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ECONOMIC MECHANISM OF ENERGY SAVING AT PUBLIC UTILITY COMPANIES

The **subject** matter of the study is the combination of theoretical, methodological and practical approaches to the development of the economic mechanism of energy saving. The **aim** of the article is to substantiate the conceptual approach to the development of the economic mechanism for energy saving at public utility companies as the theoretical and methodological basis of energy saving policy at enterprises in this sphere. While achieving the objectives of the study the following tasks were solved within the **research**: the current state of energy saving in Ukraine and at public utilities was analyzed; theoretical approaches for revealing the essence of the concept of energy conservation was considered; the pattern of the economic mechanism of energy saving at public utility companies was developed and its costituents were grounded. The **following methods** were used in the research: the abstract and logical method was used for generalizing the theory and formulating conclusions; the method of system and structural analysis was used for studying and generalizing approaches to the definition of energy saving; methods of economic and mathematical statistics were used for processing and analyzing initial data, identifying trends and patterns of the efficiency of studied factors; graphical method was used for visualizing the results of the research. According to the **results** of the study the following conclusions can be formulated: the conceptual approach for developing the economic mechanism of energy saving should be worked out as it is a burning issue for public utility companies. Its solution will contribute to achieving the goals of the Strategy of Sustainable Development "Ukraine – 2020" and the Energy Strategy up to 2030. The concept of energy saving was defined in the course of the study, the conceptual pattern of the economic mechanism of energy saving at public utility companies was also suggested, the constituents of the economic mechanism of energy saving was revealed, which creates a theoretical and methodological basis for developing energy saving policy at public utility companies.

Keywords: energy saving, economic mechanism, public utility companies, the economic mechanism of energy saving.

Introduction

One of the national priorities of economic development of Ukraine is the reduction of energy intensity of production, which is stated in the Strategy of Sustainable Development "Ukraine – 2020" [1] (hereinafter – the Strategy) and the Energy Strategy up to 2030 [2]. The strategic guidelines outlined in these and other documents of macroeconomic planning dictates the necesssity of implementing the effective policy of energy saving in various areas of the national economy. This issue is very important for power consuming enterprises, including public utility companies. The lack the system approach for developing and implementing the policy of energy saving in this sphere mainstreams the task of working out the conceptual approach to the development of energy saving economic mechanism (ESEM) at public utility companies.

Analysis of literary sources and problem statement

Many well-known scientists dealing with the problems of energy saving focus on strategic directions of development of various sectors of economy; amon them are: V. Lear [3] O. Oliynyk [4], R. Yuhimetsky [5], L. Lukyanenko [6], B. Gaprindashvili [7], V. Poliaunov [8], L. Fedulova [8], L. Taranyuk [10]. Some aspects of energy saving in the sphere of housing and communal services are studied by such Ukrainian scientists as: P. Bubenko [11], O. Dimchenko [12], O. Trach [13] and others. The scientists mentioned above study the state of energy saving in Ukraine, the causes of high energy intensity of gross domestic product (GDP) and ways to reduce it, suggest the ways as for the increase of energy efficiency and mechanisms for financing energy-saving procedures within target projects. However, despite numerous researches, a holistic approach to the elaboration of theoretical and methodological foundations for the development and implementation of energy saving policies at public utility companies has not been suggested yet.

The **aim** of the article is to substantiate the conceptual approach to the development of the economic mechanism for energy saving at public utility companies as the theoretical and methodological basis of energy saving policy at enterprises in this sphere.

Materials and methods of research

In order to achieve the goal, the following methods were used: abstract and logical (for theoretical generalization and formulation of conclusions); system and structural analysis (for studying and generalizing approaches to the definition of energy saving); methods of economic and mathematical statistics (for processing and analyzing initial data, for identifying trends and patterns of efficiency of the studied indicators); graphical method (for visualizing the results of the research). The information basis of this study includes periodicals, statistics and legislative acts of the government of Ukraine, the State Agency for Energy Efficiency and Energy Saving of Ukraine, the Internet resources, theoretical aspects.

