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Contents

INTRODUCTION 7

SHVETS M.D. *Candidate of Technical Sciences, Associate Professor, National University of Water and Environmental Engineering (Ukraine),* **KLIMOVA I.O.** *Candidate of Economic Sciences, Associate Professor, Head of the Department of Economics, Management, Marketing and Hotel-Restaurant Business, Zhytomyr Ivan Franko State University (Ukraine),* **MISHCHENKO I.A.** *Candidate of Economic Sciences, Associate Professor, Department of Administrative Management and Foreign Economic Activity, National University of Life and Environmental Sciences of Ukraine (Ukraine)*
LOGISTICS RESILIENCE OF ENTERPRISES' FOREIGN ECONOMIC ACTIVITY AMID THE TRANSFORMATION OF GLOBAL SUPPLY CHAINS 8–20

GRYSHCHENKO M.O. *PhD student of Department of Air Transportation Organization, National University "Kyiv Aviation Institute" (Ukraine)*
APPLICATION OF THE ANALYTIC HIERARCHY PROCESS (AHP) IN A TWO-STAGE MODEL FOR STRATEGIC DECISION-MAKING BY AN AIRLINE UNDER CONDITIONS OF UNCERTAINTY 21–31

ZBYSHKO K.R. *PhD Candidate (Economics), Lutsk National Technical University (Ukraine)*
ARTIFICIAL INTELLIGENCE AS A DRIVER OF CUSTOMER VALUE IN B2C SERVICES 32–44

OREL A.M. *Doctor of Economics, Professor, Professor of the Department of Marketing, Kyiv National University of Technologies and Design (Ukraine),* **OREL V. M.** *Doctor of Economic Sciences, Professor, Leading Researcher of the Department of Economics, Management and Transfer of Innovations in Animal Husbandry, Livestock farming institute of NAAS of Ukraine (Ukraine)*
FORMATION OF A COMPETITIVENESS STRATEGY FOR ENERGY ENTERPRISES OF UKRAINE IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT 45–53

HORODETSKIY YU.D. *Senior lecturer, Department of Marketing, Kyiv National University of Technologies and Design (Ukraine)*
INDUSTRY-SPECIFIC ADAPTATION OF MARKETING MECHANISMS FOR BRAND MANAGEMENT BASED ON ARTIFICIAL INTELLIGENCE AND NEUROMARKETING 54–67

GRYTSENKO S.I. *Doctor of Economics, Professor, Professor of Logistics Department, National University «Kyiv Aviation Institute» (Ukraine),* **MISHCHENKO N.A.** *Bachelor of Management, National University «Kyiv Aviation Institute» (Ukraine)*
DIGITAL TRANSFORMATION OF INTERNATIONAL LOGISTICS AND EXPRESS DELIVERY: IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE CONTEXT OF UKRAINE'S EUROPEAN INTEGRATION 68–76

SHCHEKHOVSKA L.I. *PhD (Public Management and Administration), Associate Professor of Department of Logistics, National University «Kyiv Aviation Institute» (Ukraine)*
AN INTEGRATED MODEL FOR ASSESSING THE ECONOMIC EFFICIENCY AND RESILIENCE OF A PORTFOLIO OF LOGISTICS INFRASTRUCTURE RECOVERY PROJECTS 77–87

HARMASH O.M. *PhD (in Economics), Associate Professor Department of International Business and Logistics, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine),* **MARCHUK V.Ye.** *Doctor of Technical Sciences, Professor, Professor of the Department of International Business and Logistics, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute." (Ukraine),* **DAVYDENKO V.V.** *PhD of Economics, associate professor, associate professor of the department of Industrial Marketing, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute." (Ukraine)*
SEARCH DEMAND SIGNALS IN E-COMMERCE INVENTORY PLANNING AND ORDER FULFILLMENT ..... 88 –103

