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INNOVATIVE APPROACHES TO STIMULATING ELECTROMOBILITY IN UKRAINE AS A SOLUTION TO URGENT ENERGY, ECONOMIC AND ENVIRONMENTAL CHALLENGES

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The study explores innovative approaches to promoting electromobility in Ukraine as one of the key directions of sustainable development aimed at addressing a range of energy, economic, and environmental challenges. The implementation of electric vehicles is a crucial element of state policy focused on reducing dependence on fossil fuels, improving the environmental situation, and modernizing transport infrastructure. At the same time, the development of electromobility faces certain barriers, including an insufficient number of charging stations, high initial costs for purchasing electric vehicles, and the need for additional public and private investments. The purpose of this study is to analyze the current state of electric transport in Ukraine, identify key challenges and obstacles to its development, assess economic and regulatory mechanisms for stimulating electromobility, and develop recommendations for implementing effective support strategies for this sector based on international experience. The current state of electric transport in Ukraine is analyzed, major barriers to its implementation are identified, and ways to overcome them are outlined. The study examines the role of financial and regulatory mechanisms, such as tax incentives, government subsidies, loan programs, and benefits for electric vehicle owners. Particular attention is paid to the development of charging infrastructure, which is a critical factor in ensuring the widespread adoption of electric transport. The experience of countries that have successfully implemented electromobility support programs is highlighted, and possibilities for adapting these practices to Ukrainian conditions are identified. The study's findings confirm the necessity of a comprehensive approach to stimulating electromobility, incorporating economic, regulatory, technological, and environmental aspects. The introduction of effective financial incentives, such as tax benefits and government subsidies, combined with the development of charging station infrastructure and the attraction of private capital, will contribute to accelerating the transition to environmentally friendly transport. The analysis of international experience demonstrates that the combination of government support, the creation of a favorable business climate for investors, and active public participation are key factors in the successful implementation of electromobility.

Keywords: financial incentives, environmental policy, charging infrastructure, economic efficiency, tax benefits, international experience, government support.

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Introduction

Today, electric mobility is one of the most promising and rapidly developing areas in global transportation policy. In the context of global climate change, growing demand for clean energy, and the need to reduce greenhouse gas emissions, this sector is becoming particularly relevant. Ukraine, as a country that is constantly facing energy and environmental challenges, has great opportunities to introduce electric transport as an important element of strategic development. Reducing air pollution, reducing dependence on imported energy, and increasing energy efficiency are priority tasks that can be partially addressed through the development of electric mobility. The energy crisis caused by military conflicts and economic sanctions further emphasizes the importance of reducing the consumption of fossil energy resources. The introduction of electric transport is an important step towards achieving Ukraine's energy independence.

However, to ensure widespread adoption of electric vehicles (EV), it is necessary to create effective financial and infrastructure mechanisms that will encourage consumers and producers to switch to new technologies. Instead, innovative approaches to stimulating electromobility should include not only tax and financial instruments, but also the improvement of charging station infrastructure, as well as the development of policies that encourage investment in environmentally friendly technologies [1]. To achieve sustainable development of this sector, it is important to maintain a balance between environmental requirements, economic interests, and the country's energy needs [1].

Analysis and research of publications

Modern professional works on innovative approaches to stimulating electromobility pay special attention to the development of technologies that can solve the country's pressing energy, economic, and environmental problems.

According to [1], innovative approaches to stimulating electromobility in Ukraine are crucial to addressing pressing energy, economic, and environmental challenges. One of the important development mechanisms is tax incentives and loan programs for dealerships that promote the electrification of transport [1]. Works [2; 3] note that tax incentives can be an important tool in encouraging businesses to actively promote electric vehicles. In particular, a reduction in income tax for companies selling electric vehicles allows dealerships to reduce costs, which in turn can help reduce the price of electric vehicles, which can also encourage them to increase sales and business, creating a positive economic effect. In addition, the reduction of VAT on electric cars and their components reduces the final price of vehicles, making them more affordable for a wide range of buyers [3; 7].

According to [9; 11], credit programs also play an important role in promoting electromobility. In particular, the authors of [7] note that preferential loans for dealerships specializing in the sale of electric vehicles can be a powerful business incentive, as they reduce the financial burden on enterprises. In addition, according to [3; 8], programs that allow end users to obtain electric vehicles on credit at reduced rates can significantly increase the demand for this type of transport.

