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ENERGY MARKETING AND FISCAL REGULATION OF A COMPETITIVE ENERGY EFFICIENCY SYSTEM

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Introduction. Developing and implementing the principles of the energy-saving approach concept actualizes the need to define energy marketing tasks and fiscal regulation tools for energy conservation to increase the efficiency of using resources in the energy sector.

Aim and tasks. The aim of this study is to form and substantiate the expediency of implementing directions for energy marketing development and fiscal regulation of implementing energy-saving measures to achieve the goals of national economic recovery and large-scale energy modernization.

The results. The main tasks of energy marketing in monitoring the current world environment based on information and communication technologies have been defined and substantiated, and that should become a source of competitive advantage in the electric energy market and obtain significant income for market participants. It has been proven that using oligopoly models to determine the equilibrium condition of the electric energy market will make it possible to form a corrective managerial influence on the development of a competitive energy industry. With a 3-fold increase in the demand parameter, it has been established that the electricity market reaches equilibrium under the equilibrium model of supply functions with larger electricity production volumes and lower prices than in other models. It has been proposed to introduce tools for fiscal regulation by introducing energy-saving technologies into a single system of solutions to increase energy efficiency and energy saving.

Conclusions. Analysing and generalizing the features of energy market participants' interaction using a wide range of oligopoly models made it possible to develop recommendations for implementing strategic security-related tasks. If these tasks are not realized, the risks of losing energy independence will increase, and the economic potential necessary for the restoration and further development of the national economy will continue to be lost based on the principles of sustainable development and a systematic approach to setting and achieving the goal of the national energy-saving policy. The feasibility of introducing tools for budget regulation is also justified, which will create a robust creative basis for implementing an effective strategy for managing the demand for energy resources.

Keywords: energy marketing, electricity market, fiscal regulation, energy saving.

1. Introduction.

The electric energy industry’s strategic role and importance necessitate modern approaches to developing energy marketing and fiscal regulation of energy saving to ensure the energy sector’s effective functioning and transition to sustainable energy development. Providing all interested market participants with advanced information on the forecasted equilibrium price for electric energy will enable them to justify and choose their energy-saving strategies (Price et al., 2005).

It will create the basis for implementing a balanced and consistent national policy to achieve the goals of the Energy Strategy of Ukraine by 2050 (Ministry of Energy of Ukraine, 2022). Based on these considerations, the national policy on electricity sector reform should aim to eliminate the primary causes of the inefficiency of the existing electricity market within the framework of adapting national legislation to European requirements, forming tools for marketing support for introducing energy-efficient technologies, and fiscal regulation of saving resources in the process of restoring the national economy.

Effective functioning of the energy sector is necessary for sustainable development of the national economy, ensuring the required level of energy security and independence. However, the crisis of the domestic economy on the whole, due to political and economic instability, and the electric power industry in particular, requires implementing radical reforms aimed at increasing the level of competitiveness and efficiency of energy production and consumption, fighting against monopolization in the sectors of energy production and distribution, diversifying the sources of energy supply, and renewing the main production assets of energy companies.

Current conceptual provisions for the electricity market operating in Ukraine have not been sufficiently developed, which negatively affects national energy security, the business activity of energy companies, and the position of electricity consumers. This, in turn, increases the urgency to find and implement new approaches to energy marketing and the fiscal regulation of energy saving.

Despite the scientific opinion on this issue being actively developed, studies do not cover the entire set of issues related to such a complex and multidimensional process of developing and implementing modern mechanisms for electric energy market development based on the principles of marketing and using the tools of fiscal regulation of the implementation processes of energy efficiency projects. The theoretical and applied aspects of developing the electric energy market are highlighted in the following Kohler (2021), Acakpovi et al. (2022), Kumar et al. (2023), Wang et al. (2023), Yao et al. (2023).

However, the methodology developed and the However, the methodology developed and the methods used for researching the development of the domestic energy sector require new comprehensive and complex research, which becomes even more critical in the context of fundamental changes in industrial relations and social and economic conditions. Also, there is a need to establish competitive relations between producers and suppliers of energy products and to effectively regulate natural “local” monopolies by creating consumer markets for these products based on empowering local self-government bodies and supporting private initiatives of the housing stock owners in the cities.