FEDYK O.V. *PhD (Economics), Associate Professor, Associate Professor of the Department of Management and Territorial Development named after Yevhen Khraplyvyi, Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies of Lviv (Ukraine),* **FEDYK S.Y.** *PhD (Law), Associate Professor, Junior Research Fellow of the Research Department, Ivan Franko National University of Lviv (Ukraine),* **FEDYK V.S.** *Bachelor's Student in Computer Science, Faculty of Applied Mathematics and Informatics, Ivan Franko National University of Lviv (Ukraine)*
INNOVATIVE MODELS OF FARM PRODUCT SALES: COOPERATIVES, CLUSTERS AND DIGITAL TECHNOLOGIES 104–116

BOIARYNOVA K.O. *Doctor of Economics, Professor, Research Fellow, Department of Economic Cybernetics, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine),* **KRAVCHENKO M.O.** *Doctor of Economics, Professor, Research Fellow, Department of Economic Cybernetics, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine),* **VOVK O.M.** *Doctor of Economics, Professor, Research Fellow, Department of Economic Cybernetics, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine)*
THE DIGITAL ECOSYSTEM FOR THE RECOVERY AND DEVELOPMENT OF INNOVATIVE INFRASTRUCTURE IN THE CONTEXT OF INVESTMENT IN NEO-INDUSTRIALISATION ..... 117 –128

ZHANG JIAYING *PhD Student, Department of Economic Cybernetics, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine),* **YERESHKO Ju.O.** *Sc.D., Professor, Department of Economic Cybernetics, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine)*
MONETARY POLICY, REAL ESTATE AND LOGISTICS: CHINA'S MACROECONOMIC DYNAMICS ACROSS CRISIS PERIODS ..... 129 –144

HRYHORAK M.Yu. *Doctor of Sciences (Economics), Professor (Associate), Academician of the Academy of Economic Sciences of Ukraine, Professor of Department of International Business and Logistics of National Technical University of Ukraine 'Igor Sikorsky Kyiv Polytechnic Institute' (Ukraine),* **BUGAYKO D.O.** *Doctor of Science (Economics), Professor, Academician of the Academy of Economic Sciences of Ukraine, Corresponding Member of the Transport Academy of Ukraine, Vice - Director of ES International Cooperation and Education Institute, Instructor of ICAO, Professor of the Logistics Department, Leading Researcher, National University "Kyiv Aviation Institute" (Ukraine),* **ZAPOROZHETS O.I.** *Doctor of Sciences (Technical), Professor, Professor of Institute of Aviation (ILot) (Poland),* **BORYSIUK A.V.** *PhD, National University "Kyiv Aviation Institute" (Ukraine)*

CIRCULAR LOGISTICS FOR POST-WAR RECONSTRUCTION: AN INTEGRATED FRAMEWORK FOR MATCHING SECONDARY RESOURCE SUPPLY AND RECONSTRUCTION DEMAND ..... 145 –170

FARTUSHNYI I.D. PhD (Physics and Mathematics), Associate Professor, Associate Professor Department of Economic Cybernetics, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine), **ROSHCHYNA N.V.** PhD (Economics), Associate Professor, Associate Professor Department of Economic Cybernetics, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine)

PREDICTIVE RELIABILITY OF FREQUENCY MODELS IN ACTUARIAL ASSESSMENT OF RAIL FREIGHT LOSSES ..... 171 –182

BOLDYRIEVA M.O. *PhD student, State University "Kyiv Aviation Institute" (Ukraine),* **SHEVCHUK D.O.** *Doctor of Sciences (Technology), senior scientific researcher, Professor of Air Transport Organization Department, Acting Dean of the Air Transportation Management Department State University "Kyiv Aviation Institute" (Ukraine)*

THE IMPACT OF ARMED CONFLICTS ON THE USE OF AIRSPACE AND THE FUNCTIONING OF INTERNATIONAL CIVIL AVIATION ..... 183 –192

KHAUSTOVA V.Ye *D. Sc. (Economics), Professor, Director, Research Center for Industrial Problems of Development of NAS of Ukraine (Ukraine),* ***TRUSHKINA N.V.*** *Ph.D. (in Economics), Senior Researcher, Senior Research Officer of the Sector of Industrial Policy and Innovative Development of the Department of Industrial Policy and Energy Security, Research Center for Industrial Problems of Development of the NAS of Ukraine (Ukraine)*

