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MODELLING THE PRICE FORMATION PROCESS FOR GREEN ENERGY TO ACHIEVE CLIMATE NEUTRALITY

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Background and Objective: This paper investigates the process of setting tariffs in green energy under conditions of instability, aiming to ensure financial sustainability, attract investments, and achieve climate neutrality. The objective is to develop a comprehensive model that accounts for economic, social, political, technological and environmental factors influencing the formation of tariffs in the renewable energy sector.

Study Design/Materials and Methods: A multi-stage methodological approach is proposed, incorporating quantitative and qualitative indicators into composite indices. The study includes a literature review on tariff formation, dynamic pricing, and sustainability factors. The Harrington scale is applied to assess the management level of tariff formation under varying degrees of instability.

Results: The findings reveal that a higher level of management in tariff formation correlates with increased renewable energy production. The model underscores the significance of adaptive strategies to address economic, political, social, technological and ecological uncertainties, leading to the stable growth of green energy generation.

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Practical Implications: The proposed composite index can be integrated into administrative and monitoring systems, enabling policymakers and energy market stakeholders to adjust tariffs promptly and adopt appropriate strategies such as stable, flexible, investment-oriented, crisis and participatory management to maintain market stability and foster sustainable energy development.

Conclusion and Summary: Regular monitoring and timely adjustments of tariff formation models are essential for mitigating risks posed by external uncertainties. The recommended framework facilitates comprehensive assessment and strategic decision-making, ultimately supporting climate neutrality goals and sustainable development in the green energy sector.

Keywords: green energy, tariff formation, sustainability, composite index, instability

JEL classification: Q42, Q48

Paper Type: Research Study

1. Introduction

Modern trends in energy development are focused on the implementation of renewable energy sources (RES) as a key element of a sustainable development strategy. The transition to 'green' energy is one of the priority areas of state policy in many countries, driven by the need to reduce dependence on fossil fuels, minimise the energy sector's impact on the environment, and achieve climate neutrality. At the same time, the effective management of tariff formation in the field of RES is a critical factor for ensuring the financial stability of the sector, attracting investments, and supporting the competitiveness of the energy market. The relevance of the study is determined by the growing influence of unstable conditions, including economic, political, social and environmental factors, on the tariff formation process in the field of 'green' energy. Fluctuations in exchange rates, changes in state regulation, technological risks, and climate challenges create additional obstacles to the formation of fair and economically justified tariffs. In this context, it is essential to develop approaches that take into account not only traditional indicators of costs and revenues, but also social, environmental and strategic aspects of the sector's development. The research aims to analyse the mechanisms of tariff management in the field of renewable energy, considering the principles of sustainable development and climate neutrality. Identifying the impact of unstable factors and developing adaptive tariff regulation models will contribute to enhancing the effectiveness of state policy in this area and creating favourable conditions for the further development of 'green' energy.

2. Literature Review

To assess the effectiveness of management, a comparison of two fundamental categories is always used: costs and revenues. However, in modern conditions of sustainable economic activity, it is necessary to consider not only financial aspects, but also social and environmental factors. This is especially important in the context of ‘green’ energy, where economic feasibility must align with long-term environmental goals. Thus, in the concept of the effectiveness of the management of tariff formation process for ‘green’ energy, it is necessary to combine costs, revenues, conditions for sustainable development, and the impact of unstable factors (Shkvaryliuk, 2024). An important criterion for effectiveness becomes not only economic profitability, but also the contribution to achieving climate neutrality. This means that the tariff formation process must take into account the reduction of greenhouse gas emissions, the development of low-carbon technologies, and the encouragement of the transition to renewable energy sources. The implementation of mechanisms that promote environmentally responsible tariff formation will ensure a balance between economic stability, social welfare, and environmental security, which is a key factor in shaping a sustainable energy future. Energy pricing is not unique as the process of moving energy resources from supplier to consumer follows the classical formula of expanded reproduction of production: G – T…V…T′ – G′, that is, through the chain of ‘raw material – production – energy – consumer’, increasing at each step. Huda (2019) conducted a study on the goals and methods of pricing through the prism of external and internal sources, assuming that the lower level of price covers costs, while the upper level of price forms demand and supply. In addition to traditional mechanisms, in the context of the digital economy, dynamic pricing is gaining increasing importance as one of the tools of adaptive tariff management. Sustainable economic development in the 21st century is understood as a complex process that includes economic, environmental and social components. The traditional model based only on economic growth is losing relevance. It is now being replaced by an integrated approach that takes into account social justice, equal access to resources, and people’s well-being. According to experts from the United Nations Research Institute for Social Development, sustainable development cannot be achieved without solving deep social problems like poverty, unemployment and inequality. These issues directly affect a society’s ability to respond to environmental challenges and adopt green changes (UNRISD, 2010). Caprotti et al. (2017) show that many urban development projects ignore the needs of vulnerable social groups, creating “green inequality.” Therefore, social factors such as access to housing, public transport, and citizen participation are key for inclusive development. Mikalauskienė et al. (2018) emphasise that hunger and poverty are serious obstacles to sustainability, especially in developing countries. They also explain that community initiatives and shared values play a strong role in the success of sustainability strategies. Social and psychological aspects – such as trust, social norms, and people’s values – are important as well. These factors shape public readiness to act for a more sustainable and fair future. Otto et al. (2020) suggest that social processes like cooperation, communication, and shared learning can help accelerate positive change. Similarly, Schorr (2018) explains that social inequality not only creates tension in society, but also makes environmental problems worse due to the unequal use of resources. In business, sustainable development is also becoming more socially focused. Annarelli et al. (2024) created a tool to measure social sustainability in companies, including factors such as jobs, safety, ethics, and fair treatment. Fathi et al. (2022), in a review of company practices, found that businesses with long-term success often include social values in their strategy. To sum up, modern research clearly shows that sustainability without the social dimension is incomplete. Inclusion, equality, social stability, and citizen involvement are not optional - they are necessary parts of a truly sustainable economy.