2. Materials and Methods.

During the last decade, the multi-vector nature of developing relations between public institutions and private entrepreneurs remains one of the most important directions of implementing public projects and regional target programs for the national economy recovery (Farghali M. et al., 2023), namely in the sphere of electric energy production, distribution and supply (Kuzmynchuk N. et al., 2023). It should be noted that the Ukrainian electricity market has a decentralized structure, including transmission and distribution systems, producers and consumers (State Agency for Energy Efficiency and Energy Saving, 2022).

The pricing mechanism on the electricity market in Ukraine is based on free market principles, and the price is determined under the influence of supply and demand at a certain point in time, which is the basis for further tariff formation for the end consumer.

Most scientists and managers of various hierarchical authority levels rely heavily on monitoring (Wang. et al., 2023). The main tasks of energy marketing in the field of monitoring the current situation in the electricity market are as follows:

– to develop ways to assess the competitive environment, electric energy market condition and development level for a certain period;

– to detect market legislation violations, monopolistic behaviour attributes, price manipulation, failures to fulfil the contract terms and conditions, and other ineligible phenomena;

– to analyse the accounting of mutual settlements between electricity market participants;

– to assess the performance of the market operator, transmission system operator, and guaranteed buyer, as well as operating of the bilateral contracts market;

– to create economic and mathematical models and software for analysing the market participants' interaction, enhancing the tools for determining the optimum electricity supply and sale volumes in the electricity market, which includes forecasting equilibrium electricity prices;

– to assess electricity supply security based on analysing electricity production and consumption balance, forecasting future demand for electricity and the required capacity of new generating facilities, assessing electricity network maintenance, and implementing strategies to resolve capacity shortage issues.

In order to set the optimum price for electricity and develop the energy market based on profit maximization principles for each market participant, it is advisable to use economic and mathematical modelling to determine the equilibrium condition of the electricity market of Ukraine. The equilibrium condition of the electricity market is determined when electricity demand meets the supply, that is, when the amount of electricity produced is equal to the amount consumed. Analysing scientific research in electricity market modelling enabled us to determine the most appropriate mathematical models, making it possible to forecast market conditions.

First of all, these oligopoly models represent a market structure in which there are a few large suppliers that control the majority of the market.

The Ukrainian electricity market is characterized by the operation of several large generating companies that significantly impact market dynamics and pricing policy. Economic and mathematical models of oligopoly allow one to analyse the suppliers' decisions taken during their interaction under competitive conditions and make it possible to understand how the changes in one particular supplier's strategies can affect the other market participants' strategies and profits. The primary energy marketing focus should be enabling consumers to regulate the electricity they receive based on their needs and the power system capabilities (Kohler, 2021). This can be achieved by providing consumers with advanced information for self-managing their electricity consumption, implementing energy-saving technologies to minimize costs, and increasing national energy security.

It is expected to consider economic and mathematical models of oligopoly based on determining the equilibrium of supply functions, which is more effective for predicting market conditions than the Cournot model. In Cournot's model, competition is limited by the volume of electricity supplied on the electricity market, whilst the proposed model allows us to take competition into account, both in the supply volume and the product price.

It has been suggested that market conditions are influenced by the linear supply functions of each generating company for a certain parameter k:

$$v_k = \mu_k(P_f - b_k), \qquad (1)$$

where: v_k is the volume of electricity supply offered by generating companies on the market;

P_f is the price determined by electricity market when participants exchange information;

$\mu_k > 0$, b_k are constant values determined by generating companies.

The function that determines the total demand for electricity:

$$DF = d - \gamma P_f, \ (\gamma > 0), \qquad (2)$$

Marginal costs of generation are:

$$\frac{\partial Z_к}{\partial v_k} = c_k v_k + a_k, \qquad (3)$$

where: $a_k \neq 0, c_k > 0$ are pre-known parameters.