IMPLEMENTATION OF A CIRCULAR APPROACH IN THE ECONOMY: THEORETICAL FOUNDATIONS AND MANAGEMENT SEQUENCE ..... 193 –215

SAVYTSKA N.L. *Doctor of Sciences in Economics, Professor, Head of the Department of Marketing, Reputation and Customer Experience Management, State Biotechnological University (Ukraine),* ***SUVOROVA I.M.*** *PhD in Economics, Associate Professor, Associate Professor of Industrial Marketing Department National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine)*

RELATIONSHIP MARKETING AS A DETERMINANT OF PROMOTION STRATEGY EFFECTIVENESS IN THE ELECTRICAL PRODUCT MARKET ..... 216 –224

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FORMATION OF A COMPETITIVENESS STRATEGY FOR ENERGY ENTERPRISES OF UKRAINE IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

Anna Orel, Volodymyr Orel. "Formation of a competitiveness strategy for energy enterprises of Ukraine in the context of sustainable development". *The article examines the theoretical, methodological and applied principles of forming a strategy for ensuring the competitiveness of Ukrainian energy enterprises in the context of sustainable development. The relevance of the study is determined by the need to adapt the domestic energy sector to structural transformations of the energy market, the consequences of wartime challenges, stronger requirements for energy security, decarbonization, digitalization and Ukraine's integration into the European energy area. It is established that the competitiveness of energy enterprises under current conditions is determined not only by economic efficiency and the ability to ensure a stable energy supply, but also by innovation and technological potential, investment attractiveness, environmental responsibility, energy efficiency and the ability to adapt rapidly to changes in the external environment. The methodological basis of the study combines general scientific and special methods, including the systems approach, analysis and synthesis, induction and deduction, comparison and generalization, as well as statistical and structural-dynamic analysis. The results identify significant structural changes in Ukraine's energy sector. Electricity production declined from approximately 157.7 billion kWh in 2021 to 96.9 billion kWh in 2024, while the share of electricity from renewable sources increased from 12.99% to 16.22%. These trends demonstrate the need to restore generating capacity while simultaneously modernizing technologies and accelerating the transition toward a more diversified, decentralized and low-carbon energy model. The practical significance of the results lies in their applicability to the development of recovery, modernization and long-term development strategies*

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45-53
v.39 (2026)
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by energy-enterprise managers. It is concluded that sustainable competitive positions require a transition to an adaptive strategic-management model balancing economic performance, technological renewal, environmental responsibility and energy security.

***Keywords**:* energy enterprise, strategy, competitiveness, competitiveness management, strategic management, competitive advantage, competitive potential, sustainable development, energy security, energy efficiency, renewable energy, decarbonization, digitalization, energy resilience, European integration