Research results

The energy intensity of social production is one of the criteria for assessing the development of the country and its economy. The data analysis given in [14; 15] indicates that Ukraine lies significantly behind the developed countries of the world according to the mentioned criterion. Thus, Ukraine’s energy intensity in 2015 amounted to 0.53 kg / UAH per capita, which is 2-4 times higher than in the leading European countries. This

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situation is primarily related to the inefficient consumption of fuel and energy resources (FER), outdated technologies and extremely worn-out networks, especially centralized heating, water supply and housing stock systems.

According to the State Statistical Service [18], in 2015 the largest FER consumer was the domestic sector – 33% in the overall structure of FER consumption. The Sectorial Programme for energy efficiency and saving in Housing and Utilities Sector (HUS) for 2010 - 2014 [19] states that public utilities use almost 70 million tons of fuel, while the housing stock of the state and social sphere consume 85% of energy resources of their total consumption. The threatening situation with energy saving in public utility companies is caused first of all by the fact that there are no renewable and alternative energy sources. Besides, FER consumption is little diversified, the processes of organization and decision-making in the field of developing and implementing measures aimed at reducing energy consumption are ineffective; there exists technological underdevelopment and worn-out networks and permanent assets; existing economic methods, leverage and tools of the national energy saving policy are ineffective, etc. The analysis of the retrospective data presented in [20] indicates the fact that the state of energy saving in public utilities of HUS is unsatisfactory, which is the result of the inadequate current national policy in this sphere and proves the necessity of updating its conceptual framework.

Since the logic of scientific research requires the clear and unambiguous definition of key terms, the existing theoretical approaches to the definition of the concept of "energy saving" will be considered.

The analysis of existing definitions of this concept [21; 22; 23; 24; 25; 26; 27; 28; 29 and others.] gives grounds for the conclusion that today there is no agreement of opinions as for its definition. Some scientists consider "energy saving" as a process [23; 25; 27] or activity [21; 28] or even measures [23; 28; 29] aimed at the reduction of energy consumption [22; 25; 26; 27; 28; 29], converting it into reasonable [21; 23; 28], economical [21; 28] and effective [24] consumption. The Great Explanatory Dictionary [30] defines a "process" as a sequential change in states or phenomena that occurs according to a regular pattern; "activity" means functioning or operation of any organization, institution; "action" means work, activity, implementation of anything; "measures" means a set of actions or ways for achieving, carrying out anything; "reduction" means the decrease of volume, size or quantity of something; something "reasonable" is based on the demands of reason, logic; something "smart" is aimed at better, reasonable use of anything; "economical" means careful, economical spending; "efficient" leads to the desired results, consequences, gives the greatest effect.

Based on the definition of the above terms, energy saving cannot be defined as an activity or action, but as the process of development and implementation of energy saving procedures that are in the continuous state of adaptation to environmental challenges and changes that occur in the sphere of energy saving.

In order to determine the main components of the concept "energy saving" it is necessary to agree with the majority of scientific approaches, which emphasize the fact that energy saving is directed precisely at reasonable and economical consumption of energy resources. Incorporating the term "reduction" into the definition of ESEM seems to be inappropriate, since reasonable, careful, economical consumption of such resources ensures their reduction. The same approach can be applied to the term "efficient", because efficiency is the result that cannot be achieved without reasonable and economical consumption of energy resources. Thus, the concept "energy saving" can be specified as the process of development and implementation of energy saving procedures aimed at reasonable and economical consumption of energy resources.

Regarding the mechanism, Y. Chistov notes that "any simple mechanism, system, lever, or block is created to either change the direction of the force, or in order to achieve the effect that exceeds this force, if less force is applied" [31]. The energy saving mechanism can be aimed at ensuring the well-established process of development and implementation of energy saving procedures directed at FER saving, reducing all resources necessary for their implementation, and preserving the environment with the help of modern forms, methods and tools. Basing on this statement and taking into account the results of the research [27; 31; 32; 33; 34], the following components can be distinguished: legal, organizational and managerial, technical and technological, social, informational, ecological and economic components (fig. 1).

