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STATE REGULATION OF THE EXTRACTION OF CRITICAL MINERALS AS A DOMINANT COMPONENT OF ACHIEVING THE GOALS OF SUSTAINABLE DEVELOPMENT AND STRENGTHENING THE ECONOMIC SECURITY OF THE STATE

The article states that the climate crisis and measures to mitigate it in recent years have significantly changed the energy landscape of the countries of the world and the configuration of the investment portfolio. Long-term investments in fossil fuels have been replaced by investments in environmentally friendly technologies, renewable sources of electricity, and smart systems for its distribution and storage. It is emphasized that even with full support of investments, plans for the decarburization of the electric power industry may remain unattainable, as the global reserves of «critical minerals», which are absolutely necessary for the transition to ecologically clean electric power, are noticeably decreasing and the demand continues to grow relentlessly. The scenarios developed by the International Energy Agency for the further transformation of the electric power sector to a low-carbon economy model were reviewed and briefly characterized: the scenario of declared policy (STEPS), the scenario of declared obligations (APS), and the scenario of net zero emissions by 2050 (NZE). The main aspects of each of the scenarios are outlined: the volume of demand for «critical minerals» their geographical concentration of

extraction, and processing. It is emphasized that the world leader in the extraction and processing of «critical minerals» is the PRC, which dictates the «rules of the game» to the majority of the world's countries. Therefore, the issue of supplies of "critical minerals" is quite painful. It was emphasized that critical minerals market participants hope to reduce total dependence through new mining projects in different geographical regions, facilitating cross-investment opportunities between partner countries, and strengthening cooperation through initiatives such as the Mineral Security Partnership and the implementation of financial instruments. The potential of Ukraine's «critical minerals» and its ability to reduce the dependence of EU countries on the People's Republic of China are characterized. The main challenges of the development of the extractive industry in Ukraine are identified, and the main vectors of the Roadmap of the partnership between Ukraine and the EU regarding critical raw materials for 2023-2024 are outlined. It was emphasized that in order for Ukraine not to become only a supplier of raw materials, it is necessary to develop the processing of raw materials and the production of products with added value. It is emphasized that such localization requires much wider efforts of the government than the list of measures in the field of regulating the extraction of «critical minerals» defined by the latest legislative acts. The author emphasizes the need to develop a comprehensive system of incentives and introduce new opportunities for stabilization and sustainable development of Ukraine's economy in order to ensure sustainability and progress towards sustainable resource management and optimization of supply chains for critical raw materials. Proposals have been developed for climate-smart mining of «critical minerals» in Ukraine in the near future.

Key words: *state regulation, economic security, energy landscape, energy decarburization, renewable energy sources, mining and metallurgical enterprises, critical minerals, critical mineral raw materials.*

Statement of the problem in a general form. The climate crisis and measures to mitigate it in recent years have significantly changed

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the energy landscape of countries around the world and the configuration of investment portfolios. Long-term investments in fossil fuels have been replaced by investments in renewable energy sources (RES), smart energy distribution, and storage systems.

IRENA estimates that to limit global temperature increase to 1.5°C and reduce CO2 emissions to zero by 2050, installed renewable energy capacity will need to increase 10 times from 2022 levels, requiring a total investment of 131 trillion. US dollars [1].

However, even with full investment, plans for decarburization of the electric power industry may remain unattainable, as global reserves of "critical minerals" that are essential for the transition to «clean energy» are noticeably decreasing, and demand continues to grow relentlessly. Thus, according to the forecasts of experts of the World Bank, the demand for renewable energy for «critical minerals» will more than double by 2030, and three and a half times by 2050, thus exceeding the threshold of 3 billion tons [1]. Therefore, for the implementation of measures to decarbonize the electricity industry, Ukraine needs: a strong economic foundation, higher growth potential and faster economic recovery. Strengthening the listed areas requires support from partners, coordination and consistency of policies for climate-smart extraction of "critical minerals", as well as acceptance of compromises regarding their resource-saving use. In particular, the European Commission currently proposes a comprehensive set of actions to ensure safe, diversified, affordable and sustainable supplies of critical raw materials, defined by the Critical Raw Materials Act (CRMA) [2]. CRMA is aimed at creating a single market of critical mineral raw materials and external cooperation of the EU with other participants of the Partnership for the Security of Mineral Resources to achieve raw material independence from Russian and Chinese mineral raw materials, the formation of new value-added chains with short logistics and optimal costs [3].