Анна Орел, Володимир Орел. «Формування стратегії конкурентоспроможності енергетичних підприємств України в контексті сталого розвитку». *У статті розглядаються теоретичні, методологічні та прикладні засади формування стратегії забезпечення конкурентоспроможності українських енергетичних підприємств у контексті сталого розвитку. Актуальність дослідження визначається необхідністю адаптації вітчизняного енергетичного сектору до структурних трансформацій енергетичного ринку, наслідків викликів воєнного часу, посилення вимог до енергетичної безпеки, декарбонізації, цифровізації та інтеграції України в європейський енергетичний простір. Встановлено, що конкурентоспроможність енергетичних підприємств за сучасних умов визначається не лише економічною ефективністю та здатністю забезпечувати стабільне енергопостачання, але й інноваційним та технологічним потенціалом, інвестиційною привабливістю, екологічною відповідальністю, енергоефективністю та здатністю швидко адаптуватися до змін зовнішнього середовища. Методологічна основа дослідження поєднує загальнонаукові та спеціальні методи, включаючи системний підхід, аналіз і синтез, індукцію та дедукцію, порівняння та узагальнення, а також статистичний та структурно-динамічний аналіз. Результати дослідження визначають суттєві структурні зміни в енергетичному секторі України. Виробництво електроенергії скоротилося приблизно зі 157,7 млрд кВт·год у 2021 році до 96,9 млрд кВт·год у 2024 році, тоді як частка електроенергії з відновлюваних джерел зросла з 12,99% до 16,22%. Ці тенденції демонструють необхідність відновлення генеруючих потужностей з одночасною модернізацією технологій та прискоренням переходу до більш диверсифікованої, децентралізованої та низьковуглецевої енергетичної моделі. Практичне значення результатів полягає в їх застосовності до розробки стратегій відновлення, модернізації та довгострокового розвитку керівниками енергетичних підприємств. Зроблено висновок, що стійкі конкурентні позиції вимагають переходу до адаптивної моделі стратегічного управління, яка балансує економічні показники, технологічне оновлення, екологічну відповідальність та енергетичну безпеку.*

Ключові слова: енергетичне підприємство, стратегія, конкурентоспроможність, управління конкурентоспроможністю, стратегічне управління, конкурентна перевага, конкурентний потенціал, сталий розвиток, енергетична безпека, енергоефективність, відновлювана енергетика, декарбонізація, цифровізація, енергетична стійкість, європейська інтеграція

Introduction. The current stage of development of Ukraine's energy sector is characterized by a highly unstable external environment, large-scale structural transformations, destruction and damage to energy infrastructure, shortages of investment resources, growing technological and security risks, and the need to align the activities of energy enterprises with European principles of energy-market operation. Under these conditions, ensuring the competitiveness of energy enterprises becomes strategically important because their performance determines not only the stability of individual business entities but also national energy security, the resilience of the economy and the prospects for post-war recovery. The issue is especially important in

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the context of sustainable development and the gradual transition toward a low-carbon economy. Stronger environmental requirements, decarbonization, the expansion of renewable energy sources, higher energy efficiency and digitalization substantially transform the traditional determinants of competitive advantage. Whereas competitiveness was previously associated mainly with production scale, resource availability and cost levels, technological flexibility, innovation and investment potential, environmental responsibility, diversification of energy supply, digital transformation and rapid crisis adaptation are becoming increasingly decisive.

The relevance of the problem is confirmed by the dynamics of key energy-sector indicators. Electricity production in Ukraine amounted to about 157.7 billion kWh in 2021 and approximately 96.9 billion kWh in 2024, indicating a substantial contraction in production potential and the need for new mechanisms to strengthen enterprise resilience. At the same time, the share of electricity generated from renewable sources increased, according to the statistical estimates used in the study, from 12.99% in 2021 to 16.22% in 2024. This demonstrates a gradual transformation of the generation structure and increases the strategic importance of environmental and innovation-technological dimensions of competitiveness.

The scientific problem consists in the need to further develop theoretical and methodological provisions of strategic competitiveness management for energy enterprises, taking into account wartime and post-war transformations, European integration and the implementation of sustainable-development objectives. Existing approaches should therefore be supplemented with instruments that integrate economic, innovation-technological, investment, environmental, market and security factors and enable enterprises to form long-term competitive advantages under high uncertainty. In practical terms, this requires the restoration and modernization of energy infrastructure, the development of decentralized and distributed generation, improved energy efficiency, digital technologies, investment attraction, diversification of energy resources and greater resilience to external threats.

Literature review. The formation and maintenance of competitiveness in Ukraine's energy sector under market instability, structural transformation and sustainable-development requirements has been examined by Ukrainian and foreign researchers. The literature treats competitiveness as a complex economic category shaped by strategic management efficiency, competitive and strategic potential, energy efficiency, innovation, digitalization, adaptability to regulatory change and the capacity to operate under considerable market uncertainty.