Dynamic pricing technology, as a progressive approach, has already been successfully applied in car-sharing and the financial sector, where the price level of a product changes reactively in accordance with the market conditions at a given moment in time. Holovanova (2016) notes that in the professional literature, several synonymous terms are used to define dynamic pricing: “dynamic price regulation”, “flexible pricing”, “adjustable pricing”, and points out that “within the framework of dynamic pricing, price dispersion (spatial, temporal) and price discrimination are considered”.

In modern economic conditions, the price set by producers must meet two important criteria:

- The price established in the market must cover all costs and bring profit, which reflects a positive financial result for the business. The resulting profit should ensure the effective functioning and development of the business entity.
- The price must satisfy the consumer and their individual factors, including purchasing power, tastes and preferences, and quality characteristics. Thus, an optimal relationship is formed between the consumer value of a product, service, or work, and its price.

In energy, the term “tariff” is used as an alternative to “price”. A tariff – according to Explanatory Dictionary of the Ukrainian Language (2005), is the officially established amount of payment or taxation for something. The formation of the price for energy resources follows the scheme presented in Figure 1.

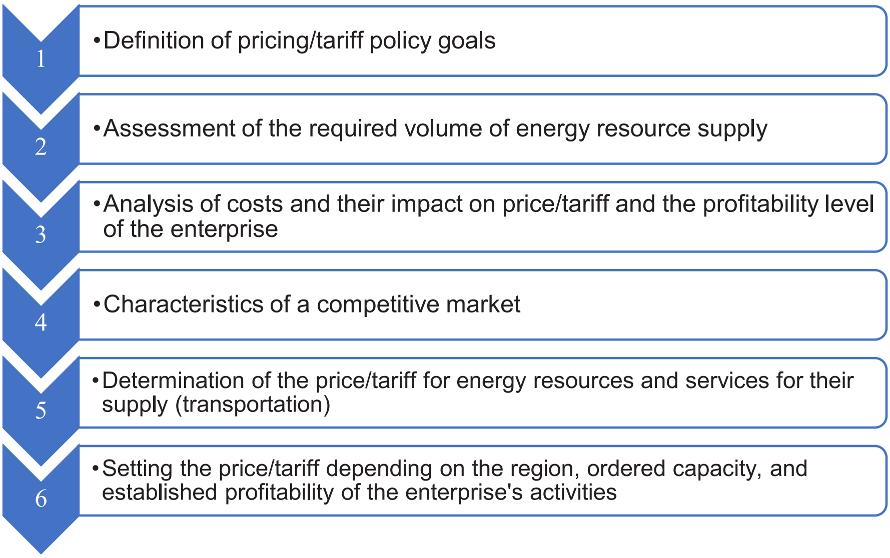

Figure 1. Scheme of the formation of the price/tariff for energy resources
Source: Developed by the author based on (Horal et al., 2025a).

3. Methodology

The studies by Horal et al. (2025a; 2025b) offer useful methodological insights for modeling green-energy tariff formation, as they examine stakeholder behaviour and decision-making in energy consumption as well as the use of AI tools in energy-system planning. These approaches can be adapted to assess how different market participants react to tariff changes and to model pricing scenarios that support the transition toward climate neutrality.

The model for determining the efficiency of tariff formation management in 'green' energy, considering unstable conditions, consists of several stages. Each stage includes the analysis of relevant factors and their impact on the tariff formation process. The model combines both quantitative and qualitative indicators for a comprehensive efficiency assessment. The algorithm for constructing the model for determining the efficiency of tariff formation management in "green" energy, taking into account unstable conditions, is shown in Figure 2.