Therefore, it is precisely because of such a rapid interest in "critical minerals" that the subject of research on their climate-smart extraction becomes especially relevant.

Analysis and research of publications. Sources shows that the issue of the extraction of «critical minerals» is currently quite actively

discussed in the pages of scientific publications, analytical reports and in the speeches of government officials, which is explained by their key importance for the development of renewable energy and the transition to a carbon-neutral economy model.

The most active discussions continue regarding the definition of the concept of «critical minerals» and criteria for their recognition, extraction technologies and supply threats, environmental impact and regulation of their demand/consumption. So, first, let us clarify the essence of the concept of "critical minerals" and the criteria for their recognition, turning to the history of its origin.

For the first time, the concept of «critical minerals» came into use before the beginning of World War II in the United States, where the Strategic and Critical Materials Stockpiling Act of June 7, 1939, which concerned the supply of critical minerals, legalized it primarily to the military industry (Strategic and Critical Materials Stock Piling Act, 1939). However, its content was so «blurry» that it was quite difficult to determine exactly which of the minerals acquired the status of «critical».

Government officials returned to the criteria of «criticality» of minerals only at the end of the 1980s. Since then, according to European legislation, the vital importance for the country's economy, functional indispensability and supply risk have been recognized as such. These, in fact, became the markers that allowed us to talk about this or that mineral with the prefix «critical». However, a generalized interpretation of this concept has not yet been formed. In particular, representatives of the leading scientific geological organization under the Australian government (Geoscience Australia) consider «critically important» minerals to be metals and non-metals that are necessary for the economic well-being and economic security of the country and with the supply of which problems may arise due to geological scarcity, geopolitical problems, trade politics, etc. factors [4]. In this case, the interpretation of this concept of «critically important» minerals is based on a value approach, according to which «criticality» is determined precisely by the impact of shortage threats on the economic growth of countries and their economic security.

However, Sarah M. Hayes, Erin A. McCullough define critical minerals as minerals accompanied by supply risk [5]. Therefore, the authors

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are more inclined to interpret the content of this concept according to the risk-approach. At the same time, Yina Su and Dewen Hu. Believe that «critical minerals» are minerals that have no modern substitutes [6]. Therefore, the author recognized the resource approach as a priority.

According to the definitions of experts of the Critical Raw Materials Alliance, an association of European raw materials producers, investors and traders, critical raw materials are raw materials that are economically and strategically important for the European economy, but have a high risk associated with their supply. At the same time, the «criticality» of materials is not related to scarcity, but to the fact that the materials currently have a significant economic impact on key sectors of the European economy, in particular, such as renewable energy, electric mobility, energy-intensive industry, digital industry, aerospace and defines sectors [1].

Therefore, according to the researchers, the main criteria for recognizing useful minerals as «critical» are their economic importance for the national economy, the risk of a decrease in global reserves, and the absence of substitutes. Of course, their conclusions are valid; however, we consider the list of criteria for recognizing minerals as «critical» to be incomplete, since in this case we are only talking about:

1) about their primary consumption. While the world experience proves the possibility of their reuse, the further spread of which will ensure a reduction of tension regarding their scarcity;

2) the criterion of the intensity of their use is ignored, which makes it difficult to understand the level of the threat of shortage of useful minerals;

3) the possibility of their restoration and dependence on imports was neglected.

Therefore, the mentioned approaches do not fully reflect the meaning of the concept of «critical minerals», and therefore cannot be fully applied when giving minerals the status of «critical» and making decisions regarding their climate-wise extraction, which is precisely what requires further research.

Purpose of the article. The purpose of the article is to study the potential of critical minerals of Ukraine and find ways of their climate-smart extraction in order for the country's mining industry to enter the world

mineral market and strengthen its competitive position, achieve ambitious goals for reducing carbon emissions and ensuring the country's energy security.

Presentation of the main material. Today, the global energy system is in the midst of a major clean energy transition. Efforts by an ever-increasing number of countries and companies to reduce their greenhouse gas emissions to zero require the widespread adoption of a wide range of clean energy technologies, many of which in turn rely on critical minerals such as copper, lithium, nickel, cobalt and rare earth elements [7], which are already in high demand on world markets [1]. According to preliminary calculations, renewable energy for the period until 2050 will require an increase in the consumption of copper by more than 40%, rare earth elements such as nickel by 60-70%, lithium by almost 90% [8]. The demand for cobalt and graphite could increase by 6-30 times than today, depending on the type of power plants and the evolution of batteries.

