УДК 330.342 **DOI: 10.30857/2786-5398.2024.6.6**

Vitalii Yu. Shekera
Kyiv National University of Technologies and Design, Ukraine

ENERGY EFFICIENCY TOOLS FOR SUSTAINABLE BUSINESS DEVELOPMENT IN THE CONTEXT OF NATIONAL ECONOMIC TRANSFORMATION

The article presents the results of research on the tools for improving the level of energy efficiency for sustainable dynamic business development, which is projected to be achieved by using, first of all, own capabilities and untapped potential reserves, creating attractive conditions in the context of the national economy transformation in order to attract sufficient volumes of domestic and foreign investment, which makes it possible to form the economic potential of the energy market, to ensure entrepreneurial activity within certain territories by. According to the results of the study, it is proved and substantiated that the systematic implementation of the principles of sustainable business development on the basis of the analysed tools is possible on the basis of the theory of optimal solutions, in substantiating the acceptable options for the behaviour of business entities, taking into account the impact of the most significant factors of energy modernisation and energy saving. The tools for improving energy efficiency for sustainable dynamic business development include the possibility of introducing innovations in energy supply aimed at increasing energy efficiency, independence and reducing energy intensity of production. The main elements of sustainable business development are the establishment of elements of the minimised structure of the energy system that ensure its efficiency.

Keywords: *alternative energy sources; renewable energy sources; energy efficiency; energy saving; added value; principles of sustainable development; sustainable business development; national economy; transformational changes.*

Віталій Ю. Шекера
Київський національний університет технологій та дизайну, Україна

ІНСТРУМЕНТАРІЙ ПІДВИЩЕННЯ РІВНЯ ЕНЕРГОЕФЕКТИВНОСТІ ДЛЯ СТАЛОГО РОЗВИТКУ БІЗНЕСУ В УМОВАХ ТРАНСФОРМАЦІЇ НАЦІОНАЛЬНОЇ ЕКОНОМІКИ

У статті наведено результати досліджень щодо інструментарію підвищення рівня енергоефективності для сталого динамічного розвитку бізнесу, який прогнозується за рахунок використання, перш за все, власних можливостей та незадіяних потенційних резервів, створення привабливих умов в умовах трансформації національної економіки з метою притоку достатніх обсягів внутрішніх та зовнішніх інвестицій, що дає можливість сформувати економічний потенціал енергетичного ринку, забезпечити підприємницьку діяльність в межах окремих територій шляхом розробки спеціалізованих програм. За результатами дослідження, доведено та обгрунтовано, що системна реалізація принципів сталого розвитку бізнесу на основі проаналізованого інструментарію, можлива на засадах теорії оптимальних варіантів рішень, в обґрунтуванні допустимих варіантів поведінки суб'єктів господарювання, враховуючи вплив найбільш значимих чинників енергомодернізації та енергозбереження. До інструментарію підвищення рівня енергоефективності для сталого динамічного розвитку бізнесу, слід віднести можливість впровадження інновацій в енергопостачанні, спрямованих на підвищення енергетичної ефективності, незалежності та зменшення енергоємності виробництва продукції. Основними елементами зодо сталого розвитку бізнесу є встановлення елементів мінімізованої структури енергосистеми, що забезпечують її працездатність.

Ключові слова: *альтернативні джерела енергії; відновлювальні джерела енергії; енергоефективність; енергозбереження; додана вартість; принципи сталого розвитку; сталий розвиток бізнесу; національна економіка; трансформаційні зміни.*

Statement of the problem. Achievement of sustainable dynamic business development in the context of the national economy transformation is projected to be achieved primarily through the use of own capabilities and untapped potential reserves, creation of attractive conditions for the inflow of sufficient volumes of domestic and foreign investment, which makes it possible to ensure entrepreneurial activity.

Unresolved parts of the problem. In the transformational period of economic war and post-war recovery, it is first of all necessary to stabilise production processes, strive to reduce the growth of resource consumption and create conditions for the implementation of a sustainable trend of reducing the resource intensity of the entire national economic complex and individual types of economic activity.

The purpose of the article is to study the tools for improving the level of energy efficiency for sustainable business development in the context of the national economy transformation.