The use of composite indices for different categories of conditions allows managers to better understand how various factors influence tariff formation processes and adjust their strategies in time to maintain efficiency and stability. All indicators for each factor are aggregated into a composite index for each category of conditions. For example, indicators of economic conditions (inflation, exchange rate, cost of capital) can be consolidated into one index reflecting the overall level of economic instability.

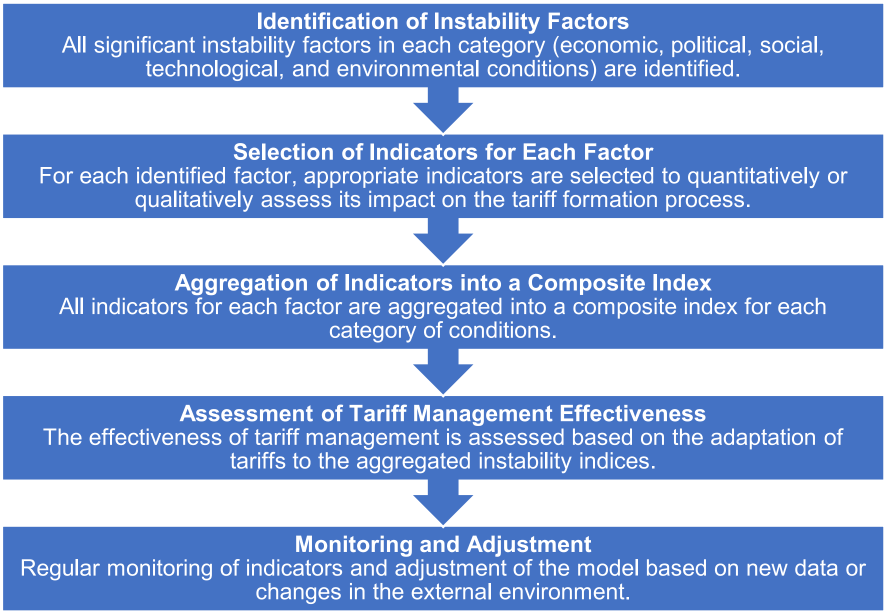

Figure 2. Algorithm for building a model to assess the efficiency of tariff management in green energy under unstable conditions

Source: Compiled by the author based on conducted research.

There are many different methods for aggregating individual quantitative and qualitative indicators into composite ones. The choice of aggregation method depends on the type of data to be combined and the purpose of creating the composite index. Linear methods are easy to use and well-suited for indicators of equal importance. Nonlinear methods and principal component analysis-based methods are appropriate for more complex cases where it is essential to consider interactions between indicators or reduce data dimensionality. Logical methods are useful when aggregation must account for specific rules or conditions.

Figure 3 illustrates the model for the effective management of the tariff-setting process in green energy.

When considering the relationship between tariff management levels and tariff rates, several key aspects emerge. The level of tariff management in green energy directly impacts green energy tariffs and determines how efficiently and fairly these tariffs are set. Policies affecting the level of management include decisions on subsidy amounts, investment levels in infrastructure, and pricing methods. High-quality management can ensure appropriate tariffs that encourage the development of green technologies and their financial sustainability. A high level of management involves effective political and economic decision-making, which directly influences tariffs.

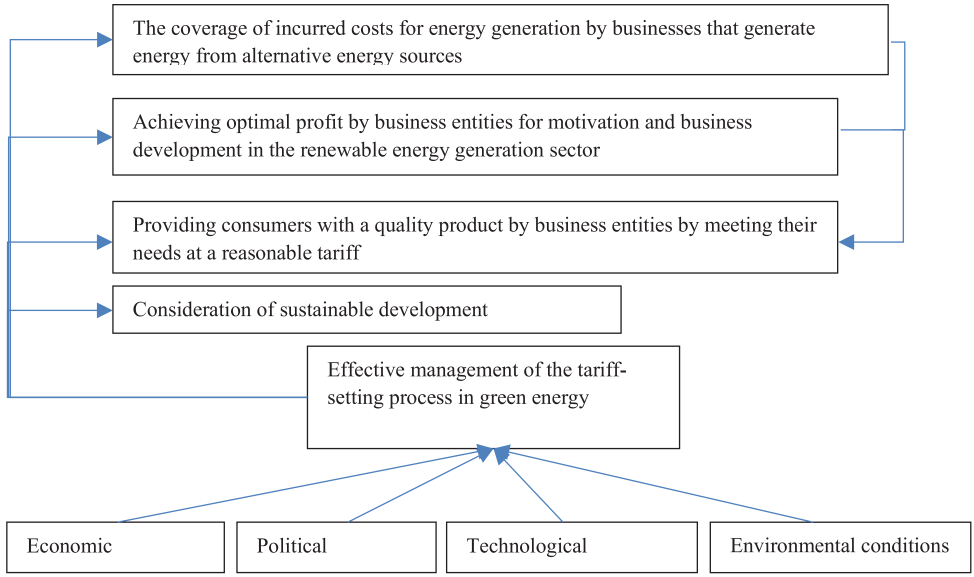

Figure 3. Key impacts of forming an effective management model for the tariff-setting process in green energy

Source: Compiled by the authors based on conducted research.