The expansion of transmission and distribution lines is also predicted, which also requires a large amount of minerals and metals. Annual demand for copper for power grids is expected to grow from 5 million tons in 2020 to 8.5 million tons by 2050, and demand for aluminium from 9 million tons in 2020 to 16 million tons by 2050 year The demand for «critical minerals» needed for the production of batteries for electric cars will increase almost 40 times [9]. So, according to preliminary assumptions, the total demand for minerals will increase from 400 kt to 11,800 kt per year (table 1).

Therefore, with the acceleration of the transition to a low-carbon model of the economy, clean energy technologies (in particular, renewable energy sources) are becoming the segment with the fastest growing demand for critical minerals (fig. 1). However, their production is so limited and geographically concentrated. This forces the world to perceive them not only as the main tool for the movement and development of the world economy, but also as a source of systemic risks and threats to the economic development of the countries of the world and their transformation to a low-carbon economy model [8].

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Table 1.

Demand for Critical Minerals by 2050

Type of Power Plants	Forecasts of Critical Material Needs
Solar Energy	Expansion of concentrated solar energy increases the demand for chromium, copper, manganese, and nickel. Between 2020 and 2040 in the SDS, demand for chromium from CSP increases 75 times (up to 91 thousand tons), demand for copper increases 68 times (up to 42 thousand tons), demand for manganese increases 92 times (up to 105 thousand tons), and demand for nickel increases 89 times (up to 35 thousand tons).
Wind Energy	Demand for copper will reach 600 thousand tons per year by 2040, driven by offshore wind, which requires more cables. Offshore wind installations account for almost 40% of copper demand from wind, despite representing only 20% of the total wind power capacity.
Geothermal Energy	Demand for minerals from geothermal energy will increase more than fourfold between 2020 and 2040. Although in 2040 geothermal energy will account for less than 1% of all low-carbon capacity, it is a major source of demand for nickel, chromium, molybdenum, and titanium in the energy sector. Of the total demand for minerals from all low-carbon energy sources in 2040, geothermal energy accounts for 80% of nickel demand, almost half of the total demand for chromium and molybdenum, and 40% of titanium demand.
Hydro and Bio-energy	Hydro and bioenergy account for only about 2% of the total copper demand from all added low-carbon capacities in 2040.
Nuclear Energy	Total mineral demand from nuclear energy, primarily chromium, copper, and nickel, will increase by approximately 35% compared to 2020 levels, reaching almost 70 thousand tons by 2040.

Source: generated by the author [9]

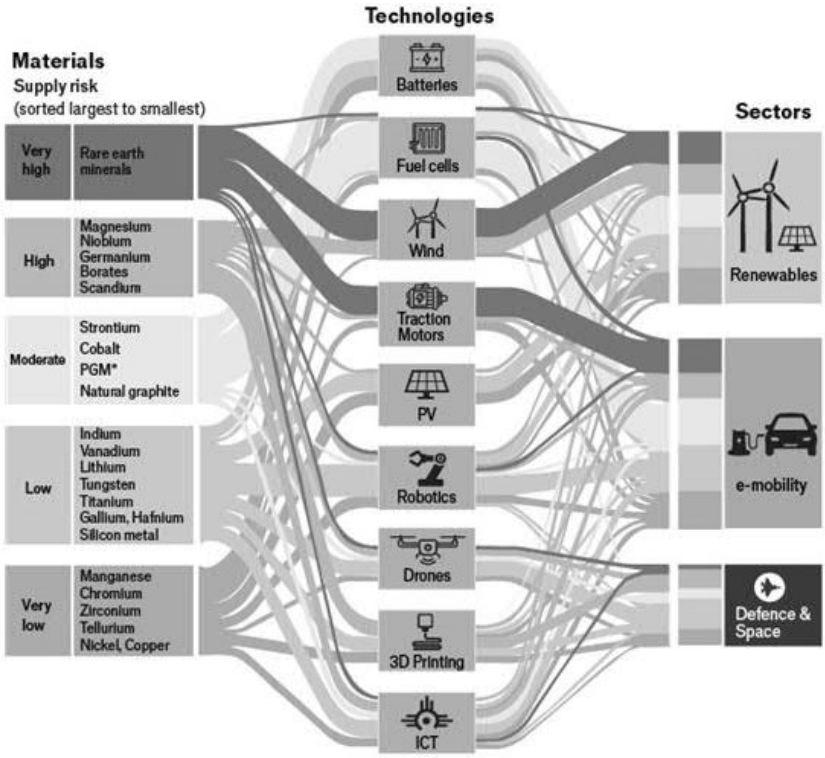

Fig. 1. Demand for critical materials by technologies and economic sectors
Source: generated by the author [10]