The residual demand for the *k-th* company is equivalent to:

$$v_k = DF - \sum_{\substack{j=1 \\ j\neq k}}^{N} v_j = d - \gamma P_f - \sum_{\substack{j=1 \\ j\neq k}}^{N} \mu_j\left(P_f + b_j\right) \quad (4)$$

According to Nash's equilibrium condition, which determine the equilibrium price and generation volume for each company:

$$DF = U = \sum_{j=1}^{N} v_j \quad (5)$$

If no equilibrium price exists, firms will not get any revenue. Thus, companies have to choose the supply volume necessary to get the maximum profit (μ_k, b_k):

$G_k(\mu_k, b_k, P_f) = P_f v_k - Z_k \rightarrow max$ (*k=1...N*).

In case this condition is met, then profit maximization will be achieved:

$$\frac{\partial G_k}{\partial P_f} = v_k - P_f \frac{\partial v_k}{\partial P_f} - \frac{\partial Z_\kappa}{\partial v_k} \cdot \frac{\partial v_k}{\partial P_f} = 0$$

Taking (2–4) into account:

$$v_k - \left(\gamma + \sum_{\substack{j=1 \\ j\neq k}}^{N} \mu_j\right)\left(P_f - c_k\, v_k - a_k\right) = 0 \quad (6)$$

Based on (1), equations can be obtained:

$$\mu_k = \left(\gamma + \sum_{\substack{j=1 \\ j\neq k}}^{N} \mu_j\right) \cdot (1 - c_k \mu_k) \quad (7)$$

$$-\mu_k b_k = \left(\gamma + \sum_{\substack{j=1 \\ j\neq k}}^{N} \mu_j\right) \cdot (-a_k + c_k \mu_k b_k) \quad (8)$$

Inserting equation (6) into equation (7) provides the condition of market equilibrium $b_k = a_k$, otherwise μ_k will depend on μ_k, that is, the supply function will not be linear:

$$v_k = \mu_k\left(P_f - a_k\right) \quad (9)$$

Then determine the influence index of the *k-th* company on electricity market conditions using the following formula: $\lambda_k = \frac{\partial U}{\partial v_k}$, which determines relationship between the change in company's electricity generation volume and the total market volume. Considering the supply and demand balance, it can be concluded from equation (2) that:

$$v_k = \frac{P_f - a_k}{\left(c_k + \frac{\lambda_k}{\gamma}\right)} \quad (10)$$

Comparing (6) and (9), it is possible to obtain the following formula:

$$\mu_k = \frac{\gamma}{c_k \gamma + \lambda_k} \quad (11)$$

By inserting equation (10) into (6), the company's influence can be concluded:

$$\lambda_k = \frac{1}{\sum_{\substack{j=1 \\ j\neq k}}^{N} \frac{1}{c_j \gamma + \lambda_j} + 1}, \quad (12)$$

The *k-th* company's level of influence is directly related to the influence levels of other companies found on the market. Having solved the system of N nonlinear equations, it is possible to determine the values of influence indices based on c_κ variable. Then imagine the largest volume of electricity available on the electricity market as V_K, then the supply function, taking (10) into account, can be expressed as:

$$v_k = \begin{cases} 0, & if\ P_f < a_k \\ \frac{\gamma}{c_k\gamma + \lambda_k}\left(P_f - a_k\right), & if\ a_k < P_f < V_k \frac{c_k\gamma + \lambda_k}{\gamma} \\ V_K, & if\ P_f > V_k \frac{c_k\gamma + \lambda_k}{\gamma} + a_k \end{cases} \quad (13)$$

Using (5) and (10) equilibrium conditions, which can determine the equilibrium price at a certain point in time:

$$P_f^{LSFE} = \frac{d + \gamma \sum_{\substack{j=1 \\ j\neq k}}^{N} \frac{a_j}{c_j \gamma + \lambda_j}}{\gamma\left(1 + \sum_{\substack{j=1 \\ j\neq k}}^{N} \frac{1}{c_j \gamma + \lambda_j}\right)} \quad (14)$$