The paper [5] emphasizes that lending for such purchases on favorable terms reduces barriers for consumers and allows them to choose electric vehicles over traditional gasoline or diesel cars.

However, for the successful development of the electric vehicle market, not only financial incentives are important, but also regulatory measures that ensure the sustainable development of the industry [4; 7].

In Ukraine, it is necessary to introduce programs similar to those in the EU [11] to support the infrastructure of charging stations, which will create the necessary conditions for the everyday use of electric vehicles. Creating and maintaining a network of charging stations should be a priority for the state, as it is a major factor in increasing the popularity of electric vehicles among citizens. Measures that support environmental initiatives, such as tax breaks for electric car buyers and subsidies for charging stations, are also important.

Paper [10] analyzes financial measures aimed at developing the electric mobility market, which should also include public investment in infrastructure and the creation of special economic zones where the production of electric vehicles and their components can be exempted from some taxes. Such measures will attract investment and create new jobs, which will have a positive impact on economic development.

As for statistical assessments of the effectiveness of tax incentives and loan programs, their impact can be analyzed through the growth in sales of electric cars, lower transportation prices, and an increase in the number of charging stations across the country. The technical, environmental, and economic parameters of such measures can be assessed using various models, including comparing the dynamics of electric transport development before and after the introduction of these programs.

Another important aspect is the effectiveness of regulatory measures in the market. It is also advisable to pay attention to the level of consumer demand, the

growth in sales, and the reduction in the cost of maintaining and servicing cars due to the use of electricity instead of traditional fuels.

To further stimulate the electric vehicle market in Ukraine, it is necessary to pay attention to the experience of other countries that have successfully implemented similar programs. Given global trends in energy and the environment, a set of financial and regulatory measures can be proposed to ensure the sustainable development of the electric vehicle market and help reduce the negative impact on the environment. This will help Ukraine achieve its strategic goals in the areas of energy security and environmental sustainability, while promoting economic development and integration into global environmental initiatives.

In particular, research on the development of rechargeable solid-state metal-air batteries for electric mobility [1] notes that such innovations can significantly improve the environmental situation and help reduce dependence on traditional energy sources, which is important for Ukraine in the context of the energy crisis.

Paper [1] emphasizes the importance of innovative approaches to addressing the growing demand for electricity in the context of the development of electric mobility. This approach may be important for Ukraine, where it is necessary to integrate electric vehicles into the energy system to reduce the burden on traditional energy sources, especially given the damage to infrastructure due to military operations.

The authors of [2] emphasize the introduction of innovative production systems for electric mobility. These strategies can be useful for Ukraine to establish the production of electric vehicles, creating new jobs and reducing dependence on oil imports. This would also help improve the country's foreign exchange balance.

In analyzing the risks to the development of electric mobility in Ukraine, [3] emphasizes the need for innovative regulatory measures, in particular, night charging of electric vehicles, which can be an effective tool for stabilizing the power system and reducing the need for shunting power plants, which has become especially relevant in times of war and destruction of energy infrastructure.

Paper [5] proposes an innovative approach to improving the quality of electricity through the use of renewable energy sources in conjunction with electric mobility, which can help Ukraine reduce its dependence on fossil fuels, reducing the burden on the energy system and creating new opportunities for economic growth through the development of local industries related to electric vehicles.

In addition, innovative approaches to project management in the field of electric mobility are important, as noted in [5]. The introduction of such management strategies in Ukraine can help overcome the existing difficulties associated with the energy and environmental situation and promote the development of electric mobility as an important tool for solving these problems.

Innovative approaches to the development of electric mobility in Ukraine also include the integration of the latest technologies that can significantly change approaches to urban transportation. An important aspect is the creation of smart and interoperable charging stations for electric vehicles, as described in paper C. V. Pillai [3]. This approach allows for efficient management of charging processes, reducing the load on energy networks, which is critical for Ukraine, especially in the context of limited access to stable energy sources due to military operations and infrastructure damage.

In turn, research by Naqvi and colleagues [11] points to the importance of innovation in creating integrated electronic control units for electric vehicles, which can improve the efficiency and safety of electric vehicles. This opens up new opportunities for the development of electric mobility in Ukraine, as it ensures better interaction between different elements of the energy and transportation systems, which is important for the stability of the energy system.