Thus, the International Energy Agency (IEA), based on the global energy and climate model (GEC), has developed three scenarios for the further transformation of the electricity sector to a low-carbon economy model: the scenario of the declared policy (STEPS), the scenario of the declared obligations (APS) and the net zero emission scenario by 2050 (NZE) [10].

The APS and STEPS scenarios are exploratory in that they define a set of initial conditions, such as policies, targets, critical minerals, etc., and see where they lead based on model representations of energy systems that reflect market dynamics and technological progress.

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The NZE scenario is prescriptive as it is designed to achieve specific outcomes – an emissions trajectory consistent with keeping the temperature increase in 2100 below 1.5 °C (with at least a 50% probability) with limited excess, universal access to modern energy services by 2030, and significant improvements in air quality – and shows the way to achieve them [10].

According to each of the listed IEA scenarios, the needs for «critical minerals» and the possibility of meeting, them in order to achieve ambitious goals for mitigating the climate crisis both in the near future (year 2030) and in the long term (year 2050) are determined.

Emphasis is also placed on the geographical concentration of extraction and processing of «critical materials» (fig. 2).

As shown in Figure 2, China holds the global dominant position in the world in the extraction of critical minerals and rare earth elements, as well as in the processing of copper, cobalt, lithium, graphite and rare earth elements. Thus, in the case of the processing of spherical graphite, it occupies almost 100% of the world volumes, and with rare earth elements – about 87% [12], with gallium – 80%, with lithium and germanium – about 60%, and with cobalt – more than 60% in the world [8].

However, despite its leading position in the world market of «critical minerals», China does not stop there and continues to buy mineral deposits abroad. In recent years, Chinese investments have poured into neighboring Myanmar, which is rich in rare earths, as well as African countries, where a third of the world's reserves of critical minerals are concentrated. After Africa and Asia, the Middle East began buying up «metal» assets in Australia and America. Therefore, China is currently a monopolist in the extraction and processing of these critical minerals, whose geopolitical behavior is poorly predictable, which poses significant threats to the achievement of the ambitious goals set by the EU, the USA and other countries of the world to reduce the carbon footprint and transform to a low-carbon economy model.

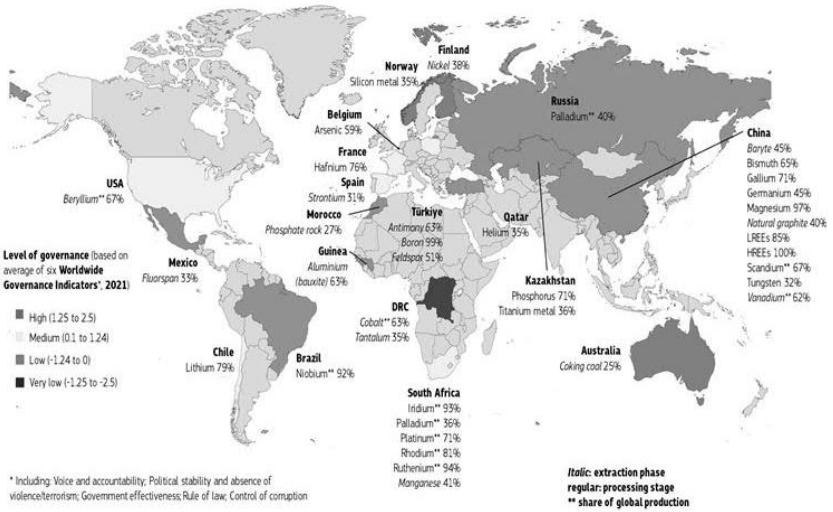

Fig. 2. Geographic concentration of extraction and processing of "critical materials" as of the end of 2023
Source: generated by the author [11]

In the field of mining and deep processing of nickel, Indonesia dominates. The Indonesian nickel cluster has currently captured a fairly large share of the world market (88%) and was able to successfully stimulate the creation of its own «downstream» processing by minimizing production costs and banning the export of unprocessed nickel ore. Therefore, the question of future nickel mining projects in Australia and Brazil is quite acute [8].