The model proposed allows us to develop a strategy in which the company takes the equilibrium price into account, together with demand, competitors' reaction to changes in price, and supply after submitting an application. It should be noted that in (13) equation all companies are assigned the same weight (w_k=1). On this basis, which can determine the equilibrium price at a certain point in time using Cournot's model (Wang et al., 2023).

$$P_f^{Cournot} = \frac{d + \gamma \sum_{j=1}^{N} \frac{a_j}{c_j \gamma + 1}}{\gamma\left(1 + \sum_{j=1}^{N} \frac{1}{c_j \gamma + 1}\right)} \quad (15)$$

In this scenario, the competition is limited by the available supply amount, and businesses are affected by both consumer demand and their own expenses, while other complex interactions are not being considered.

When each company's supply is calculated using marginal cost and the total supply function is determined by adding the volumes of all producers, then the Walrasian model can be followed (Wang et al., 2023). In this model, the equilibrium price at a certain point in time is determined by the following formula:

$$P_f^{Walras} = \frac{d+\gamma\sum_{j=1}^{N}\frac{a_j}{c_j}}{\gamma\left(1+\sum_{j=1}^{N}\frac{1}{c_j}\right)} \quad (16)$$

The supply function of each company is as follows:

$$v_k = \begin{cases} 0, & if\ P_f < a_k \\ \frac{(P_f - a_k)}{c_k}, & if\ a_k < P_f < V_k c_k + a_k \\ V_K, & if\ P_f > V_k c_k + a_k \end{cases} \quad (17)$$

3. The aim and tasks.

This study aims to define and substantiate directions for developing energy marketing and fiscal regulation and implementing energy-saving measures to achieve the goals of recovery, sustainable development, and large-scale energy modernization of the national economy.

4. Results.

The results of monitoring the current electricity market environment allow us to investigate conditions for achieving equilibrium, which forms the source of competitive advantage and affects the income of all participants.

Five electric energy producers have been considered using the equilibrium model of supply functions (Table 1). It was assumed that the demand function in the electricity market has the following form:

DF=46000-γP_f,

where, γ is the demand parameter, which changes with a step of 10, with initial value of 20 and equals 20, 30, 40, 50, 60, respectively.

Table 1. Initial data for calculating the Equilibrium model of supply functions.

	a_k, UAH/mWh	c_k, UAH/(mWh)^2
Manufacturer 1	2695	0,187
Manufacturer 2	2805	0,220
Manufacturer 3	2750	0,203
Manufacturer 4	2530	0,171
Manufacturer 5	2860	0,231

Table 2 shows the results of calculating the equilibrium price, the amount of electricity offered to consumers on the market, and the profits of electricity producers. Analysing the data received has shown that when γ demand parameter increases by 3 times, the electricity supply on the market decreases. The total amount of electricity available in the market fell 50.1% as demand increased. Moreover, it has been established that the lower the cost of electricity production, the slower the decline in the volume of electricity produced by generating companies. Thus, in Fig. 1, the analysed indicator for producer №4 decreases by 1.8 times only and for producer №5, whose electricity production cost is the highest, it falls by 2.3 times.

When γ demand parameter increases from 20 to 60, there is a noticeable decrease in electricity producers' profit (Fig. 2). The profit of electricity producers (G_k, thousands UAH) decreases significantly with a 4.5-fold increase in demand, which corresponds to a decrease of 77.6%, and indicates the increased competition and a decrease in electricity market profitability under conditions of increased demand. The profit for electricity producer №4 decreases by 3.6 times, and for "the most expensive" producer No. 5, where the cost of electricity production is the highest, the profit decreases by 5.9 times (Fig. 2). Accordingly, the equilibrium price also tends to decrease and actually decreases by 24.2% when γ demand parameter increases to 60.

Table 2. The results of calculating the equilibrium price and electricity volume according to the equilibrium model of supply functions.