Innovations are also reflected in the economic aspect of electric mobility. As Kim, Heo, and Song [10] point out, such technologies can provide economic benefits, in particular by creating new jobs in the service and sales of electric vehicles, which is important for Ukraine in the face of ongoing economic instability. In addition, the expansion of the electric vehicle fleet can significantly reduce dependence on oil imports, which has a positive impact on the country's foreign exchange balance.

Special attention is also paid to tax incentives and loan programs for dealerships. As Hancharou V. and Yankevich N. [6] study shows, the effective use of such mechanisms can stimulate the faster development of electric mobility, accelerating the process of transport electrification in Ukraine. This will reduce the cost of purchasing electric vehicles for end users and ensure the sustainable development of this industry.

The further development of innovative approaches to electric mobility in Ukraine should also take into account the possibility of using night charging of electric vehicles, which, according to research by Fleisher and colleagues [5], can significantly reduce the load

on the country's power system. Nighttime charging allows the use of capacity that remains unused at night, thus reducing the need for shunting power plants, which are critical to ensuring the stability of the grid. It also reduces the cost of electricity generation, which is important from an economic point of view, especially in the face of ongoing energy crises.

Nevertheless, there is also a need to adapt the electricity infrastructure to the changing conditions of energy needs. According to a study by Falfar and Bianchi [4], a possible increase in electricity demand due to the massive shift to electric cars may require significant changes in the distribution of energy resources, which will require improvements to existing networks and the development of new energy storage technologies.

Another important component is to improve the efficiency of the charging infrastructure by developing more powerful and consumer-friendly charging stations that can operate in fast charging mode and provide connections to smart grids that help control and optimize energy use. Innovative solutions in this area are actively developing, as shown by Yu and McKinley [16], who consider the possibility of using automated scheduling systems to effectively manage the distribution of charging stations and optimize the load on power grids.

Thus, as part of innovative approaches to the development of electric mobility in Ukraine, it is important to focus not only on improving technical aspects, such as the development of charging infrastructure and the use of night charging, but also on economic and social benefits. This will determine how quickly the country will be able to adapt to the requirements of sustainable development and energy security. Successful implementation of such innovative solutions will help Ukraine achieve significant results in the areas of environment, economy and energy stability in the face of current challenges.

The purpose of the article

The purpose of the article is to study innovative approaches to stimulating electromobility in Ukraine, which can be a solution to numerous problems of the energy, economic and environmental components of modern state policy.

Methods and materials

The article uses several main research methods. First of all, a literature analysis was conducted, which included a review of scientific publications related to electric vehicles, their implementation and impact on energy security, economic development and environmental aspects. The study of international experience and practices of countries that are actively developing electric mobility allowed us to identify key success factors and apply them in the context of Ukraine.

One of the important aspects of the study was the systems approach, which allowed us to assess the relationship between different factors, such as energy resources, economic strategies, and environmental requirements. This helped to understand how these factors can interact and contribute to the development of electric transport in Ukraine. To assess the effectiveness of different approaches to promoting electromobility, a comparative analysis method was used to compare the tools used in other countries, such as the European Union, the United States, and China, with those used in Ukraine. This made it possible to identify the most appropriate financial and policy mechanisms for adaptation in the Ukrainian context. In addition, the study used a method of modeling economic and environmental effects. This method allowed us to predict potential benefits from the development of electromobility, such as reduced greenhouse gas emissions, savings on imported energy, and improved energy security.

The materials for the study included scientific articles and studies on the technological and economic aspects of electric vehicles.

To analyze the situation in Ukraine, we also used statistical data provided by the State Statistics Service of Ukraine and international organizations that monitor the development of electric transport. This included information on the number of electric vehicles sold, the development of charging station infrastructure, and CO_2 emissions in the transportation sector. The study used software tools to model economic and environmental effects, including SAM (System Advisor Model) to assess economic efficiency and impact on energy security, and LEAP (Long-range Energy Alternatives Planning system) to model energy and environmental scenarios for the introduction of electric mobility in Ukraine. These tools allowed for an in-depth analysis and accurate assessment of the potential benefits and risks associated with the development of electric transport in the country, including CO_2 emissions reduction and savings on imported energy.