Canada dominates the production of aluminum and gallium, which are increasingly important in the production of integrated circuits, lasers and LEDs, solar cells, radar and infrared equipment.

Therefore, the issue of supplies of «critical minerals» is quite painful. Critical mineral market participants hope to reduce total dependence through new mining projects in different geographic regions, facilitating cross-investment opportunities between partner countries and strengthening cooperation through initiatives such as the Mineral Security Partnership and the introduction of financial instruments [1].

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Understanding the complexity of the situation and the existing threats to achieving ambitious goals in the development of renewable energy and reducing carbon emissions, the European Commission in 2020 unveiled the Action Plan on Critical Raw Materials. The key task of this plan was to reduce dependence on foreign sources throughout the entire value chain of critical materials and active cooperation through the European Rare Earth Competency Network (ERECON) and the European Raw Materials Alliance.

In 2023, the European Commission adopted the European Critical Raw Materials Act [13] and a Communiqué on the secure and sustainable supply of critical raw materials necessary for the "green" and digital transition. These documents state that the EU is not self-sufficient in reserves of critical raw materials. Therefore, within the framework of the Global Gateway strategy [14], the EU relies on developing partnerships with developing countries, including Ukraine.

Thus, Ukraine currently has an opportunity to realize its mineral and raw material potential. Based on the beta version of the interactive online map of critical minerals in Ukraine created in 2022 [15], more than 117 types of minerals have been identified within the country, 22 of which are included in the list of critical minerals compiled by the EU [16]. According to experts, Ukraine's identified reserves of lithium, graphite, nickel, and iron ore are sufficient to produce lithium-ion batteries with a total capacity of 1000 GWh to support the production of about 20 million electric vehicles (which exceeds the global annual production in 2023, which is 14 million). Ukraine's titanium reserves are equivalent to 15 years of global titanium production and can be melted into metal for aircraft construction or used to produce white pigment for the chemical industry. The development of combined deposits of apatite and rare earth elements can ensure the production of 100 million tons of phosphate fertilizers for agriculture, for over 30 years of the current consumption of Ukraine's agro-industrial complex [15]. Thus, occupying only 0.4% of the Earth's surface, Ukraine has 5% of the world's mineral reserves, surpassing the US, Great Britain, France, Germany, and Canada in volume [17].

In July 2021, Ukraine and the EU signed a Memorandum of Strategic Partnership in the raw materials sector, which was intended to spur the

development of the sector and ensure the alignment of national legislation with European environmental, social, and governance criteria. However, due to military actions, this has not happened [1], as part of Ukraine's territory remains temporarily occupied. The number of lost deposits that had development licenses is about 700 units, 22% of which are precisely deposits of "critical minerals." Therefore, due to the geopolitical situation, a deficit of investments and new technologies, lack of transparency, and clarity of mineral extraction rules, Ukraine has not yet occupied competitive positions in the global market of critical raw materials.

Currently, investment is needed in the Polokhiv deposit (license until 2037), the Dobra, Shevchenkivske (Donetsk region) and Kruta Balka sites, the Perzhan beryllium deposit (license until 2039), the Novopoltava rare earth deposit, the Kapitaniv nickel deposit (license until 2032), Prutivskoe cobalt deposit (license until 2034), Balakhivskoe (license until 2039) and Burtynskoe graphite deposits [3]. However, their involvement is possible under the condition of creating a favorable investment environment, which European partners have been waiting for for years.

Therefore, understanding the importance of the extraction of critical minerals in the reconstruction of the country, at the end of March 2023, the Government of Ukraine enacted the Law «On Amendments to Certain Legislative Acts of Ukraine on Improving Legislation in the Field of Subsoil Use» dated 12/01/2022 under 2805-IX [18]. It provides for the deregulation of the sector, the introduction of a free license market, new conditions for the extension of the validity of special permits, exhaustive cases of cancellation and suspension of the right to use subsoil, which should be the key to the attractiveness of investments in the mining industry. However, its developers seem to have forgotten about the need for climate-smart mining of critical minerals, which is extremely unacceptable for the following reasons:

1) reaching the production peak and reducing ore quality. In particular, the average grade of copper ore has declined by an average of 30% over the past 15 years, creating numerous challenges. Extracting metal content from lower-grade ores requires more energy, which increases costs and thus puts pressure on mining and processing. Lower-grade ores also

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produce more waste and tailings (especially carbonaceous) that require careful handling;

2) hydrogen stress arising from the high demand for production, in particular, copper and lithium in water, and increasingly frequent droughts due to climate change;

3) the high-energy intensity of the mining industry, etc.