Analysis of scientific literature. Ukraine is an energy-deficit country. It meets its needs for fuel and energy resources by less than 50% from its own sources. Through its own production of fossil fuels, Ukraine can meet its needs for natural gas by 25%, oil by 12%, and coal by 87%. An analysis of the structure of annual production and consumption of fuel and energy resources in Ukraine shows that the level of energy dependence on imported carriers in our country is 61%, including 75% for gas, 88% for oil, and 13% for coal [3]. In the context of war and given the damage to the energy infrastructure and parts of the occupied territories of the state, more attention should be paid to the use of renewable and non-traditional energy sources.

The shortage of energy resources and damage to the energy infrastructure in the context of the war in Ukraine contribute to increased attention to the use of unconventional sources of fuel and energy raw materials. The use of integrated energy systems based on renewable energy sources makes it possible to provide autonomous energy supply to industrial and public facilities to ensure the sustainable development of business entities [7].

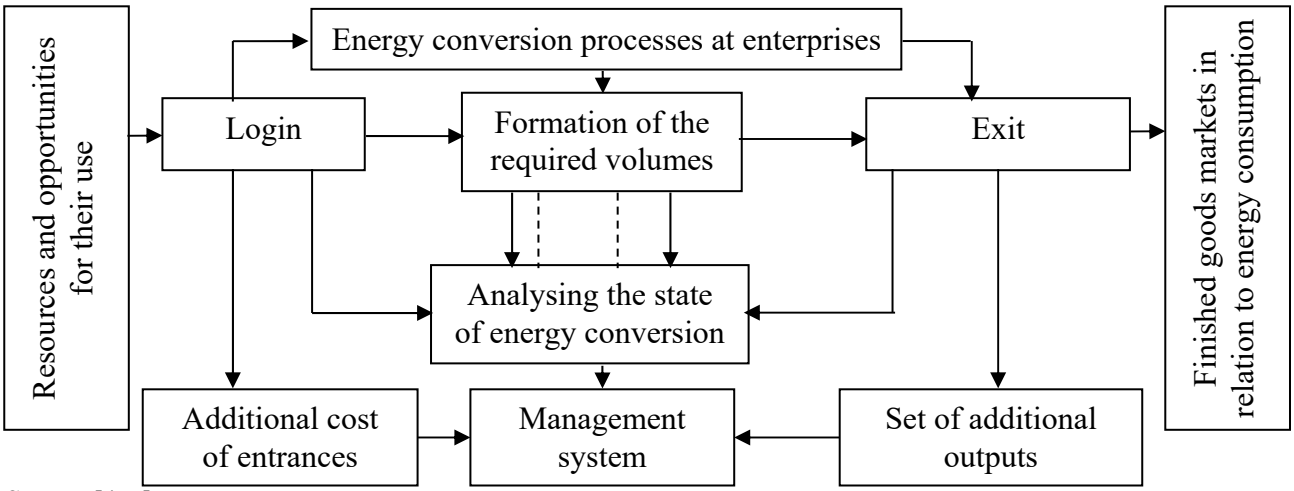
Summary of the main material. Given that the problem of ensuring the competitiveness of sustainable business development in the context of the transformation of the national economy is the main criterion for the economic feasibility of production, further ensuring the conditions for the functioning of the economic mechanism as a set of measures to achieve the goal requires more flexible management methods and tools based on planning the functional characteristics and adaptive properties of management decisions [4]. This is due to the fact that the process of determining the goal of sustainable business development and effective means of achieving it is the most important management function that unites all subsystems into a single whole (system), makes all processes unidirectional and coordinated, while ensuring the achievement of all process parameters and their management efficiency.

The current economic environment requires businesses to improve the efficiency of their use of production resources and energy potential, which is a costly part of their operations. Each business entity is characterised by a different ratio of components of the production potential, and in this regard, it is necessary to produce such products and services, the ratio of which will lead to the maximum effective final result, taking into account European or global trends.