Presentation of the main material

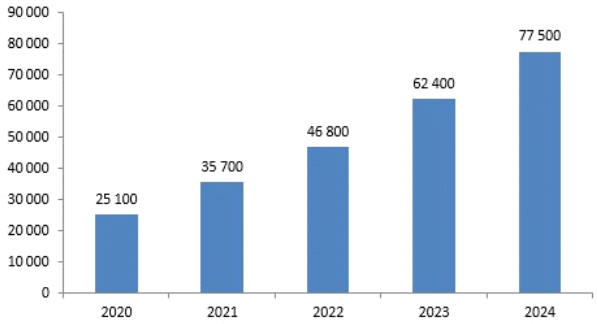
In 2025, the electric vehicle market in Ukraine has been showing steady growth in recent years. Despite the challenges posed by the war, the number of electric vehicles on Ukrainian roads continues to increase, which demonstrates the growing interest of Ukrainians in environmentally friendly transportation.

According to [14], sales of electric vehicles are increasing both in the new car market and in the

used car market, with used electric vehicles being particularly popular, making them more accessible to a wide range of consumers. The structure of the electric vehicle market is changing: while used electric vehicles used to dominate, the share of new cars is now growing, due to the introduction of new models of electric vehicles on the market, as well as the development of charging station infrastructure.

One of the key trends affecting the development of electric mobility in Ukraine is the development of the domestic charging station infrastructure. In particular, the number of fast charging stations is increasing in Ukraine, which makes electric vehicles more convenient for long-distance use, and a network of home charging stations is also developing, allowing electric vehicle owners to charge their cars at home. Legislation plays an important role in the development of the electric vehicle market, customs clearance benefits and other incentives contribute to the growth of demand for electric vehicles, but full customs clearance for electric vehicles will return in 2026, which will increase prices by 20-40%, and some activity in the segment is expected, which will become more noticeable as we approach the calendar end of the current year.

Ukrainians are increasingly aware of the benefits of electric vehicles, such as environmental friendliness, efficiency and modern technology, and there is growing interest in electric vehicles among young people and urban residents. These trends indicate that the electric vehicle market in Ukraine has great potential for further development. Figure shows data on the registration of new electric vehicles in Ukraine in 2020–2024 according to the Ministry of Internal Affairs of Ukraine [17].



The number of registered cars in Ukraine in 2020–2024

Source: according to the Ministry of Internal Affairs of Ukraine [17]

Table 1 shows the results of the analysis of financial and regulatory measures that influenced the spread of electric mobility in Ukraine in 2020–2024.

Table 1

Results of the analysis of financial and regulatory measures that influenced the spread of electric mobility in Ukraine in 2020–2024

Name of the event	Years				
	2020	2021	2022	2023	2024
Subsidies for electric cars (demand growth, %)	5	10	15	20	25
Reduction of customs duties (availability of electric transport, %)	2	5	10	12	15
Investing in the charging network (new jobs, thousand USD)	1	2	4	6	10
Priority access (share of electric vehicles in cities, %)	1	3	5	7	10
Reduction of CO_2 emissions (million tons)	0.5	1	1.5	2	3

Source: compiled by the author according to the data [17; 18]

Table 1 clearly shows that the implementation of a comprehensive policy to stimulate electromobility in Ukraine will not only address the issue of grid stability, but will also contribute to economic development and environmental improvement. The use of night charging as a key tool for load balancing can be a significant step in reforming the country's energy strategy.

Table 2 shows the results of the analysis of the impact of charging station infrastructure development on the availability of electric vehicles in Ukraine (2020–2024).

Table 2 shows that the development of charging station infrastructure significantly improves the availability of electric vehicles for consumers. An increase in the number of charging stations leads to a decrease in the distance to the nearest station, which increases the convenience of using electric cars and increases their popularity among the population.

Table 2

Results of the analysis of the impact of charging station infrastructure development on the availability of electric vehicles in Ukraine (2020–2024)

Indicator	2020	2021	2022	2023	2024
Number of charging stations	200	500	800	1 200	1 500
Time to the nearest charging station (km)	50	40	35	30	25
Number of sold electric vehicles	2 000	4 000	6 000	8 000	10 000
Number of consumers using charging stations	500	1 500	3 000	5 000	7 000

Source: compiled by the author according to the data [17; 18]

Table 3 shows the results of the analysis of environmental benefits from the growth in the number of electric vehicles in Ukraine in 2020–2024.

Table 3 clearly shows that an increase in the number of electric cars definitely reduces CO_2 emissions and environmental pollution. It also leads to savings in fuel use and a reduction in overall emissions.