Potapov [1] studies ways to improve competitiveness under unstable energy-market conditions and emphasizes the need for enterprises to adapt to dynamic changes in the external environment. This approach is particularly relevant for Ukrainian energy enterprises exposed to substantial economic, market, technological and security risks. Adaptability and the capacity to respond promptly to external change should therefore be regarded as important components of strategic competitiveness.

Dykan and Anhelis [2] examine ways of ensuring the competitiveness of Ukrainian energy enterprises during crisis periods. Their contribution is important because it focuses on the specific operating conditions of energy enterprises during crisis transformations. Anti-crisis adaptation, continuity of business activity and the preservation of competitive potential can thus be treated as integral elements of strategic competitiveness management.

Polozova [3] systematizes the strategic directions and prospects for the development of enterprises in Ukraine's energy market.

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Strategic development is directly connected with the formation of long-term competitive advantages because it aligns current managerial decisions with long-term objectives, changes in the competitive environment and transformations of the energy market.

Klymchuk, Ilina, Shovkivska and Klymchuk [4] substantiate theoretical and methodological principles for enterprise-development strategies based on energy efficiency and informatization. Their approach combines more efficient use of energy resources with the introduction of information technologies. In the context of sustainable development, energy efficiency reduces resource costs and environmental pressure, while digitalization and informatization increase the speed and effectiveness of managerial decisions. These dimensions therefore constitute important sources of long-term competitive advantage.

Ovsiienko [5] examines supplier enterprises in Ukraine's energy market under new regulatory challenges. The regulatory dimension is critical because the operation of energy enterprises is strongly influenced by institutional conditions, market rules and changes in public energy policy. The ability to adapt business models and competitive strategies to regulatory transformation is therefore an important determinant of resilience and competitiveness.

Konoplianko [6] develops the theoretical basis for assessing the strategic potential of an enterprise. Such assessment is directly relevant to competitiveness strategy because it identifies the resources, competencies and capabilities available for achieving long-term objectives. For energy enterprises, strategic potential should include not only financial, economic and production resources but also innovation-technological, investment, human-capital, environmental and security capabilities.

Sotnyk, Kovalenko, Martymianov and Nikulina [7] investigate the economic competitiveness of green-energy business projects in Ukraine. This area is particularly important for sustainable development because renewable energy combines enterprises' economic objectives with decarbonization, diversification of energy resources and reduction of environmental impacts. Environmental and innovation characteristics are consequently transforming from supplementary attributes into factors of long-term competitiveness.

Purpose and objectives. The purpose of the article is to provide theoretical and methodological substantiation and to develop strategic principles for ensuring the competitiveness of Ukrainian energy enterprises under sustainable-development conditions, taking into account current transformations of the energy market, wartime and post-war challenges, energy-security requirements, decarbonization, digitalization and European integration.

Results, analysis, and discussion.

Ensuring the competitiveness of Ukrainian energy enterprises should be regarded as a comprehensive process of developing the ability of energy-market participants to maintain economic efficiency, technological resilience, investment attractiveness and adaptability to changes in the external environment. The transformation of European energy policy and the spread of sustainable-development principles require traditional economic criteria of competitiveness to be supplemented by environmental, innovation-technological and security parameters.

The full-scale war has substantially changed the operating conditions of Ukrainian energy enterprises. Damage to generating facilities and grid infrastructure, the loss of part of production capacity, rising operational and security risks, and the need for emergency restoration have increased the importance of resilience and adaptability as components of competitive potential. Competitiveness should therefore be assessed not only through price and financial-economic indicators, but also through the

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45-53
v.39 (2026)
https://smart-scm.org

enterprise's capacity to ensure continuity of operations, technological modernization and diversification of energy resources.

Table 1. Dynamics of selected indicators of Ukraine's electric-power sector

Indicator	2021	2024	Change in 2024 vs. 2021
Electricity production, billion kWh	157.7	96.9	–38.6%
Share of electricity from renewable sources, %	12.99	16.22	+3.23 p.p.
Electricity production index (2021 = 100), %	100.0	61.4	–38.6 p.p.