The identified and substantiated trends form the impact on the final results of economic activity and on the efficiency of energy resources use due to the state of inter-sectoral relations, the structure of production, the intensity of diffusion of certain types of production processes, its diversification, etc. Given that in a market economy the concept of ‘distribution of material

resources' does not exist at the regional or national levels, attention should be paid to the efficiency of intra-economic distribution of resources at the level of individual management entities and the related problem of optimal use of resources.

Economic growth is a constant change in the final results of the use of limited material resources in order to increase consumption. At the present stage, the developed theories of reproduction and production efficiency do not fully reflect the new conceptual provisions that require changes (optimisation) of business strategies and management methods. The developed approach combines the fundamental value of methods and models with the modern requirements of new competitive advantages of the resource-saving economy and its structural subsystems (Fig. 1).



Source: [4–7].

Figure 1. **Interrelationships of energy conversion processes in sustainable business development**

The information content of the resource flows that form various types of business activities and the developed interrelationships shows that the processes of entry and exit have acquired a fundamentally different meaning. Whereas before 2020, in most economies of the world, inputs were location advantages, efficiency of natural resources, cheap labour, economies of scale, etc., today they include possession of the latest technologies, modern management, high competence of employees, intellectual property, AI, etc. In the processes of energy resources transformation, the inputs are resources with unique features of their manifestation – intellectual, information, knowledge capital, etc. And if the management system is effective, then the production and economic activities of enterprises generate added value, which is embodied in profit, increased market share, increased sales, etc. In this case, the concepts of product (intermediate or final), technological method of production and type of economic activity are considered as one, i.e. energy product embodies both technological method of production and type of activity, and the differences between them are reduced to differences in the cost structure in the production of different types of products. This approach makes it possible to identify technologies with high energy saving rates (at the level of 8–10%) of the consumed fuel and energy resources. It is important to reasonably distribute this potential across implementation areas, in particular across individual types of agricultural activity in accordance with European requirements.

For the purpose of sustainable business development and achieving the planned energy efficiency at the level of European standards, it is necessary, first of all, to modernise management systems, which will intensify the priority processes of developing (modernising) technologies for the extraction (production), conversion and distribution (transportation) of energy resources, and

increase the level of energy saving in agricultural enterprises of the region. According to the prospects for 2030, the share of imported resources will be up to 11.7%, which is evidence of Ukraine's undeniable energy security [6].

Achieving the goals and objectives of the current stage of enterprise development requires a significant acceleration and deepening of qualitative transformations in the economic and social spheres The core of management theory is the doctrine of the general functions of management entities as certain homogeneous types of work, the interaction of which combines their daily practical production activities. The following types of work can be distinguished:

- analysis (among all types of analysis, we will distinguish economic analysis) as a method of studying economic activity in the entirety of the processes taking place in them, and for each of them. Analysis of economic activity is the study and evaluation of the use of all types of economic resources, including energy resources and the results of the work of enterprises and organisations in order to increase their efficiency. In the process of analysing economic activity, economic and social factors affecting production efficiency are revealed, which becomes the basis for selecting and justifying management decisions:

- performance organisation – an open system of interacting and managed parts that work with a specific purpose, content, mission and have all types of resources (financial, energy, etc.) at their disposal;

- enterprise planning is the process of determining the goal of the enterprise and the means of achieving it. This is the most important function of production management. It makes the goal unidirectional and coordinated, and is the central link in the adaptive management system;

- control is the process of ensuring that an organisation achieves its goals.

It is a system for monitoring and verifying the compliance of the controlled subsystem's operation with the decisions made, as well as developing certain adapted actions in accordance with the adopted technology and control concept.

Solving the problem of energy supply and its efficient use in sustainable business is becoming more complicated amid the current upward trends in global energy prices, military operations and further intensification of competition in the global market under the influence of transformational globalisation processes. Therefore, the widespread introduction of energy-saving technologies and organisational and technical measures will help to increase the efficiency of fuel and energy resources. The second most important strategic issue is the provision of business with energy resources, including renewable ones. Without this, it is impossible to guarantee sustainable economic development and increase the social and environmental responsibility of enterprises. This is the basis for the sustainable development strategy, the main conceptual principles of its general and energy-saving development [5].