Table 3

Results of the analysis of environmental benefits from the growth of electric vehicles in Ukraine in 2020–2024

Indicator	2020	2021	2022	2023	2024
Reduction of CO_2 emissions (tons per year)	100 000	200 000	300 000	400 000	500 000
Gasoline consumption (liters per year)	6 000 000	12 000 000	18 000 000	24 000 000	30 000 000
Fuel savings (UAH million)	0	50 000	100 000	150 000	200 000
Emissions of harmful gases (tons per year)	50 000	100 000	150 000	200 000	250 000

Source: compiled by the author according to the data [17; 18]

Table 4 shows the results of the analysis of the impact of the main financial mechanisms on the growth of the number of electric vehicles in Ukraine.

Table 4 shows that financial and regulatory measures have a significant impact on the development of the electric vehicle market in Ukraine. Tax incentives and soft loans can significantly increase demand, while investments in charging infrastructure make electric vehicles more accessible to a wide range of consumers.

Table 4

Results of the analysis of the impact of the main financial mechanisms on the growth of electric vehicles in Ukraine

Financial mechanism	Description	Problems of realization	Key elements of implementation	Forecasting effect
State funding	Direct investments of the state in the development of electric transport	High pressure on the budget	Incorporating costs into government programs	+20% increase in the share of electric transport
Tax benefits	No VAT and reduced duty on EVs	Possible loss of budget revenues	Legislative changes	+30% growth in EV sales
Private sector investments	Attracting private capital to the development of EV infrastructure	High risks for investors	Guarantees of refunds through public-private partnerships	+$500 million to build a network of charging stations

Source: compiled by the author according to the data [17; 18]

Table 5 summarizes the latest updated financial mechanisms for influencing the growth of electric vehicles in Ukraine.

In general, innovative approaches to stimulating electromobility in Ukraine can become an important tool for solving many energy, economic, and environmental problems. However, for these initiatives to be successful, comprehensive financial and regulatory measures need to be implemented to support the development of infrastructure, production, and consumption of electric vehicles, which in turn will contribute to the country's sustainable development.

Table 5

Newly updated financial mechanisms for influencing the growth of electric vehicles in Ukraine

Financial mechanism	Description	Problems of realization	Key elements of implementation	Forecasting effect
Public-private partnership (PPP)	Joint financing of electric transport projects by the state and private business	High risks for investors, lengthy approval process	The state guarantees partial payback of the project and tax benefits for investors	Creating new charging stations, attracting up to $500 million in investments
"Green loans"	Low-interest loans for the purchase of electric vehicles	High threshold of confidence in new financial instruments	0–2% interest rate, compensation up to 15% of the cost of EVs, loan term 3-7 years	+40% growth of the EV market, saving $500 million on fuel imports
Subsidy programs	Direct payments or discounts for the purchase of electric vehicles	High pressure on the budget	$5000–7000 subsidies for EVs, support for domestic producers	+30% increase in the share of electric transport, reduction of pollution
"Green bonds"	Financing EV infrastructure through the issuance of securities	High cost of launching the mechanism, complexity of regulation	Issuance of government and corporate bonds, interest rate 3–5% per annum	Attracting up to $1 billion in investments for the development of charging infrastructure
Insurance benefits for EVs	Reducing the cost of electric vehicle insurance	Lack of interest from insurers	20–30% discount on insurance policies for EVs, government compensation	Stimulating the transition to EVs among citizens, – 15% of operating costs
Financing through carbon credits	Redistribution of revenues from the sale of CO ? quotas for the development of electric transport	Volatility of the allowance market, possible corruption risks	Include EV infrastructure in the national emissions trading plan	$200–300 million annually for EV development, reduction of CO_2 emissions
Leasing programs for EVs	Long-term rental of electric vehicles with state compensation	Low confidence in leasing in Ukraine	50% compensation from the state, preferential terms for EVs	Massive transition of small and medium-sized businesses to EVs
Electric transport development fund	Special fund to finance electric vehicle initiatives	Requires large start-up investments	Financing from the state budget and the private sector, grant programs	Support for R&D in the field of EVs, growth of local production
Preferential taxation	Tax cuts for EV owners	Possible budgetary losses	No VAT on EVs, reduced income tax for companies implementing EVs	Stimulating demand, up to +50% EV among new cars
Financing through international environmental funds	Obtaining grants and loans for the development of electric transport	Competition for international funds, complex bureaucratic procedures	Participation in programs of the EU, the World Bank, and the Green Climate Fund	Additional $200–500 million to build EV infrastructure

Source: compiled by the author according to the data [17; 18]

From an economic point of view, the expansion of the electric vehicle fleet creates conditions for the development of new industries related to the production, sale, maintenance, and charging infrastructure. This contributes to the creation of new jobs, which stimulates the economy and increases employment. In addition, reducing dependence on imports of petroleum products will reduce foreign exchange costs and improve the country's trade balance. For example, the projected reduction in imports of

petroleum products by 2.5 million tons by 2030 will save more than $2.5 billion on fuel purchases.