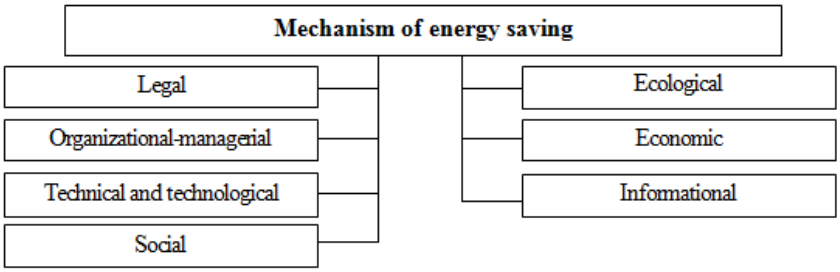

Fig. 1. Components of the mechanism of energy saving

Source: author's development

Each component interacts directly with another one and affects the effectiveness of the whole mechanism of energy saving. Within the study, the economic component will be emphasized; this component with all its financial resources and economic tools will contribute to the achievement of the set goals and to the solution of the tasks identified in the Strategy and other programme documents of macroeconomic planning, in particular:

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legislative establishment of the structure of tariffs for natural gas, electricity, thermal energy, their transportation; ensuring cooperation with the World Bank as for the implementation of the Partnership Strategy with Ukraine for 2012–2016; implementation of cooperation programmes with the International Monetary Fund, the World Bank, the European Bank of Reconstruction and Development, the European Investment Bank and other international financial organizations; legislative revision of stimulating the production of electricity from non-traditional and renewable energy sources; reforming the system of "green" tariffs and their balancing.

The ideas mentioned above enable considering ESEM as a set of economic methods, forms, tools and levers of influence on economic relations and processes, which, due to management functions, ensure the development and implementation of measures for reasonable and economical consumption of energy resources.

In the context of the development of theory and methodology as well as practical recommendations for improving the efficiency of managing processes related to energy saving at public utility companies, the ESEM conceptual diagram at the enterprises of this sphere is suggested and shown in fig. 2.

The components of the suggested ESEM at public utility companies should be detailed.

The main objective of ESEM development is to ensure reasonable and economical consumption of energy resources within the implementation of relevant energy saving programs at public utility enterprises.