	№ 1	№ 2	№ 3	№ 4	№ 5
γ=20					
Equilibrium Price P_f, UAH	4257				
Electricity Volume v_k, mWh	35959	29508	32538	42554	27313
Profit G_k, thousands UAH	6210	4620	5346	8256	4081
γ=30					
Equilibrium Price P_f, UAH	3927				
Electricity Volume v_k, mWh	29084	23309	26015	35365	21313
Profit G_k, thousands UAH	3922	2794	3306	5478	2409
γ=40					
Equilibrium Price P_f, UAH	3658				
Electricity Volume v_k, mWh	23100	17958	20367	29073	16137
Profit G_k, thousands UAH	2398	1617	1969	3586	1348
γ=50					
Equilibrium Price P_f, UAH	3426				
Electricity Volume v_k, mWh	17831	13266	15395	23502	11611
Profit G_k, thousands UAH	1392	858	1100	2283	682
γ=60					
Equilibrium Price P_f, UAH	3228				
Electricity Volume v_k, mWh	17831	13266	15395	23502	11611
Profit G_k, thousands UAH	1392	858	1100	2283	682

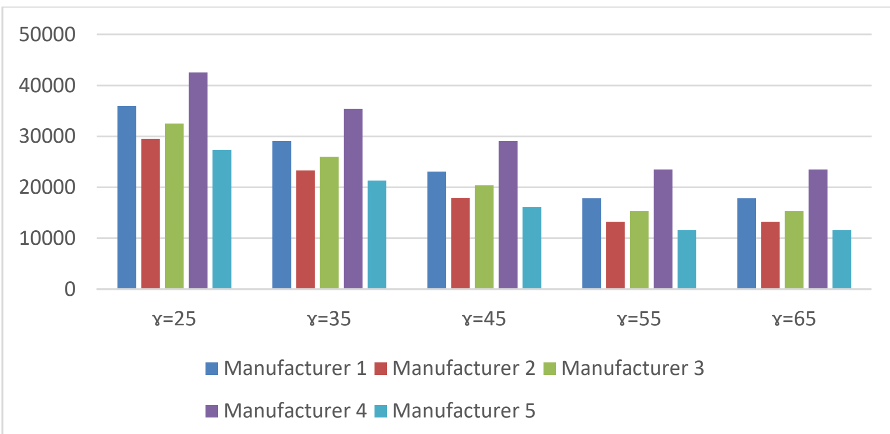

Figure 1. The dynamics of changes in electricity volume offered on electricity market, MWh.

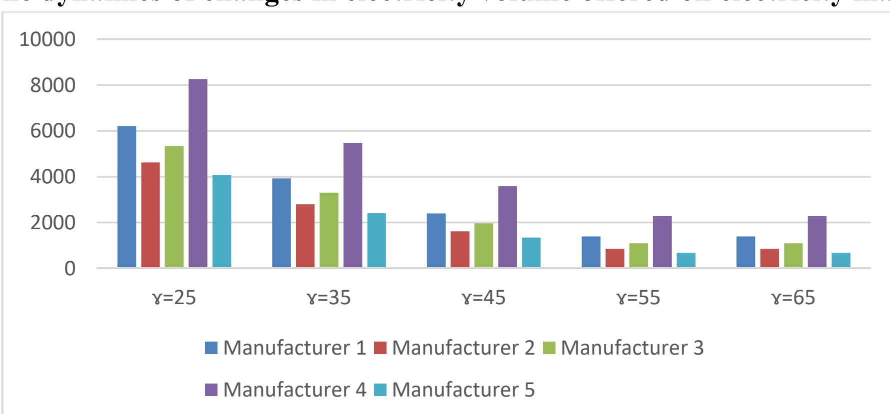

Figure 2. The dynamics of profit for electricity producers, thousands UAH.

To obtain more substantiated conclusions, the results of calculating the equilibrium volume and price for three market models were simultaneously compared (Table 3). Then, observations of a decrease in the equilibrium price were carried out based on the Walras model when γ parameter increased while the profits of generating companies were decreasing. For electricity producers, there is also a decrease in v_k electricity generation volume when γ parameter increases, which may be a result of changing production and supply strategy, and it also reduces the energy companies' profit. As for Cournot's model, a similar situation was observed: with an increase in demand for electricity, there was a decrease in the equilibrium price, electricity generation volume, and profits of electricity producers.

