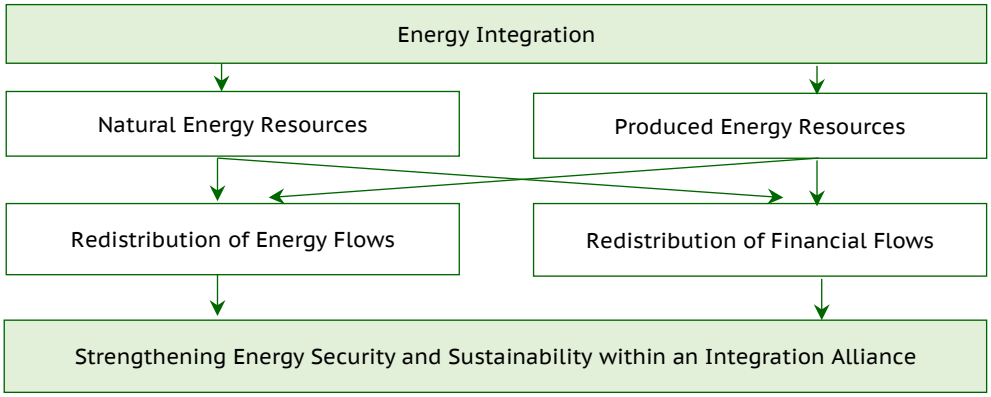

Fig. 1. **Redistribution of Energy Resources During the Formation of Common Energy Markets** */ Рис. 1.* **Перераспределение энергетических ресурсов в процессе формирования общих энергетических рынков**

Source: compiled by the authors based on bibliographic review / *Источник:* составлено авторами на основе изучения специализированной научной литературы

By deepening energy cooperation, each of the EAEU member countries expects to receive additional competitive advantages and unique strategic opportunities due to their geographic location, available capacities, legacy of infrastructure, etc., which in the future will ensure an increase in the sustainability indicators of national economies (*Fig. 2*).

When using isolated or poorly integrated energy systems, changes in operating modes, emergencies in the national energy system lead to losses of consumers, who are forced to stop the production cycle, etc. The high integration of systems, on the contrary, allows for balancing in cases of drops and leveling unforeseen emergency shutdowns that occur. Thus, we are talking about an advantage, which is to increase the energy security of countries and the sustainability of backbone power grids and systems. The next advantage is to increase the energy efficiency of production and optimize production cycles (increasing the efficiency of the system, increasing the flexibility of distribution, reducing costs, increasing the service life of the equipment due to even distribution of the load, etc.). In addition, it will be possible to comprehensively use different types of energy capacities, since they will be mutually complementary within the system (an optimal combination of low- and high-maneuverable capacities, different generating facilities, etc.).

The generation of such advantages is especially relevant when using an integrated energy system in such vast territories as the Eurasian space with the possibility of including other countries in it in the future. In this regard, the analysis and assessment of the prospects for the implementation of energy integration projects in the Eurasian space are being updated.

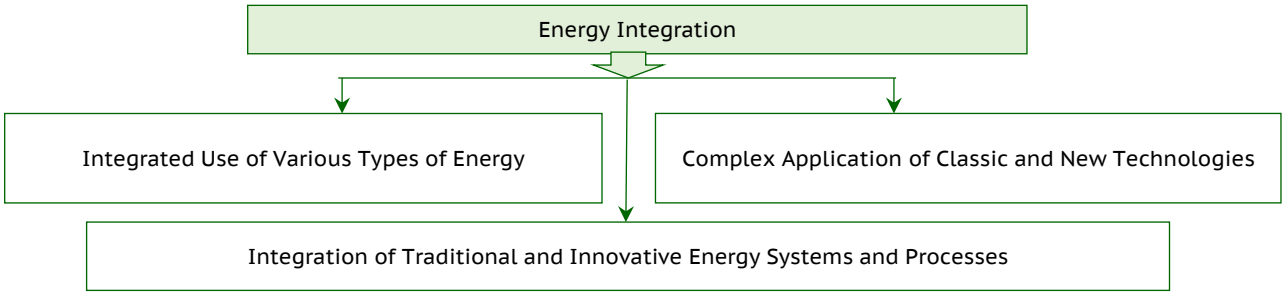

Fig. 2. **Benefits from the Energy Integration of the EAEU Member States** */ Рис. 2.* **Преимущества от энергетической интеграции стран-участниц ЕАЕU**

Source: compiled by the authors based on bibliographic review */ Источник:* составлено авторами на основе изучения специализированной научной литературы

Integration in the energy sector is a complex process of forming common markets as unified technical and economic systems that are influenced by many exogenous and endogenous factors – the state of supply and demand, the level of development of technological innovations, the values of indicators of investment attractiveness, etc. In this regard, in order to calculate the prospective development of the EAEU energy markets, it was necessary to collect and analyze large amounts of data and parameters affecting the system, which was taken into account in the assessment methodology proposed by the authors, which is based on the methods of comparative analysis and the implementation of predictive estimates within the framework of the scenario approach. as well as various economic and mathematical methods [6].