It is also important to note that regulatory measures in the field of electric mobility are a key element in the sustainable development of Ukraine's transport infrastructure and energy system. Simplifying the procedures for importing electric vehicles will expand their availability and stimulate the growth of the share of environmentally friendly transport. According to statistics, over the past five years, the number of electric vehicles in Ukraine has increased more than tenfold, and as of 2023, their number exceeded 50 thousand units. However, the growth rate could be even higher if the tax burden was reduced and customs procedures were simplified.

The experience of the European Union shows that measures such as the abolition of customs duties and VAT lead to a 30–40% increase in electric vehicle imports within the first two years after implementation. Standardization of charging infrastructure is an important aspect of the development of electric mobility, as the growth of this sector is limited without unified technical requirements. An analysis of international experience shows that the introduction of common standards for charging stations (CCS, Type 2) and mandatory requirements for charger power can increase the level of their use by 60–80%.

In 2023, there were about 1,500 charging stations in Ukraine, which is significantly lower than in European countries with similar car fleets. In the future, it is necessary to expand the network of charging stations to at least 10,000 units in the next 5 years, which will avoid overloads and help increase the number of electric vehicles.

One of the challenges for integrating electric transport into the energy system is the growing load on the power grid, which requires the development of a system for monitoring and forecasting consumption. In countries that are actively developing electric mobility, such as Germany or the Netherlands, the use of smart meters and forecasting algorithms can reduce the load on the grid by 15–20% during peak hours. This is achieved through dynamic management of charging processes and the introduction of the Vehicle-to-Grid concept, which allows electric vehicles not only to consume but also to return energy to the grid. The introduction of such technologies in Ukraine could help increase energy stability, as a significant portion of electricity is generated from renewable sources such as solar and wind power plants.

Therefore, an integrated approach to regulating electric mobility, including import facilitation, unification of charging station standards, and development of intelligent energy load monitoring systems, will contribute to the country's sustainable development, increase its energy independence, and significantly reduce the negative impact of transport on the environment.

Table 6 summarizes the results of the review of key regulatory measures for the development of electric mobility, their expected effect, and international experience.

Table 6 clearly shows that the successful development of electromobility in Ukraine requires a comprehensive strategy that includes economic incentives, infrastructure development, the introduction of innovative technologies, and an active environmental policy.

Regulatory measures for the development of electric mobility include not only import facilitation, standardization of charging infrastructure, and monitoring of energy loads, but also a number of additional tools that can significantly affect the speed and efficiency of the transition to a sustainable transport system. These include financial incentives for the purchase of electric vehicles, priority access for electric vehicles to urban traffic flows, and the integration of electric mobility into the smart city system. The experience of EU countries shows that subsidies for the purchase of electric vehicles in the amount of EUR 5,000–7,000, as implemented in Norway and Germany, lead to an increase in sales of electric vehicles by 50–70% during the first three years of the program. In Ukraine, where the average cost of a new electric vehicle still exceeds the means of most citizens, the introduction of similar measures would expand the market and help to renew the vehicle fleet.

Another important aspect is to stimulate the development of charging infrastructure through government programs and investments. The introduction of special electricity tariffs for charging stations, as is done in France and the UK, ensures the economic attractiveness of investing in this area. Studies show that the creation of an accessible network of fast charging stations helps reduce the average charging time for electric vehicles by 60%, which in turn reduces the load on the city power grid and increases the comfort of using electric vehicles. For Ukraine, the issue of an even distribution of charging stations across regions remains relevant, as 75% of the infrastructure is currently concentrated in large cities.

An important area is the creation of zones with priority access for electric vehicles, which helps to reduce pollution in cities and stimulate the transition to environmentally friendly transport. This practice has been successful in many EU countries, including

London, where electric vehicles are exempt from city center fees, which has helped increase their share to 15% of all new car registrations. For Ukraine, the introduction of such mechanisms could be effective in cities with high levels of air pollution, such as Kyiv, Dnipro, and Odesa.