Table 3. The results of calculating equilibrium volume and price according to three market models.

		№ 1	№2	№3	№4	№5	Total
γ=20							
Walras's Model	Equilibrium Price P_f , UAH	3976					
	Electricity Volume v_k, mWh	37708	29304	33017	46684	26598	173311
	Profit G_k, thousands UAH	4395	3119	3696	6144	2701	20053
Equilibrium Model of Supply Functions	Equilibrium Price P_f , UAH	4257					
	Electricity Volume v_k, mWh	35959	29508	32538	42554	27313	167871
	Profit G_k, thousands UAH	6210	4620	5346	8256	4081	28512
Cournot's Model	Equilibrium Price P_f , UAH	5274					
	Electricity Volume v_k, mWh	15263	13024	14108	17864	12144	72402
	Profit G_k, thousands UAH	6446	5236	5814	8025	4769	30289
γ=60							
Walras's model	Equilibrium Price P_f , UAH	3173					
	Electricity Volume v_k, mWh	14020	9169	11396	20697	7420	62700
	Profit G_k, thousands UAH	605	308	435	1210	209	2767
Equilibrium Model of Supply Functions	Equilibrium Price P_f , UAH	3228					
	Electricity Volume v_k, mWh	17831	13266	15395	23502	11611	81604
	Profit G_k, thousands UAH	1392	858	1100	2283	682	6314
Cournot's Model	Equilibrium Price P_f , UAH	3300					
	Electricity Volume v_k, mWh	9405	6468	7860	13464	5313	42510
	Profit G_k, thousands UAH	765	435	583	1381	319	3482

The electricity market, with a 3-fold increase in the demand parameter, reaches equilibrium under conditions of the equilibrium model of supply functions with larger electricity production volumes and prices lower than those under Cournot competition. This benefits buyers even though each company makes a lower profit. It was also found that the electricity producer's profit is halved when the cost of electricity production increases by 10%, unlike other generating companies, whose profit increases by 8%. It should be noted that Walras model is based on the idea of universal market equilibrium pricing, where all market participants take prices for granted and adjust their production volumes to achieve supply and demand equilibrium. For this reason, to obtain adequate information about electricity market conditions in the future for developing energy-saving strategies by all market participants and relevant programs by regulatory bodies, it is advisable to use the equilibrium model of supply functions, which allows one to consider producers' flexibility in response to price changes, while Cournot's model considers producers' decisions about production in terms of competition when producers can affect the price through their production decisions, which does not correspond to current market conditions.

Considering the specifics of the Ukrainian electricity market, the proposed equilibrium model of supply functions can be a useful tool for analysing the market environment and interaction among generating companies in order to develop and implement the concept of an energy-saving outlook, which involves developing a set of measures for fiscal regulation of energy-saving technologies. The energy-saving ideology involves creating particular mechanisms aimed at stimulating investment in modern technologies and infrastructure that contribute to energy conservation and the reduction of losses in transmission and distribution systems. Furthermore, they envisaged using fiscal regulatory instruments to support energy-efficient solutions and motivate electricity consumers to reduce their energy consumption. Such an approach will facilitate the balanced development of the electric energy industry, ensuring its stability and sustainable reduction of greenhouse gas emissions, contributing to the overall sustainability of the energy sector, and increasing its competitiveness (Dzwigol et al., 2023).

The diagnostic and analytical basis requires the use of tax regulation tools, which are priority areas of national policy in the fields of energy saving and energy efficiency. Tax policy tools are very common in modern global taxation practice. Given the current scarcity of financial resources for businesses and households, tax regulation is particularly important. Thus, investigating how tax regulation is applied worldwide, establishing the principles of using tax policy to stimulate energy efficiency, and providing theoretical and methodological recommendations for choosing the right tools are important and relevant. An important factor in developing an effective fiscal policy is choosing the subject of influence, whose economic interests create motivation to resolve this issue (Arya D. et al., 2022).