Overall, the level of tariff management determines how fairly and efficiently green energy tariffs will be set, considering economic, social and environmental factors. This ensures a balance between market needs, legislative requirements, and consumer interests.

A highly managed system responds more quickly to changing conditions such as currency fluctuations, new environmental requirements, or technological innovations, helping maintain tariff stability. Management decisions with a high level of control can improve the quality of infrastructure and services, positively impacting the efficiency and reliability of the energy supply system. Effective management allows for the optimisation of subsidies, ensuring their targeted use to support innovation and the development of green energy, which can ultimately reduce tariffs for end consumers.

Balanced and transparent management creates a favourable investment climate, attracting more investments into the industry and fostering the development of new projects and technologies. It also promotes political stability by reducing the risks of social and economic conflicts related to tariff policies and ensures better control over the implementation of regulatory acts and standards, enhancing the overall efficiency of the tariff-setting system in green energy.

To form a model for assessing the level of tariff management in green energy, we propose using a composite indicator.

Composite and integral indicators are used for summarising information, but they have different approaches and objectives. Composite indicators focus on summarising various aspects within a single category, while integral indicators integrate multiple numerical values to provide an overall assessment.

Advantages of the Composite Indicator over the Integral Indicator for Evaluating Tariff-Setting Management:

— It combines various aspects such as economic, social, political and environmental factors affecting tariff-setting, ensuring a comprehensive assessment, whereas the integral indicator often focuses on numerical results without a detailed differentiation of components.
— It can assign weights to different components, reflecting their importance, whereas the integral indicator typically does not account for these weights.
— It facilitates tracking changes and trends, allowing for a better assessment of how different factors influence tariff management over time.
— By integrating multiple factors, the composite indicator provides more context and accuracy in evaluating tariff policy effectiveness.
— It helps identify relationships between different factors, offering a better understanding of their combined impact.
— It is more flexible and can be adapted to changing conditions and requirements.
— It simplifies the communication and presentation of results for stakeholders by consolidating information into a single comprehensive figure.
— It better reflects changes in the political, economic and social context.
— It allows for more detailed policy analysis and adjustments compared to the integral indicator, which may not capture all nuances.
— The presence of separate components in the composite indicator makes it easier to determine which specific aspects need improvement.

To determine the level of management in the tariff-setting process for green energy, the Harrington scale (Harrington, 1965) was applied. This scale offers numerous advantages for assessing tariff management in green energy, particularly by providing an accurate evaluation of the quality and efficiency of management processes through fractional values. This allows for a clear representation of goal achievement levels and the identification of weak points.

The flexibility of the scale enables its adaptation to various aspects of tariff-setting, allowing for a detailed analysis and the precise identification of problematic areas. This facilitates the comparison of different management elements and the identification of best practices.

Assessment using the Harrington scale helps develop targeted strategies for process improvement by accurately identifying deficiencies. Planning and monitoring become more effective due to the ability to create detailed plans for enhancing management quality and tracking progress in their implementation. The scale aids in prioritising issues and allocating resources to address the most critical problems, thereby improving the efficiency of management decisions.

Transparency in the tariff-setting process also improves, fostering greater trust in decision-making. The justification for decisions is strengthened by precise data, allowing for more informed choices regarding changes and improvements. The analysis of results and the collection of feedback become more detailed, forming a foundation for continuous improvement.

The scale's criteria and a detailed description of management levels are presented in Table 1.

Table 1. Criteria boundaries and the justification of the efficiency level of tariff management in «green» energy

Management level boundaries	Justification
0.0 – 0.1	In conditions of instability, this level indicates critical problems in the tariff management process, associated with a high degree of uncertainty, major organisational and managerial challenges, and potential risks that significantly complicate effective tariff setting.
0.1 – 0.3	At this level, even with some efforts, the tariff management process still exhibits weaknesses, especially in unstable conditions. This may result from frequent policy or economic changes, making it difficult to establish and monitor tariffs consistently.
0.3 – 0.5	Under unstable conditions, the medium level indicates the presence of basic elements of effective tariff management but with certain shortcomings. Processes may be sufficiently structured, but external instability affects their efficiency, necessitating additional measures to maintain stability.
0.5 – 0.7	At a high-medium management level, tariff-setting processes are generally effective, but instability may still introduce certain adjustments to their functioning. This suggests that the system can adapt to changes, although it requires additional efforts to maintain high standards in fluctuating conditions.
0.7 – 0.9	A high level of tariff management in unstable conditions indicates a significant degree of organisation and efficiency. Processes are well-tuned, and the system can respond effectively to external changes, though minor areas for further improvement may still exist.
0.9 – 1.0	This level is characterised by high-quality management, even in conditions of significant instability. Tariff-setting processes operate at the highest level, with excellent adaptability to changes and instability, ensuring maximum efficiency and stability in complex conditions.