Source: systematized and calculated by the authors using statistical and analytical data from international energy databases

The data in Table 1 demonstrate a substantial decline in electricity production compared with the pre-war period. Generation decreased by about 60.8 billion kWh, or 38.6%, while the 2024 production index relative to 2021 was only 61.4%. From the perspective of enterprise competitiveness, the contraction of available production potential increases the importance of efficient utilization of existing capacity, rapid restoration, investment in modernization and the development of alternative generation. At the same time, the increase in the renewable-electricity share by 3.23 percentage points confirms the strategic importance of renewable energy in the transformation of energy enterprises.

An important characteristic of the sector's development prospects is the condition of renewable energy. Under the IRENA methodology used in the source study, renewable-energy capacity is understood as the maximum net generating capacity of power plants and other installations using renewable sources. Long-term statistical series make it possible to evaluate structural transformations in renewable generation and their implications for competitiveness.

Table 2. Impact of key sustainable-development factors on the competitiveness of Ukrainian energy enterprises

Factor	Manifestation in enterprise activity	Impact on competitiveness	Strategic response
Technological	Equipment wear and need for modernization	Higher costs and technological risks	Modernization and digitalization
Innovation	Need for new generation and energy-storage technologies	Creation of new competitive advantages	Investment in innovation and R&D
Environmental	Decarbonization and stricter environmental requirements	Need to reduce carbon intensity	Renewables and low-carbon technologies
Investment	Large financing needs for recovery	Determines the pace of modernization	Private and international capital
Market	Closer integration with the European energy market	Expansion of market opportunities and competition	Adaptation to EU rules and standards
Security	Wartime threats and infrastructure damage	Risk of interruption or contraction of activity	Decentralization and resilience
Managerial	Need for rapid decision-making	Determines enterprise adaptability	Adaptive strategic management

Source: developed by the authors

The systematization in Table 2 shows that competitiveness under sustainable-development conditions is formed under the simultaneous influence of several interrelated groups of factors. A traditional focus on cost minimization and profitability alone is

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insufficient to ensure long-term resilience. The strategy should create a competitive potential that enables the enterprise to adapt to technological, environmental, market and security changes.

Institutional readiness for energy-sector transformation is also reflected in the implementation of European energy legislation and policy. According to the Energy Community indicators used in the source article, Ukraine's overall implementation score was 54% in 2024, with substantial differences across individual areas.

Table 2. Selected indicators of Ukraine's energy-policy implementation in 2024

Area	Implementation level, %
Overall indicator for Ukraine	54
Markets and integration	46
Energy-sector decarbonization	59
Renewable energy	61
Energy efficiency	81
Energy security	32
Environmental improvement	33
Effectiveness of public authorities	81

Source: compiled by the authors using Energy Community data.

The indicators demonstrate the uneven character of the sector's transformation. The highest values in 2024 were recorded for energy efficiency and the effectiveness of the relevant public authorities, both at 81%. Renewable-energy implementation reached 61% and decarbonization 59%, while energy security was only 32% and environmental improvement 33%. This imbalance demonstrates the need for a competitiveness strategy that balances economic efficiency, environmental transformation, technological development and system resilience.

At the same time, institutional transformation shows positive dynamics. According to the Energy Community estimates reported in the source study, Ukraine's overall indicator increased to 56% in 2025, decarbonization to 67%, renewable energy to 67%, and energy efficiency to 83%. These developments indicate the gradual formation of institutional prerequisites for a more sustainable model of energy-enterprise operation.

Table 4. Comparison of selected indicators of Ukraine's energy-sector transformation, 2024–2025

Indicator	2024, %	2025, %	Change, p.p.
Overall implementation indicator	54	56	+2
Energy-sector decarbonization	59	67	+8
Renewable energy	61	67	+6
Energy efficiency	81	83	+2

Source: compiled and calculated by the authors using Energy Community data.