In particular, for household and industrial consumers of energy resources and energy-saving equipment, the mechanism of influence may imply a tax burden reduction when implementing measures to save energy resources, use their alternative types, and consume low-energy-intensive goods or goods produced with renewable energy sources.

Manufacturers or importers of energy-efficient equipment and technologies may apply such tools for reducing the tax burden as reducing direct taxes, cutting costs via reducing the tax component (indirect taxes); for banks and other financial institutions, reducing the tax burden on loans granted for implementing energy-efficient projects may be applied.

The most common instruments of fiscal regulation in the field of energy-saving technology introduction are tax loans, tax discounts, accelerated depreciation, differentiated rates, tax holidays, and tax exemptions (Ivanov Y. B., 2018).

For instance, by Cabinet of Ministers of Ukraine (2023a), importing equipment for energy production from renewable energy sources in Ukraine is exempt from the VAT.

The list of goods and their corresponding codes according to the Ukrainian Classifier of Foreign Trade Goods is determined by the Cabinet of Ministers of Ukraine according to the document’s provisions. In Ukraine, the main methods of stimulating renewable energy development are introducing the “green” tariff for electricity produced from alternative sources and providing customs and tax benefits (Cabinet of Ministers of Ukraine, 2003b). At the next stage, it will be proposed to reduce the coefficient for solar power plants to 2.45 in 2025 (currently it is 2.69, i.e. by about 10%). During the final four years, when the “green” tariff is applied from 2026 to 2029, the ratio will be reduced to 2.21 from the current 2.69. Thus, the tariff for solar power plants installed in 2025 will be €0.132 per kilowatt-hour, falling to €0.119 per kilowatt-hour for plants installed between 2026 and 2029. The proposed law was approved during the first reading and is expected to be finalized.

The state guarantees that companies that produce electricity from alternative sources at existing power plants will benefit from the rules outlined in this article, not just from the moment the power plants start operating but even during the construction phase. In case of any changes to legislation related to the process of stimulating the production of electricity from renewable sources, companies will have the opportunity to apply any other stimulation process.

5. Discussion

In the current political instability, the critical state of the domestic economy, and the deterioration of the social and economic environment, one should not hope to find a quick solution to the tasks of energy marketing aimed at increasing the efficiency of using the energy sector resources.

It is known that any activity has to have a motive to be carried out. It has long been clarified that developing provisions of the energy-saving outlook concept is impossible without considering the information and marketing aspects, which state that any activity is a result of constant information processing, and that it is the core of self-organization in the energy market and requires applying modern approaches to achieve the maximum benefit.

Scientists, specialists, and managers should seek and implement step-by-step solutions to the corresponding issues to achieve strategic goals in the field of energy-saving. This approach requires providing and constantly improving informational, monitoring, diagnostic, and analytical support for the process of assessing the electricity market environment in order to motivate consumers to switch to more economical and energy-saving technologies, which will enable saving financial resources and using available energy sources as effectively as possible by reducing excessive losses.

Economic and mathematical oligopoly models are proposed to determine the equilibrium condition of the electric energy market, which makes it possible to form a corrective managerial influence on creating a competitive energy industry under the influence of market environment factors and crisis conditions. On this basis, it was proven how relevant, vital, and critical it is to introduce tools of fiscal regulation, which will allow us to form a robust creative basis for implementing an effective strategy for managing the demand for energy resources.

It has also been substantiated that the most common incentives and tools for introducing energy-saving technologies are tax credits, tax discounts, accelerated depreciation, differentiated rates, and tax exemptions.

6. Conclusions.

In order to justify strategic management decisions and prospective development in the field of energy saving aiming at increasing the efficiency of using resources, it has become important to resolve the issues of implementing provisions of the energy-saving outlook concept in accordance with the tasks of energy marketing and fiscal regulation of energy saving. It has been substantiated that determining and assessing the equilibrium state of electric energy market in conditions of changing regulatory and legislative framework, monitoring data, etc., have become primarily essential.