Source: Adapted by the author based on research (Liutyk, 2016; Myronchuk, V.M. 2012; Prokhorova et al., 2024; Brych et al., 2024).

The use of the Harrington scale from 0 to 1 for assessing the level of tariff management in green energy under conditions of instability involves dividing the scale into different levels of quality and efficiency. This approach not only allows for a detailed evaluation of the overall level of tariff management, but also considers the impact of unstable conditions on the effectiveness and resilience of the processes.

4. Results

The construction of the model for determining the level of tariff management in green energy under unstable conditions involved the calculation and normalisation of indicators for each identified group of instability factors. All individual indicators were normalised using the min-max normalisation method to ensure comparability and to transform all values into a unified [0.1] scale. This approach made it possible to integrate heterogeneous variables into a single dimensionless index. To ensure the reliability of the selected indicators, a preliminary correlation analysis was carried out. Variables with a high degree of correlation (correlation coefficient above 0.85) were further analysed in order to prevent multicollinearity, and only statistically significant and independent indicators were retained for the final model. Additionally, we evaluated the variance of each indicator to confirm that all selected variables meaningfully contribute to the composite index and are neither statistically insignificant nor excessively uniform. We have also added a subsection clarifying that the data used for the analysis were obtained from publicly available official sources.

The instability of the economic component was assessed based on indicators such as the inflation rate, fluctuations in the national currency exchange rate against major foreign currencies, and the average interest rate on loans.

Political conditions were determined by the number of changes in legislative acts regulating green energy, the amount of state subsidies, and the political stability index. Social factors were analysed based on the level of public support for green energy, the number of protests or social movements related to energy tariffs, and demographic changes. In the group of technological conditions, factors considered included the number of new patents or technological solutions in the sector, the delivery time of critical equipment, and the frequency of successful cyberattacks on energy systems. Environmental conditions were characterised by the frequency of extreme weather events, changes in the capacity utilisation factor of renewable energy sources, and the number of environmental protests or movements related to green energy tariffs. By applying aggregation methods, a quantitative representation of the composite indicators of instability levels for the proposed groups was obtained. The calculated results are visualised in Figure 4.

Ukraine was chosen for the analysis as the country with the most dynamic development of green energy in the pre-war period. The analysis of economic, political, social, technological and environmental instability indicators in Ukraine reveals significant changes and fluctuations in these factors over the past decades. The initial period from 1991 to 1994 was characterised by a relatively low level of instability, which can be explained by the transition period following the collapse of the USSR. During these years, the country was just beginning to form new political and economic institutions, which to some extent ensured stability in the social and economic spheres. However, starting from the mid-1990s, instability indicators began to gradually increase. This can be attributed to the deepening economic and political crises resulting from the adaptation to new market economy conditions and political transformation. For example, in 1995, there was a significant rise in political and economic instability. This period was marked by challenging economic conditions, high inflation, declining production, and social discontent.