In the fall of 2023, the government announced that Ukraine should become an integral part of the European Commission's European Critical Raw Materials Act 2030 initiative [13]. Therefore, in order to achieve the set goal, the Road Map of the partnership of Ukraine and the EU regarding critical raw materials for 2023-2024 was formed and the guidelines for its implementation were clearly defined:

– creation of safe and sustainable supply chains of critical raw materials to the EU thanks to monitoring of supply chains of critical minerals and coordination of their strategic reserves between member states;

– deployment of breakthrough technologies to improve the circulation and sustainability of critical minerals;

– diversification of EU imports of critical minerals through increased cooperation with reliable partners, in particular, through the creation of a Club of critical raw materials for all like-minded countries that wish to strengthen global supply chains, strengthening the World Trade Organization (WTO), expanding the network of agreements on promoting sustainable investment and free trade agreements and strengthening measures to combat unfair trade practices;

– maximizing the contribution of EU trade agreements in full complement to the Global Gateway strategy, etc. [13].

However, in order for Ukraine not to become only a supplier of raw materials, the country should develop the processing of raw materials and the production of products with benefit. However, such localization requires a much broader government effort than the simplification of permitting procedures for the field of subsoil use. To do this, it is necessary to create enterprises with a full production cycle, to attract foreign partners who have modern technologies for extraction, enrichment and processing of critical materials [1].

A separate track should be preservation of transparency of subsoil use, compliance with environmental regulations and prevention of possible negative impact of mining activities on the environment. This especially applies to the simplification of the granting of special permits, the localization of processing and environmental impact assessment [1] and the implementation of ESG-approaches in business practice. After all, approaching modern standards of sustainable and responsible entrepreneurship, following the example of leading international companies, can be considered a fundamental criterion for the investment attractiveness of domestic mining companies [19].

Equally important are incentives to reduce material intensity and replace materials thanks to technological innovations. In particular, a 40-50% reduction in the use of silver and silicon in solar cells over the past decade has significantly increased solar PV deployment.

The processing of «critical minerals» is also worthy of attention, as it significantly reduces the pressure on primary supply. Minerals and metals are permanent materials that can be reused and continuously recycled with the right infrastructure and technology. Thus, according to the IEA's forecast calculations, by 2040, the processed amount of copper, lithium, nickel and cobalt from used batteries can reduce the total primary needs in the supply of these minerals by approximately 10%. In particular, according to Harper G., Somerville R., Kendrick E. and others. [20] all electric cars sold in 2019 will soon reach the end of their service life, this will lead to 500,000 tons of waste battery batteries, the processing of which will allow to reduce to some extent the primary consumption of critical mineral raw materials [20].

Thus, we conclude that in order to increase the sustainability of the supply chains of «critical minerals» in the context of the worsening climate crisis, more decisive actions are needed, aimed at their climate-smart extraction, based on ecological, social and corporate responsibility for the preservation of the environment for future generations.

Conclusions. Therefore, according to the results of the research, we have reason to state that the climate crisis and measures to mitigate it in recent years have significantly changed the energy landscape of the countries of the world and the configuration of the investment portfolio.

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Long-term investments in fossil fuels have been replaced by investments in environmentally friendly technologies, renewable sources of electricity, and smart systems for its distribution and storage. However, even with full investments, plans for decarburization of the power industry may remain unattainable, as global reserves of «critical minerals» that are vitally needed for the transition to environmentally friendly power generation are significantly decreasing, and demand continues to grow relentlessly. Therefore, the issue of supplies of «critical minerals» is quite painful.

Critical minerals market players hope to reduce China's total dependence on «critical minerals» through new mining projects in different geographies, facilitating cross-investment opportunities between partner countries and strengthening cooperation through initiatives such as the Mineral Security Partnership and the introduction of financial instruments, to which Ukraine also joined. So, currently, a window of opportunity is open for Ukraine to realize its mineral and raw material potential. However, due to the full-scale invasion of the Russian Federation into the territory of Ukraine, it is not yet possible to take advantage of this opportunity, since part of the territory of our country remains temporarily occupied.