Table 6

Results of the review of key regulatory measures for the development of electric mobility, their expected effect and international experience

Regulatory measure	Expected effect	International experience	Expected results for Ukraine	Innovation for Ukraine
Simplifying the import of electric vehicles	Reducing the cost of electric vehicles, increasing their market share	The abolition of customs duties and VAT in Norway has led to 70% of electric cars among new cars	Increase the share of electric vehicles in the sales structure to 20% within 5 years	Introduction of preferences for electric vehicles and new tools to support national production
Standardization of charging stations	Unifying technologies, expanding the availability of charging infrastructure	Unified standards (CCS, Type 2) in the EU have increased the use of charging stations by 60%	Increase the efficiency of charging stations by 50%, accelerate the construction of new facilities	Developing national standards for charging infrastructure and supporting innovations in this area
Monitoring and forecasting energy loads	Optimizing electricity consumption, reducing the load on the grid	In the Netherlands, dynamic charging management reduced peak load by 20%	Reducing the peak load on the grid by 15–20%, improving the stability of the power system	Implementation of AI to predict loads and optimize energy consumption in real time
Financial incentives for the purchase of electric vehicles	Growing demand, renewal of the transport fleet	In Germany, subsidies of up to 7000 euros increased sales of electric vehicles by 50% in three years	Accelerate fleet renewal, reach 100 thousand electric vehicles by 2030	Developing innovative financial mechanisms to support electric vehicles, including leasing and soft loans
Priority access to electric transport in cities	Reducing emissions in cities, encouraging the transition to electric transport	In London, exemption from entry fees increased the share of electric vehicles to 15%	Reducing air pollution in large cities by 10–15%	Creating low-emission zones with intelligent traffic control systems
Development of charging infrastructure	Improving the comfort of using electric vehicles, even distribution of stations across regions	The introduction of tariff incentives in France contributed to the growth of stations by 40%	Increase the number of charging stations to 10 thousand within 5 years	Use of smart charging stations with energy saving support and integration with renewable energy sources
Integration of electric mobility into the "smart city" system	Optimization of traffic flows, energy efficiency	Use of AI in Sweden Reduced Network Congestion by 30%	Efficient management of urban transport, reduction of congestion by 10–20%	Implementation of intelligent transportation systems using real-time data to manage traffic and charging

Source: compiled by the author according to the data [18; 14; 17]

A separate area is the integration of electric mobility into the concept of smart cities, which involves the use of artificial intelligence to optimize energy consumption and traffic management. The use of forecasting systems can reduce grid congestion by 20–30%, and the combination of electric mobility with renewable energy sources helps to increase energy independence. In countries with developed electric mobility, such as the Netherlands and Sweden, such approaches have increased the use of green energy in the transport sector by 40–50%. In Ukraine, the potential for applying such technologies is significant, especially given the development of renewable energy, which already exceeds 15% of the total energy balance.

Therefore, a combination of regulatory measures aimed at stimulating the purchase of electric vehicles, expanding charging infrastructure, prioritizing access to urban traffic flows for electric vehicles, and integrating smart solutions can significantly accelerate the development of electric mobility in Ukraine. This will not only improve environmental safety, but will also contribute to economic growth, attract investment, and reduce dependence on imported energy resources.

Conclusions

Innovative mechanisms for introducing electric mobility in Ukraine have a strong potential to transform the energy and economic sectors. The use of comprehensive innovative approaches, including economic incentives, tax breaks, and infrastructure development, will not only reduce fuel costs and improve the environmental situation, but also ensure sustainable economic growth.

To accelerate the electrification of transport, tax incentives and loan programs for dealerships should be introduced to reduce the cost of electric vehicles and make them more affordable for the population. Government incentive mechanisms could also include subsidies for the development of charging infrastructure, which would help attract private investment and accelerate the deployment of charging stations. Regulatory measures should include simplifying the procedures for importing electric vehicles, introducing standards for charging stations, and creating a system for monitoring and forecasting energy loads, which will allow integrating electric mobility into the country's overall energy stability strategy. All of these measures together can contribute to Ukraine's sustainable development, increase its energy independence, and reduce the negative environmental impact of transportation.