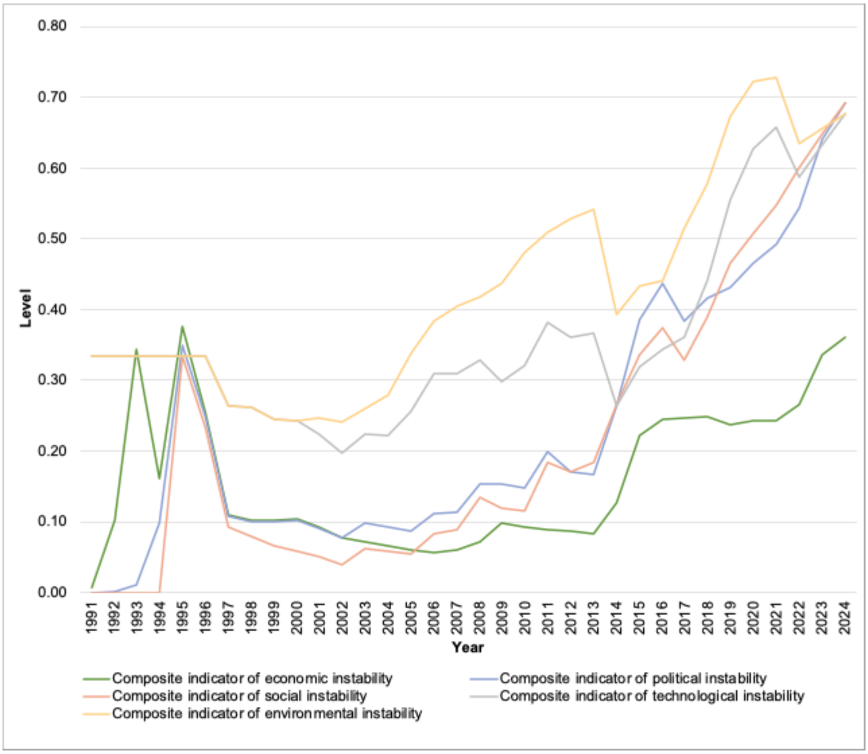

Figure 4. Dynamics of composite indicators of unstable conditions in green energy tariff regulation

Source: Compiled by the author based on the obtained results of composite indicator modelling in the table 2.

In the following years, instability indicators remained at relatively high levels, indicating persistent problems in the country. However, the most significant changes occurred in 2014 when Russia annexed Crimea and the war in eastern Ukraine began. These events led to a sharp increase in political, social and economic instability. Political instability escalated due to conflicts among political forces, internal contradictions, and external threats. Social instability rose due to migration processes, declining living standards, and increasing social tension. Economic instability was driven by GDP decline, currency devaluation, market losses, and a growing budget deficit.

The growth of instability indicators continued in the following years. In particular, during 2022–2024, when the full-scale war between Ukraine and Russia began, all instability indicators reached their peak. Military actions on Ukrainian territory led to severe economic and social shocks. Economic instability reached its highest level due to infrastructure destruction, a significant decline in investment, increasing public debt, and a drop in production. Political instability grew due to military actions, frequent government changes, societal divisions, and loss of control over certain territories. Social instability increased due to heavy civilian losses, internally displaced persons, and rising poverty levels. Technological instability also rose as the war hindered access to technological resources and innovations, while environmental instability worsened due to severe ecological damage caused by military actions.

It is important to note that a country's active development, including digitalisation and other innovations, can not only contribute to economic growth, but also increase instability. Technological innovations create both new opportunities and potential threats. For example, digitalisation can accelerate economic development, improve governance efficiency, and increase transparency. However, it may also lead to rising cybersecurity threats, social issues related to unemployment due to automation, and greater dependency on technology, making the country more vulnerable to external attacks.

Given these trends, it can be concluded that instability processes in Ukraine have significantly influenced tariff regulation in green energy. The growing uncertainty caused by political, economic and social factors forced the government and businesses to adapt their strategies. This impacted investment levels in green energy, tariff adjustments, and overall energy sector policies. Despite all the difficulties, the development of green energy continued, but in conditions of high instability, this process requires careful planning and risk assessment.

The continuation of economic-mathematical modelling involves determining the level of tariff regulation management in green energy. Based on the defined composite indicator, tariff regulation strategies have been proposed according to three main indicators: management level, tariff size, and conditions aimed at ensuring the continued growth of electricity production from alternative energy sources. This approach will not only stabilise the green energy market, but also promote the further development of environmentally friendly technologies in Ukraine's energy sector.

By applying methods of aggregating indicators and factors, a composite indicator of the level of tariff regulation management in green energy was calculated. The results of the proposed indicator calculation, the volume of energy produced from alternative sources, and the average electricity tariff from alternative sources are presented in Table 2.

Table 2. Composite indicator of tariff regulation management in green energy from 2009 to 2024

Years	Composite indicator of tariff regulation management under conditions of instability	Volume of energy produced from renewable sources (GWh)	Average tariff for electricity produced from alternative energy sources, UAH/kWh
2009	.	7	959
2010	0.23	8	959
2011	0.27	10	959
2012	0.26	13	959
2013	0.27	15	959
2014	0.26	18	959
2015	0.34	20	547
2016	0.37	23	547
2017	0.37	25	520
2018	0.41	30	520
2019	0.47	35	520
2020	0.51	40	460
2021	0.53	45	460
2022	0.53	48	460
2023	0.58	50	460
2024	0.62	52	460

Source: Compiled by the author based on calculations.

Figure 4 shows changes in the composite indicator of tariff regulation management under unstable conditions against the background of the dynamics of the average tariff for green energy. Figure 5 illustrates the dynamics of the composite indicator of tariff regulation management in green energy compared to changes in the volume of energy produced from alternative energy sources. Given that unstable conditions are intensifying each year and the level of tariff regulation management is becoming increasingly important in mitigating negative trends, the production of energy from alternative sources continues to grow. In 2009, the composite indicator of tariff regulation management under unstable conditions was 0.22, while the volume of energy produced from renewable sources was at the level of 7 GWh.