The methodology is formed on the basis of certain macroeconomic scenario conditions and includes the following forecasts for energy use:

- final consumption with a specific division of energy resources by different types of consumers in the EAEU member countries;
- development of the energy industry in the EAEU member countries based on the future dynamics of national generating capacities.

The development of the electric power industry was predicted on the basis of information obtained from the strategic documents of the EAEU member countries regarding investment projects for the commissioning of generating facilities for hydroelectric power plants, nuclear power plants and renewable energy sources; as well as regarding the possibilities for the construction of new generation facilities and the modernization of existing capacities [18].

Thus, according to the results of calculations regarding the prospects for the development of the gas market, an increase in the total consumption (production) of gas is expected in 2017-2040. from 2% to 17% depending on the scenario being implemented (*Table 1*).

According to the forecast, the total production on the oil market by 2040 will decrease by 0.2% (low scenario), and under the conditions of the medium and high scenarios, it will grow from 7% to 15%, respectively, in relation to 2017. According to the studied project documents, it is noted that the total capacity of oil refineries for primary processing will not change, however, the long-term plans of the EAEU member countries include the implementation of high-tech projects for the secondary processing of oil (*Table 2, Table 3*).

Table 1 / Таблица 1

Results of Calculations for Prospective Development of the Common Gas Market in the EAEU space / Результаты расчетов по перспективному развитию общего рынка газа на пространстве EAEU

EAEU Member State / Страна-участница EAEU	Gas Consumption (Production), billion cubic meters / Потребление (производство) газа, млрд. куб. м			
	2017, Fact / 2017 г., факт	By 2040, Depending on the Type of Scenario (Forecast) / к 2040 г. в зависимости от вида сценария (прогноз)		
		Low / низкий	Middle / средний	High / высокий
Armenia	1.9 (0)	3 (0)	3 (0)	3 (0)
Belarus	19.7 (0.4)	14 (1)	15 (1)	16 (1)
Kazakhstan	36.6 (50.6)	36 (36)	38 (38)	40 (40)
Kyrgyzstan	0.3 (0.1)	1 (0)	1 (0)	2 (0)
Russia	475.9 (703.1)	450 (715)	478 (763)	507 (858)
EAEU, total	534.4 (754.2)	504 (752)	535 (802)	568 (899)

Source: compiled by the authors based on [18] / *Источник:* составлено авторами по [18]

Table 2 / Таблица 2

Results of Calculations for Prospective Development of the Common Oil and Petroleum Products Market in the EAEU Space / Результаты расчетов по перспективному развитию общего рынка нефти и нефтепродуктов на пространстве EAEU

EAEU Member State / Страна-участница EAEU	Oil Consumption (Production), million tones / Потребление (производство) нефти, млн. тонн			
	2017, Fact / 2017 г., факт	By 2040, Depending on the Type of Scenario (Forecast) / к 2040 г. в зависимости от вида сценария (прогноз)		
		Low / низкий	Middle / средний	Low / низкий
Armenia	0.3 (0)	0.3 (0)	0.3 (0)	0.3 (0)
Belarus	6.3 (1.6)	5.5 (1)	5.8 (2)	6.3 (2)
Kazakhstan	15.8 (89.6)	14.1 (114)	15.4 (123)	17.1 (131)
Kyrgyzstan	1.9 (0)	2.8 (0)	3.0 (0)	3.2 (0)
Russia	193.4 (547.9)	169.6 (522)	181.9 (560)	198.7 (603)
EAEU, total	217.7 (639.1)	192.3 (637)	206.4 (685)	225.6 (736)

Source: compiled by the authors based on [18] / *Источник:* составлено авторами по [18]

Table 3 / Таблица 3

Results of Calculations for Prospective Processing of the Common Oil and Petroleum Products Market in the EAEU Space / Результаты расчетов по перспективной переработке нефти и нефтепродуктов на пространстве EAEU

EAEU Member State / Страна-участница EAEU	Refining (Capacity) of oil, millon tons / Переработка (мощности) нефти, млн. тонн			
	2017, Fact / 2017 г., факт	By 2040, Depending on the Type of Scenario (Forecast) / к 2040 г. в зависимости от вида сценария (прогноз)		
		Low / низкий	Middle / средний	Low / низкий
Armenia	0	0	0	0
Belarus	18.4	24.0	24.0	24.0
Kazakhstan	13.7	17.1	17.1	17.1
Kyrgyzstan	0.8	1.1	1.1	1.1
Russia	281.4	316.2	316.2	316.2
EAEU, total	314.3	358.4	358.4	358.4

Source: compiled by the authors based on [18] / *Источник:* составлено авторами по [18]

The long-term forecast for the development of the electric power industry of the EAEU states is based on market demand indicators, interstate policies of countries in this area, as well as investment plans regarding the commissioning of electric power capacities, including non-fuel generation (*Table 4*).