The comparative analysis indicates that the largest improvement in 2025 was achieved in decarbonization, which increased by 8 percentage points. Renewable-energy implementation rose by 6 percentage points, while energy efficiency and the overall indicator each increased by 2 percentage points. These results confirm a gradual shift of strategic priorities toward a low-carbon and energy-efficient model.

Ukraine's strategic objectives also reinforce the importance of the environmental dimension of competitiveness. The 2030 target used in the

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v.39 (2026)
https://smart-scm.org

source study provides for a 65% reduction in greenhouse-gas emissions relative to the baseline level and a target renewable-energy share of 27%. Achieving these objectives will require substantial technological, organizational and investment changes at the enterprise level.

Table 5. Strategic directions for ensuring the competitiveness of Ukrainian energy enterprises

Strategic component	Key measures	Expected result
Economic	Cost optimization, business-process improvement, resource management	Higher economic efficiency
Innovation and technological	Equipment modernization, digitalization, smart technologies, energy storage	Higher productivity and technological flexibility
Investment	International and private capital, public-private partnerships	Accelerated recovery and modernization
Environmental	Renewables, decarbonization, improved energy efficiency	Lower environmental burden
Market	Integration into the European energy market, improved customer models	Expanded market opportunities
Security	Decentralized generation, reserve capacity, critical-infrastructure protection	Greater energy resilience
Managerial	Risk management, scenario planning, ESG approaches	Greater management adaptability

Source: developed by the authors.

Based on the study, the strategy for ensuring the competitiveness of an energy enterprise is proposed as an integrated system of long-term managerial decisions aimed at forming and realizing competitive potential by balancing economic performance, technological modernization, innovation, environmental responsibility and energy resilience. The innovation-technological component is of priority importance because modernization of fixed assets, digital management systems, energy-storage systems and demand forecasting create prerequisites for reducing operating costs and increasing flexibility. The environmental component involves gradual decarbonization, renewable-energy development and higher energy efficiency. The investment component should provide the financial resources required for technological change, while the security component should focus on decentralization, capacity redundancy and the resilience of critical infrastructure.

The results confirm that the competitiveness of Ukrainian energy enterprises under sustainable-development conditions is multidimensional. The contraction of traditional production potential, combined with stronger requirements for decarbonization, energy efficiency and European integration, requires a transition from predominantly reactive management toward an adaptive competitiveness strategy. Its foundation should be the synergy of economic efficiency, innovation-technological development, investment capacity, environmental responsibility and energy security. Such an approach can contribute not only to restoring the competitive potential of individual enterprises but also to building a resilient, technologically modernized Ukrainian energy sector integrated into the European energy area.

Conclusion.

The study establishes that ensuring the competitiveness of Ukrainian energy enterprises under sustainable-development conditions requires a comprehensive and adaptive system of strategic management oriented not only toward economic efficiency but also toward technological resilience, innovation development, investment

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attractiveness, environmental responsibility and energy security. Wartime challenges, infrastructure damage, changes in the generation structure, decarbonization and European integration substantially alter the traditional conditions for forming competitive advantages.

The statistical analysis confirms a significant decline in the production potential of the domestic electric-power sector compared with the pre-war period. Electricity production decreased from approximately 157.7 billion kWh in 2021 to 96.9 billion kWh in 2024, or by 38.6%. At the same time, the share of electricity generated from renewable sources increased from 12.99% to 16.22%, demonstrating a gradual structural transformation and the growing strategic role of renewable energy. Positive changes were also identified in the adaptation of Ukraine's energy policy to European requirements: according to the Energy Community indicators used in the study, the overall implementation score increased from 54% in 2024 to 56% in 2025, decarbonization from 59% to 67%, renewable energy from 61% to 67%, and energy efficiency from 81% to 83%.