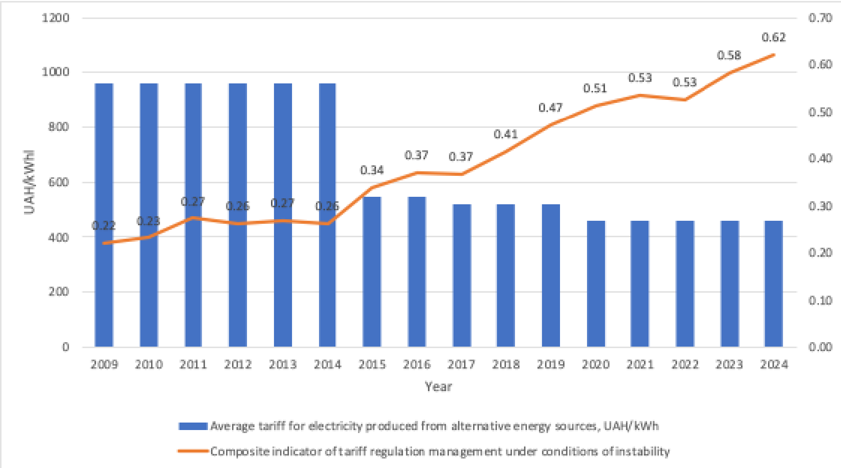

Figure 5. Dynamics of the composite indicator of the management level under unstable conditions against the background of changes in the average "green" tariff

Source: Compiled by the authors based on conducted research.

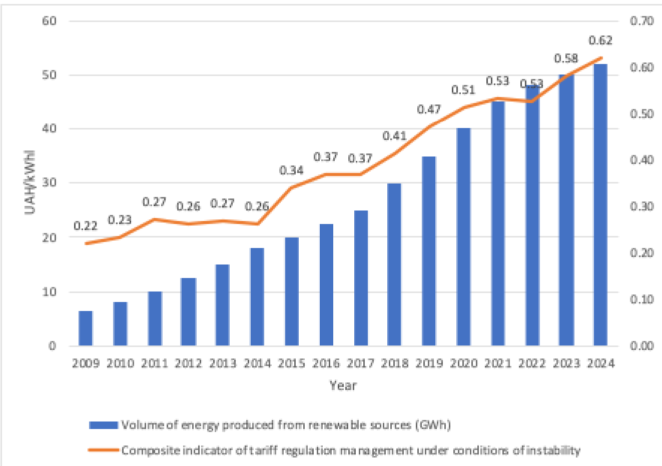

Figure 6. Dynamics of the composite indicator of the management level under unstable conditions against the background of changes in the volume of energy produced from alternative energy sources

Source: Compiled by the authors based on conducted calculations.

With each passing year, the composite indicator has increased, reaching 0.62 in 2024, accompanied by a significant rise in renewable energy production to 52 GWh. This indicates that, despite increasing instability, active tariff regulation management enables the continued growth of energy production from alternative sources. From 2010 to 2013, as the composite indicator rose from 0.23 to 0.27, energy production increased from 8 to 15 GWh.

Between 2014 and 2018, when the indicator increased from 0.26 to 0.41, renewable energy production grew from 18 to 30 GWh. This trend continued in subsequent years, with the indicator reaching 0.62 in 2024 and production rising to 52 GWh. The increasing level of tariff regulation management under unstable conditions is a key factor in sustaining the positive trend in renewable energy production, emphasising the need for well-developed and implemented management strategies that account for growing instability.

Based on the tariff regulation management indicator, effective strategies can be developed to ensure stability and sustainable growth in green energy under conditions of instability. The indicator helps assess how various instability factors influence tariff regulation and overall system efficiency, providing insights into industry risks and guiding strategy adjustments to minimise negative consequences. In an environment of increasing economic, political and social instability, this indicator becomes an essential tool for enhancing the resilience of the energy system.

Moreover, this indicator can be applied in administrative systems, serving as a foundation for informed decision-making regarding tariff adjustments and other aspects of green energy management. Administrators can use it for more precise industry development planning, helping to avoid errors and mitigate risks.

We believe that the proposed composite indicator is also valuable for monitoring processes, where it can serve as a performance measure for existing strategies and indicate when changes are needed for improvement. It can signal necessary policy adjustments when unstable conditions begin to negatively impact renewable energy production. Incorporating the tariff regulation management indicator into planning will enable more flexible and adaptive management, fostering the long-term development of the sector.