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ІННОВАЦІЙНІ ПІДХОДИ ДО СТИМУЛЮВАННЯ ЕЛЕКТРОМОБІЛЬНОСТІ В УКРАЇНІ ЯК РІШЕННЯ НАГАЛЬНИХ ЕНЕРГЕТИЧНИХ, ЕКОНОМІЧНИХ ТА ЕКОЛОГІЧНИХ ВИКЛИКІВ

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Досліджено інноваційні підходи до стимулювання електромобільності в Україні як одного з ключових напрямів сталого розвитку, що спрямований на вирішення низки енергетичних, економічних та екологічних викликів. Впровадження електромобілів є важливим елементом державної політики, спрямованої на зменшення залежності від викопних видів палива, покращення екологічної ситуації та модернізацію транспортної інфраструктури. Водночас, розвиток електромобільності стикається з певними бар'єрами, серед яких недостатня кількість зарядних станцій, високі початкові витрати на придбання електромобілів та потреба у додаткових державних і приватних інвестиціях. Метою дослідження є аналіз сучасного стану електромобільного транспорту в Україні, визначення ключових викликів та перешкод його розвитку, оцінювання економічних та регуляторних механізмів стимулювання електромобільності, а також розробка рекомендацій щодо запровадження ефективних стратегій підтримки цього сектора на основі міжнародного досвіду. Проаналізовано сучасний стан електротранспорту в Україні, визначено основні бар'єри його впровадження та окреслено шляхи їх подолання. Досліджено значення фінансових і регуляторних механізмів, таких як податкові пільги, державні субсидії, кредитні програми та преференції для власників електромобілів. Окрему увагу приділено аналізу розвитку інфраструктури зарядних станцій, що є критично важливим фактором для забезпечення широкого поширення електротранспорту. Висвітлено досвід країн, які успішно реалізували програми підтримки електромобільності, та визначено можливості його адаптації до українських умов. Результати дослідження підтверджують необхідність комплексного підходу до стимулювання електромобільності, що включає економічні, регуляторні, технологічні та екологічні аспекти. Впровадження дієвих фінансових стимулів, таких як податкові пільги та державні субсидії, у поєднанні з розвитком інфраструктури зарядних станцій та залученням приватного капіталу, сприятиме прискоренню переходу до екологічно чистого транспорту. Аналіз міжнародного досвіду показує, що поєднання державної підтримки, створення сприятливого бізнес-клімату для інвесторів та активна участь громадськості є визначальними факторами успішного впровадження електромобільності.

Ключові слова: фінансові стимули, екологічна політика, інфраструктура зарядних станцій, економічна ефективність, податкові пільги, міжнародний досвід, державна підтримка.

INNOVATIVE APPROACHES TO STIMULATING ELECTROMOBILITY IN UKRAINE AS A SOLUTION TO URGENT ENERGY, ECONOMIC AND ENVIRONMENTAL CHALLENGES

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The study explores innovative approaches to promoting electromobility in Ukraine as one of the key directions of sustainable development aimed at addressing a range of energy, economic, and environmental challenges. The implementation of electric vehicles is a crucial element of state policy focused on reducing dependence on fossil fuels, improving the environmental situation, and modernizing transport infrastructure. At the same time, the development of electromobility faces certain barriers, including an insufficient number of charging stations, high initial costs for purchasing electric vehicles, and the need for additional public and private investments. The purpose of this study is to analyze the current state of electric transport in Ukraine, identify key challenges and obstacles to its development, assess economic and regulatory mechanisms for stimulating electromobility, and develop recommendations for implementing effective support strategies for this sector based on international experience. The current state of electric transport in Ukraine is analyzed, major barriers to its implementation are identified, and ways to overcome them are outlined. The study examines the role of financial and regulatory mechanisms, such as tax incentives, government subsidies, loan programs, and benefits for electric vehicle owners. Particular attention is paid to the development of charging infrastructure, which is a critical factor in ensuring the widespread adoption of electric transport. The experience of countries that have successfully implemented electromobility support programs is highlighted, and possibilities for adapting these practices to Ukrainian conditions

are identified. The study's findings confirm the necessity of a comprehensive approach to stimulating electromobility, incorporating economic, regulatory, technological, and environmental aspects. The introduction of effective financial incentives, such as tax benefits and government subsidies, combined with the development of charging station infrastructure and the attraction of private capital, will contribute to accelerating the transition to environmentally friendly transport. The analysis of international experience demonstrates that the combination of government support, the creation of a favorable business climate for investors, and active public participation are key factors in the successful implementation of electromobility.

Keywords: financial incentives, environmental policy, charging infrastructure, economic efficiency, tax benefits, international experience, government support.

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