Economic and mathematical modelling in the field of energy saving is of great theoretical and practical importance. Without its use, scientific reasoning of Ukraine's integration into modern world structures seems impossible, and it requires significant positive changes in the national electricity market. Applying dual approach to assessing electric energy market environment involves, on the one hand, determining the electric energy price, electricity production, transmission and consumption volumes, which allows the results of each market participant's activities to be as close to achieving the set goals as possible, and on the other hand, ensuring stability of social paradigm regarding the expediency of implementing the energy-saving technologies. Such an approach indicates the need for public institutions to work more actively on the further development of energy-saving technologies and should become a powerful basis for prospective growth of the national economy, enhancing national energy security, and Ukraine's integration into the global economic space having the rights equal to those of other countries.

REFERENCES

Acakpovi, A., Botwe-Ohenewaa, G., & Sackey, D.M. (2022). Impact of energy efficiency and conservation programs on the national grid in some selected households in Ghana. Energy Efficiency, 15(5). https://doi.org/10.1007/s12053-021-09998

Arya, D., & Bandyopadhyay, S. (2022). Uncertainties in the resource conservation problems: a review. Clean Technologies and Environmental Policy, 24, 2681–2699. https://doi.org/10.1007/s10098-022-02354-6

Cabinet of Ministers of Ukraine. (2003a). On Alternative Energy Sources: Law of Ukraine of 20.02.2003 №. 555-IV. https://zakon.rada.gov.ua/laws/show/555-15#Text.

Cabinet of Ministers of Ukraine. (2003b). On Amendments to Certain Laws of Ukraine on the Restoration and Green Transformation of the Energy System of Ukraine: Draft Law of Ukraine of 28.04.2023 №. 9011-d. https://itd.rada.gov.ua/billInfo/Bills/Card/41849

Dzwigol, H., Kwilinski, A., Lyulyov, O., & Pimonenko, T. (2023). The role of environmental regulations, renewable energy, and energy efficiency in finding the path to green economic growth. Energies, 16(7), 3090. https://doi.org/10.3390/en16073090

Farghali, M., Osman, A.I., & Mohamed, I.M.A. (2023). Strategies to save energy in the context of the energy crisis: a review. Environmental Chemistry Letters, 21, 2003–2039. https://doi.org/10.1007/s10311-023-01591-5

Ivanov, Y. B. (2018). Tax policy in the field of energy efficiency. Formation of a market economy in Ukraine, 40(1), 135–143.

Kohler, T. (2021). Renewable Energies marketing models Poland. https://www.roedl.com

Kumar, G., Kumar, L., & Kumar, S. (2023). Multi-objective control-based home energy management system with smart energy meter. Electric Engineering, 105, 2095–2105. https://doi.org/10.1007/s00202-023-01790-x

Kuzmynchuk, N., Kutsenko, T., Zhagyparova, A., Saparova, B., Kydykov, A., & Konokhov, S. (2023). Sustainable Electrical Energy Management in the Energy Saving System Based on Analytical and Logistic Approach. Circular Economy for Renewable Energy (pp. 4). Springer. https://doi.org/10.1007/978-3-031-30800-0_4

Ministry of Energy of Ukraine. (2022). Energy Strategy of Ukraine until 2050. https://www.mev.gov.ua/reforma/enerhetychna-stratehiya

Price, L., Galitsky, C., Sinton, J., Worrell, E., & Graus, W. (2005). Tax and fiscal policies for promotion of industrial energy efficiency: a survey of international experience.

State Agency for Energy Efficiency and Energy Saving. (2022). National Energy Efficiency Action Plan until 2030. https://saee.gov.ua/uk/content/npdee-2030

Wang, R., Cao, T., & He, X. (2023). Energy financing, energy projects retrofit and energy poverty: a scenario-analysis approach for energy project cost estimation and energy price determination. Environmental Science and Pollution Research, 30, 108865–108877. https://doi.org/10.1007/s11356-023-29822-w

Yao, Z., Lum, Y., Johnston, A., Mejia-Mendoza, L. M., Zhou, X., Wen, Y., ... & Seh, Z. W. (2023). Machine learning for a sustainable energy future. Nature Reviews Materials, 8(3), 202-215. https://doi.org/10.1038/s41578-022-00490-5