Considering constant changes in the external environment, this indicator will not only help stabilise the market, but also support further green energy growth through integration into planning systems (Onyshchenko et al. 2022). This will allow for the development of long-term industry growth plans while accounting for potential risks and challenges. As a result, policymakers will have a tool for making more informed decisions aimed at achieving strategic goals under unstable conditions.

Developing strategies based on the proposed indicator will also help ensure the resilience and competitiveness of green energy at both national and international levels. Using the indicator in management will facilitate better coordination between the different economic sectors involved in renewable energy production and consumption, leading to more efficient resource utilisation and improved overall industry performance while maintaining its environmental benefits.

Thus, the tariff regulation management indicator is a crucial tool for effectively responding to instability challenges and ensuring the sustainable development of green energy in Ukraine.

5. Conclusions

It is worth noting that the regular monitoring of tariff management indicators and the continuous adjustment of models based on new data or changes in the external environment are key elements for maintaining the effectiveness of management decisions in the field of green energy. This enables a quick adaptation of strategies to new conditions arising from instability and ensures the relevance of the decisions made.

The proposed model allows for a comprehensive assessment of the effectiveness of tariff management for green energy, considering unstable conditions (Horal et al, 2025b). The use of composite indices for different categories of conditions helps managers to better understand how various factors influence tariff-setting processes and to adjust their strategies in a timely manner to maintain efficiency and sustainability.

Based on the proposed model for determining the level of tariff management in green energy, management strategies have been developed depending on composite indicators of unstable conditions, the level of management, and green energy tariffs (Table 3).

Analysing the proposed tariff management strategies in the green energy sector, several key existing strategies can be distinguished:

- Stable tariff-setting, aimed at maintaining tariff stability in stable market conditions. It is suitable for ensuring predictability and minimising risks but requires a high level of management and regular market monitoring.
- Flexible tariff-setting, which allows for the quick adaptation of tariffs to changes in market conditions and costs, but requires moderately stable conditions for effective implementation.
- Investment stimulation, an important strategy in conditions of instability, aimed at attracting investments to improve infrastructure and reduce costs, which can help stabilise tariffs in the long run.
- Crisis management, necessary in highly unstable conditions, where urgent measures need to be taken to minimise the impact of crises on consumers and ensure a quick response to unforeseen circumstances.

Table 3. Tariff management strategies in green energy

Strategy	Management Level	Conditions	Tariff Level	Description	Objective
Stable Tariff Formation	High	Stable	Moderate	Maintaining tariff stability through regular monitoring and adjustments based on market conditions	Ensure predict-ability and mini-mise social and economic risks
Flexible Tariff Formation	Medium	Moderately stable	High	Implementing flex-ible tariff mecha-nisms to adapt to changes in costs and market con-ditions	Improve the alignment of tariffs with ac-tual costs and market condi-tions
Investment Stimulation	Low	Unstable	High	Encouraging investments in infrastructure to improve efficiency and reduce costs, including support programmes	Increase ef-ficiency and system stability, and reduce tariffs
Crisis Management	Low	Unstable	High	Implementing emergency meas-ures to manage crisis situations, reviewing and ad-justing tariffs	Mitigate the negative impact of crises on consumers and ensure a rapid response
Innovative Development	High	Stable	Low	Investing in new technologies and innovations to en-hance efficiency and reduce costs, implementing stimulus policies	Maintain low tariffs through technological progress
Regulation through Subsidies	Medium	Unstable	Moderate	Using subsidies and financial instruments to support consum-ers and stabilise tariffs	Reduce finan-cial pressure on consumers and stabilise tariff formation

continued table 3

Adaptive Management	Medium	Stable	High	Adapting management processes to changing conditions, ensuring regular monitoring and a rapid response	Flexibly manage tariffs to ensure fairness and cost compliance
Participatory Management	High	Variable, but mostly stable	Depends on a consensus decision	Decision-making involves all key stakeholders, allowing different perspectives and interests to be considered. This can enhance transparency and tariff management efficiency	Ensure fair and balanced tariff formation that considers the interests of all stakeholders, minimising social conflicts and increasing trust in decisions within the green energy sector

Source: Created by the authors based on conducted research.

The innovation development strategy focuses on utilising new technologies to reduce costs and maintain low tariffs, which can be effective in stable market conditions. Regulation through subsidies provides financial support to consumers in unstable conditions, reducing pressure on them and stabilising tariff formation. Adaptive management allows for a flexible response to market changes, ensuring fair tariffs that correspond to actual costs, making it effective in stable conditions with possible short-term fluctuations.

Participatory management ensures the involvement of all stakeholders in the decision-making process, increasing transparency and trust in adopted decisions, particularly in variable market conditions.

Each of these strategies has its advantages and areas of application, depending on the level of instability and management tasks, allowing for the selection of the most suitable approach for a specific situation.

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