However, the government of Ukraine is already taking care of the reconstruction of Ukraine and expanding the limits of the extraction of «critical minerals», which is evidenced by the creation of the appropriate legislative field, the definition of the main vectors of the Roadmap of the partnership between Ukraine and the EU regarding critical raw materials for 2023-2024 and the plan for its implementation. At the same time, the focus is on the reconstruction of the country and the enterprises of the extractive industry. However, in the conditions of worsening climate crisis, this is not enough. Reconstruction of the industry should be based on climate-smart extraction of «critical minerals», based on environmental, social and corporate responsibility of mining and metallurgical enterprises to preserve the environment for future generations.

ДЕРЖАВНЕ РЕГУЛЮВАННЯ ВИДОБУТКУ КРИТИЧНИХ МІНЕРАЛІВ ЯК ДОМІНАНТНА КОМПОНЕНТА ДОСЯГНЕННЯ ЦІЛЕЙ СТАЛОГО РОЗВИТКУ ТА ПОСИЛЕННЯ ЕКОНОМІЧНОЇ БЕЗПЕКИ ДЕРЖАВИ

В статті констатовано, що кліматична криза та заходи щодо її пом'якшення в останні роки суттєво змінили енергетичний ландшафт країн світу та конфігурацію портфоліо інвестування. На зміну довгостроковим інвестиціям у викопне паливо прийшли інвестиції у екологічно чисті технології, відновлювані джерела електроенергії та розумні системи її розподілу й зберігання. Підкреслено, що навіть за повноцінного забезпечення інвестиціями, плани щодо декарбонізації електроенергетики можуть лишитись недосяжними, оскільки світові запаси «критичних мінералів», вкрай необхідних для здійснення переходу до екологічно чистої електроенергетики, відчутно зменшуються, а попит продовжує невпинно зростати. Розглянуто та коротко охарактеризовано побудовані Міжнародною енергетичною агенцією сценарії розвитку подій за подальшої трансформації сектору електроенергетики до низьковуглецевої моделі економіки: сценарій заявленої політики (STEPS), сценарій оголошених зобов'язань (APS) і сценарій чистого нульового викиду до 2050 року (NZE). Окреслено основні аспекти кожного зі сценаріїв: обсяги попиту на «критичні мінерали», їх географічну концентрацію видобутку та переробки. Акцентовано, що світовим лідером видобутку та переробки «критичних мінералів» є КНР, яка диктує «правила гри» переважній частці країн світу. Відтак, питання поставок «критичних мінералів» є досить болючим. Наголошено, що учасники ринку критичних корисних копалин сподіваються знизити тотальну залежність завдяки новим проектам видобутку у різних географічних регіонах, сприяючи можливостям перехресного інвестування між країнами-партнерами та зміцненню співробітництва за допомогою таких ініціатив, як Партнерство з безпеки корисних копалин та впровадження фінансових інструментів. Охарактеризовано потенціал «критичних мінералів» України та її можливості у зменшенні залежності країн ЄС від КНР. Озна-

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чено основні виклики розвитку видобувної індустрії в Україні та окреслено основні вектори Дорожньої карти партнерства України та ЄС щодо критичної сировини на 2023-2024 роки. Акцентовано, що для того, аби Україна не стала лише постачальником сировини, варто розвивати переробку сировини та виробництво продукції з доданою вартістю. Підкреслено, що така локалізація потребує набагато ширших зусиль уряду, ані ж визначеного останніми законодавчими актами переліку заходів у сфері регулювання видобутку «критичних мінералів».

Наголошено на необхідності розробки комплексної системи стимулювання та впровадження нових можливостей стабілізації та сталого розвитку економіки України з метою забезпечення стійкості та прогресу на шляху сталого управління ресурсами та оптимізації ланцюгів постачання критичної сировини. Розроблено пропозиції щодо кліматично розумного видобутку «критичних мінералів» в Україні в найближчій перспективі.

Ключові слова: *державне регулювання, економічна безпека, енергетичний ландшафт, декарбонізація енергетики, відновлювальні джерела енергії, гірничо-металургійні підприємства, критичні мінерали, критичні корисні копалини, критична мінеральна сировина.*

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