It should be noted that the EAEU interstate policy in the field of electricity provides for the following promising conditions for the functioning of common markets:

- the possibility of access of EAEU member countries to the Russian electricity market under a low development scenario by 2025, with an average – by 2022, with a high – from July 1, 2019 (the specificity of the EAEU market is such that the success of integration processes in the energy sector on the Eurasian space largely depends on access to Russia's power generation systems);
- the possibility of an additional volume of electricity supplies to Russia from the EAEU member countries in the low scenario – 12 TWh, with an average and high, respectively, 20 and 25 TWh;
- If the middle scenario is realized, the companies of the EAEU member countries will not be able to purchase Russian gas at domestic prices from 2030, and if the scenario is high, from 2025.

The calculations show that by 2025 the EAEU market capacity in the energy sector may reach about 9.5 GW, 2/3 of which will be in Russia. In the

forecast period (until 2040), it is planned to increase the EAEU's nuclear power capacity, mostly in Russia, from 2.5 to 12.0 GW, and due to the commissioning of nuclear power plants in Belarus and modernization of nuclear power plants in Armenia. The hydropower industry is planned to be developed in Russia and Kyrgyzstan, where the increase in hydroelectric capacity is projected up to 6.7 GW in total. Renewable energy capacities can increase up to 15.7 GW [15]. Here, we note that the implementation of programs to expand the introduction of alternative energy sources in the Eurasian space is proceeding slowly, although the EAEU member countries have a certain energy and technological potential for expanding this direction of energy in their territories.

Table 4 / Таблица 4

The Results of Calculations of the Production / Consumption of the Electric Power Industry of the EAEU Member States in the EAEU Space for the Period 2018-2040 / Результаты расчетов производства / потребления электроэнергетики стран-участниц ЕАЭС на пространстве ЕАЭС за период 2018-2040 гг.

EAEU Member State / Страна-участница ЕАЭС	Electricity Production / Consumption 2017, TWh / Производство / потребление электроэнергии 2017 г., ТВ-ч	Scenario Type (Consumption Forecast), TWh / Вид сценария (прогноз потребления), ТВт-ч		
		Low / низкий	Middle / средний	Low / низкий
Armenia	7.9 / 6.7	10.0	10.7	11.6
Belarus	35.0 / 37.6	41.6	44.2	47.4
Kazakhstan	119.0 / 119.0	147.0	158.8	173.4
Kyrgyzstan	12.8 / 13.4	23.6	25.6	28.1
Russia	1097.1 / 1053.0	1295.6	1375.7	1454.2
EAEU, total	1517.0 /1229.7	1517.8	1615.0	1714.7

Increase in Electric Power Capacities, GW / Прирост электроэнергетических мощностей, ГВт			
EAEU Member State / Страна-участница ЕАЭС	Generation Type / Вид генерации		
	NPP / АЭС	HPP / ГЭС	RSoE / ВИЭ
Armenia	0.0	0.1	0.3
Belarus	2.4	0.1	0.9
Kazakhstan	0.0	0.0	2.3
Kyrgyzstan	0.0	1.3	0.0
Russia	2.6	5.4	12.2
EAEU, total	5.0	6.9	15.7

Источник: составлено авторами по [18] / *Source:* compiled by the authors based on [18]

The results of the study indicate that the demand for electricity consumption for the period up to 2040 in the EAEU member countries will grow, and to a greater extent in Russia, Belarus and Kazakhstan due to the significant size of the national economies of these countries. At the same time, Armenia and Kyrgyzstan have significant potential for fuel and non-fuel generation and opportunities for its development. In any development scenarios, the integration effects from the formation of common energy markets in the Eurasian space will be obtained by ensuring the flexibility of meeting demand, the reliability of the energy system, the efficiency of the redistribution of electricity, which, as a result, will contribute to an increase in the stability of the entire EAEU energy system and the generation of socio-ecological and economic effects. Expansion of cooperation in the energy sector of the region will activate related sectors of the economy and increase the competitiveness of the EAEU member countries.

Authors' Liability Statement

The authors declare no conflicts of interest related to the publication of this article. The article reflects the results of the joint research of the authors.

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