The key factors shaping competitiveness were systematized into economic, innovation-technological, investment, environmental, market, managerial and security groups. Their isolated consideration cannot produce sustainable competitive advantages; strategic management must therefore integrate them. The proposed strategy combines economic, innovation-technological, investment, environmental, market, security and managerial components. Its main implementation directions include modernization of production capacity and energy infrastructure; digitalization of production and management; introduction of innovative and energy-efficient technologies; development of renewable energy and distributed generation; attraction of private and international investment; diversification of energy-supply sources; integration into the European energy market; stronger risk-management systems; and protection of critical energy infrastructure.

Sustainable development should be regarded not as an additional restriction on energy-enterprise activity but as a determinant of long-term competitiveness. Energy efficiency, decarbonization, renewable energy, digitalization and environmentally oriented technologies can reduce resource intensity, increase technological flexibility, attract investment and strengthen positions in domestic and European energy markets. Strategic competitiveness management should consequently move from predominantly reactive crisis response to an adaptive model of long-term development that balances economic performance, innovation, technological modernization, environmental responsibility and security.

Further research should focus on developing methodological tools for comprehensive assessment of energy-enterprise competitiveness that integrate indicators of economic efficiency, innovation-technological potential, energy and environmental resilience; constructing quantitative indicators for evaluating the effectiveness of the proposed strategy; and testing the approach using data from specific Ukrainian energy enterprises.

References

1. Potapov, V. Ye. (2024). Pidvyshchennia rivnia konkurentospromozhnosti v umovakh nestabilnykh enerhetychnykh rynkiv [Increasing the level of competitiveness in conditions of unstable energy markets]. Zbirnyk naukovykh prats Natsionalnoho universytetu korablebuduvannia imeni admirala Makarova, 4(497). https://doi.org/10.15589/znp2024.4(497).29

This work is licensed under a Creative Commons Attribution 4.0 International License

2. Dykan, V. V., & Anhelis, Ye. O. (2022). Shliakhy zabezpechennia konkurentospromozhnosti pidpryiemstv enerhetychnoi haluzi Ukrainy u kryzovyi period [Ways to ensure competitiveness of Ukrainian energy enterprises during the crisis period]. Visnyk ekonomiky transportu i promyslovosti, 78–79, 62–69. (in Ukrainian).

3. Polozova, T. V. (2024). Upravlinnia stratehichnym rozvytkom pidpryiemstv enerhetychnoho rynku Ukrainy [Management of strategic development of enterprises in the energy market of Ukraine]. Ukrainskyi zhurnal prykladnoi ekonomiky ta tekhniky, 1, 162–168. https://doi.org/10.36887/2415-8453-2024-1-27

4. Klymchuk, M. M., Ilina, T. A., Shovkivska, V. V., & Klymchuk, S. A. (2020). Teoretyko-metodolohichni zasady formuvannia stratehii rozvytku pidpryiemstv na zasadakh enerhoefektyvnosti ta informatyzatsii [Theoretical and methodological principles of forming an enterprise development strategy based on energy efficiency and informatization]. Formuvannia rynkovykh vidnosyn v Ukraini, 7–8, 103–110.

5. Ovsiienko, O. V. (2022). Pidpryiemstva-postachalnyky na enerhetychnomu rynku Ukrainy: novi vyklyky rehuliatornoho seredovyshcha [Supplier enterprises in the energy market of Ukraine: New challenges of the regulatory environment]. Efektyvna ekonomika, 10. http://nbuv.gov.ua/UJRN/efek_2022_10_20

6. Konoplianko, D. O. (2021). Sutnist ta metody otsinky stratehichnoho potentsialu pidpryiemstva [The essence and methods of assessing the strategic potential of an enterprise]. Ekonomika ta suspilstvo, 34, 147–151.

7. Sotnyk, I., Kovalenko, Y., Martymianov, A., & Nikulina, M. (2022). Economic competitiveness of green energy business projects in Ukraine. Naukovyi visnyk Ivano-Frankivskoho natsionalnoho tekhnichnoho universytetu nafty i hazu. Seriia: Ekonomika ta upravlinnia v naftovii i hazovii promyslovosti, 1(25), 21–36. https://doi.org/10.31471/2409-0948-2022-1(25)-21-36.

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