Increasing the level of energy use and energy efficiency should be based on the existing base of energy resources (traditional and alternative) and the introduction of a sound system of economical use to reduce the energy intensity of products. Insufficiently developed concepts, strategies and models of strategic energy saving development have a negative impact on sustainable business development.

The conceptual framework for improving the level of energy use and energy efficiency of sustainable business development is formed at the following levels:

Level 1: 1st block ‘Strategic management’ – defining the concept of energy saving; ensuring the strategic goal aimed at achieving the world level of energy efficiency indicators introducing the concept of strategic business units as the basis for implementing the principles of centralising strategy development.

Block 2, Medium-Term Management, is aimed at assessing the use of the business's production potential; preparing fuel and energy balances and forecasts of fuel and energy consumption.

The 2nd level includes: Block 3, Operational Management of Energy Consumption; Block 4, Technical (Process) Energy Saving, which involves upgrading or replacing energy-intensive existing technologies, improving business energy efficiency, and reducing energy losses; Block 5, Structural Energy Saving, which involves fundamental structural changes to create a low-energy and low-resource economy through the introduction of the latest technologies; and Block 6, Identification and Analysis of Business Energy Efficiency Reserves.

Level 3: Economic and energy assessment of the efficiency of managing the production potential of a business. It includes optimising the distribution of energy resources in the face of their limited availability. In any organisation, resources are limited, so it is necessary to solve the problem of how to allocate limited resources, including energy resources, in order to achieve the organisation's goals in the most efficient way. In this case, the concept of management by objectives becomes dominant. At this level, the production system is managed in real time, with the main focus on the concept of intensifying commercial efforts, optimising production, assessing the levels of use of alternative and generating energy sources, etc.

Conclusions. Thus, the proposed tools can serve as a basis for creating a model of integrated economic and energy assessment of the use of production potential of sustainable business development, which is formed at three levels and is based on the use of traditional methods of economic analysis adapted to the specifics and wartime, special and non-traditional methods of energy assessment, which ensures the identification of unused reserves for increasing energy use and energy efficiency, helps to identify new and existing energy sources.

Organisational and technological support plays an important role in improving the level of energy use and energy efficiency of sustainable business development. Technical energy saving is based on the optimal staffing of enterprises. Technological energy saving includes the use of modern technologies that can reduce fuel consumption by up to 70%.

Thus, the primary task of sustainable business development is to overcome the resource-intensive nature of production and introduce resource-saving technologies, increase the output of products with a high level of added value.

References

1. Shcherbak, V., Gryshchenko, I., Ganushchak-Yefimenko, L., Nifatova, O., Bobrovnyk, V., Verhun, M. (2022). Energy-innovation knowledge common connection point management in preventing outbreak of the Covid-19 pandemicin a University. *Global Journal of Environmental Science and Management*, Vol. 8, Iss. 1, P. 45–58. DOI: 10.22034/gjesm.2022.01.04. URL: https://www.scopus.com/record/display.uri?eid=2-s2.0-85119330129&origin=recordpage.

2. Shcherbak, V., Ganushchak-Yefimenko, L., Nifatova, O., Dudko, P., Savchuk, N., Solonenchuk, I. (2019). Application of international energy efficiency standards for energy auditing in a University

Література

1. Shcherbak V., Gryshchenko I., Ganushchak-Yefimenko L., Nifatova O., Bobrovnyk V., Verhun M. Energy-innovation knowledge common connection point management in preventing outbreak of the Covid-19 pandemicin a University. *Global Journal of Environmental Science and Management*. 2022. Vol. 8, Iss. 1. P. 45–58. DOI: 10.22034/gjesm.2022.01.04. URL: https://www.scopus.com/record/display.uri?eid=2-s2.0-85119330129&origin=recordpage.

2. Shcherbak V., Ganushchak-Yefimenko L., Nifatova O., Dudko P., Savchuk N., Solonenchuk I. Application of international energy efficiency standards for energy

buildings. *Global Journal of Environmental Science and Management*, Vol. 5, Iss. 4, P. 501–514. DOI: 10.22034/gjesm.2019.04.09. URL: https://www.scopus.com/record/display.uri?eid=2-s2.0-85075599808&origin=recordpage.

3. Statystychna informatsiia [Statistical information]. *State Statistics Service of Ukraine*. URL: https://www.ukrstat.gov.ua/ [in Ukrainian].
4. Hrazhevska, N. I. (2008). Ekonomichni systemy epokhy hlobalnykh zmin: monohrafiia [Economic Systems in the Era of Global Change: Monograph]. Kyiv: Znannia. 431 p. [in Ukrainian].
5. Vitlinskyi, V. V. (2003). Modeliuvannia ekonomiky: navchalnyi posibnyk [Economic Modeling: A Tutorial]. Kyiv: KNEU. 408 p. [in Ukrainian].
6. Varlamov, H. B., Liubchyk, H. M., Maliarenko, V. A. (2003). Teploenerhetychni ustanovky ta ekolohichni aspekty vyrobnytstva enerhii: pidruchnyk [Thermal power plants and environmental aspects of energy production: textbook]. Kyiv: IVC "Polytechnica Publishing House". 232 p. [in Ukrainian].
7. Kvasnyuk, B. E. et al. (2003). Rol derzhavy u dovhostrokovomu ekonomichnomu zrostanni [The Role of the State in Long-Term Economic Growth]. Edited by B. E. Kvasnyuk. Kyiv; Kharkiv: Fort. 424 p. [in Ukrainian].
8. Pro enerhetychnu efektyvnist [On energy efficiency: Law of Ukraine dated 10/21/2021 No. 1818-IX as amended on 01/01/2025]. URL: https://zakon.rada.gov.ua/laws/show/1818-20#Text [in Ukrainian].
9. Pro skhvalennia Enerhetychnoi stratehii Ukrainy na period do 2050 roku [On approval of the Energy Strategy of Ukraine for the period until 2050: Resolution of the Cabinet of Ministers of Ukraine dated 04/21/2023 No. 373-r]. URL: https://zakon.rada.gov.ua/laws/show/373-2023-%D1%80#Text [in Ukrainian].
10. Pro nevidkladni zakhody shchodo zabezpechennia efektyvnoho vykorystannia palyvno-enerhetychnykh resursiv [On urgent measures to ensure the effective use of fuel and energy resources: Decree of the President of Ukraine dated February 28, 2008 No. 174/2008]. URL: https://zakon.rada.gov.ua/laws/show/174/2008#Text [in Ukrainian].

auditing in a University buildings. *Global Journal of Environmental Science and Management*. 2019. Vol. 5, Iss. 4. P. 501–514. DOI: 10.22034/gjesm.2019.04.09. URL: https://www.scopus.com/record/display.uri?eid=2-s2.0-85075599808&origin=recordpage.
3. Статистична інформація. *Державна служба статистики України.* URL: https://www.ukrstat.gov.ua/
4. Гражевська Н. І. Економічні системи епохи глобальних змін: монографія. К.: Знання, 2008. 431 с.
5. Вітлінський В. В. Моделювання економіки: навчальний посібник. К.: КНЕУ, 2003. 408 с.
6. Варламов Г. Б., Любчик Г. М., Маляренко В. А. Теплоенергетичні установки та екологічні аспекти виробництва енергії: підручник. К.: ІВЦ "Видавництво "Політехніка", 2003. 232 с.
7. Роль держави у довгостроковому економічному зростанні. За ред. Б. Є. Кваснюка. К.; Харків: Форт, 2003. 424 с.
8. Про енергетичну ефективність: Закон України від 21.10.2021 № 1818-IX зі зміна від 01.01.2025. URL: https://zakon.rada.gov.ua/laws/show/1818-20#Text.
9. Про схвалення Енергетичної стратегії України на період до 2050 року: Розпорядження Кабінету Міністрів України від 21.04.2023 № 373-р. URL: https://zakon.rada.gov.ua/laws/show/373-2023-%D1%80#Text.
10. Про невідкладні заходи щодо забезпечення ефективного використання паливно-енергетичних ресурсів: Указ Президента України від 28.02.2008 № 174/2008. URL: https://zakon.rada.gov.ua/laws/show/174/2008#Text.