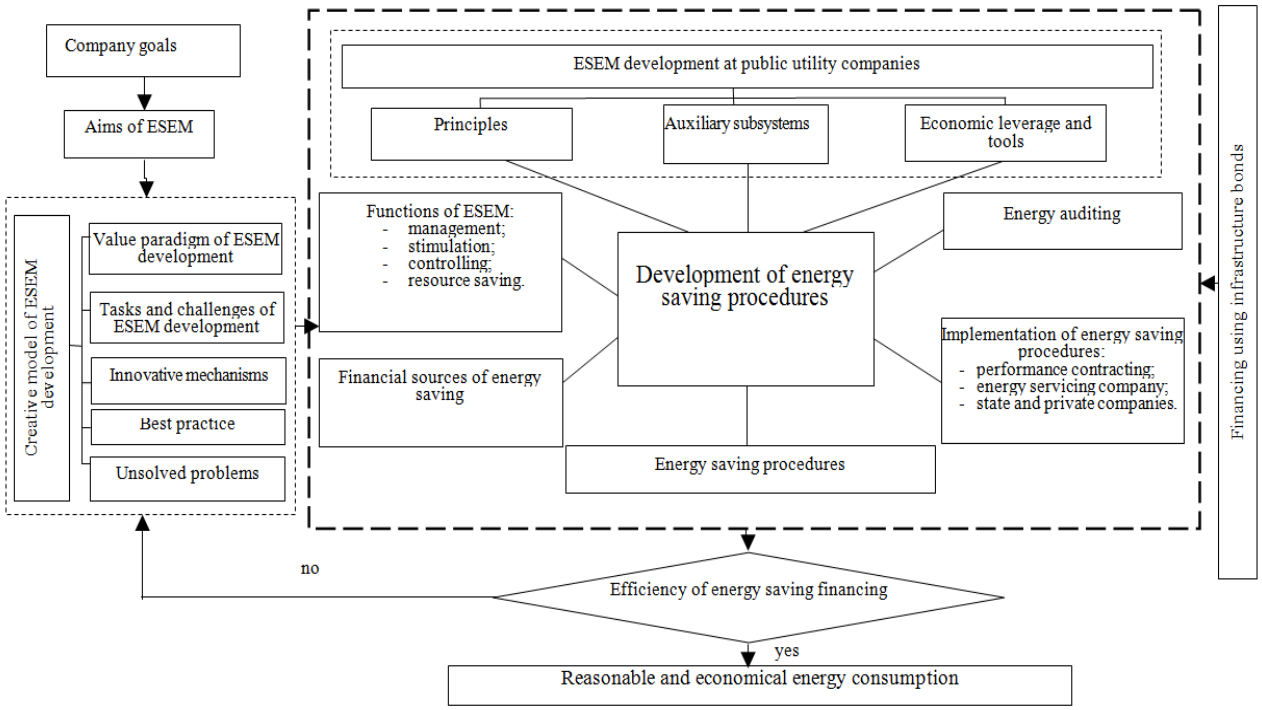

Fig. 2. Economic mechanism of energy saving at public utility companies *Source: author's development*

A separate block element of the suggested ESEM is the creative model of ESEM development, which is a structure of domain knowledge that includes a navigation structure which visualize algorithms that concern the reaction to the environmental challenges, the solution of internal system problems, preparing and sending outside the system of information (messages) that considers the current state, goals and strategies of its development and which is determined by such components as: value paradigm of ESEM development, tasks and challenges of ESEM development, innovative mechanisms, best practices, and unsolved problems.

The basis of the suggested ESEM at public utility companies is the concept of ESEM development at the enterprises of this sphere, which includes principles, auxiliary subsystems, economic leverage and tools. The principles of ESEM development at public utility companies include the following ones: systemacity, responsibility, motivation, priority, informatization, cooperation, purposefulness, efficiency.

The auxiliary subsystems include the following ones: management, functional and maintenance. The ESEM functional subsystem at public utility companies is mainly aimed at:

- saving energy resources, which provides reasonable and economical consumption of FER by developing appropriate measures with the help of modern technologies and new equipment;

- stimulating effective interaction in order to achieve the goal of ESEM development, which is directed at creating proper conditions for all the employees who work at public utility companies and participate in the process of developing and implementing energy saving procedures;

- analysis, accounting and monitoring, which enable receiving information about actual consumption of FER and comparing the obtained figures with the planned ones.

The management subsystem includes:

- organization, which establishes the system of interaction of all structural units of the enterprise in order

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to obtain the maximum result of their interaction;

- planning, which enables ensuring the efficient use of all resource potential of the enterprise, in particular: material, financial, personnel and information;

- motivating the company's employees, which is aimed at achieving the set goals and objectives and results in developung the system of rewards for successful performance of duties which contributed to improving the performance of the enterprise;

- monitoring and controlling make it possible to observe the implementation of energy saving procedures and obtain results, which will help to identify timely the causes of probable deviations from the planned figures with further specification of ways for improving the efficiency of enersy saving at the enterprise.

With the help of utilities supply subsystem, the conditions for enterprise normal operation are created; the components of such subsytem are:

regulative and legal support, which is the basis for ESEM development and the groud for determining the general rules (principles) of its implementation;

- resource support that is the complex of resources (material, fuel and energy, etc.) which are used in the production process of the enterprise;

- information support or a set of methods and means for obtaining information the enterprise needs in order to make grounded decisions;

- staffing support, that is the required quantity and quality of employees of a public utility company which, due to its professional training, reaches planned results;

- financial support.

Economic tools and leverage play an important role in ESEM development. They include state and regional programs, plans, energy saving projects, energy prices and tariffs (including the "green" tariff), direct budget support, taxes and other elements of the tax mechanism (tax advantages, tax holidays, tax credits, etc.), grants of targeted state and private funds for research and development in the sphere of energy saving, elements of material incentives (bonuses, paid education etc.), fines and sanctions, amortization policies and other financial instruments.

It should be noted that ESEM at the enterprise performs such important functions as:

- managing, which creates proper conditions for the interconnection of structural units related to the process of energy saving at the enterprise and enable meeting the set objectives as well as ensuring the efficiency of enterprise operation;

- stimulating, which provides the system of incentives for the company and employees involved in the process of development and implementation of energy saving procedures aimed at their efficient interaction in order to achieve the goal of ESEM operation with the help of material interest of all participants;

- controlling, which enables implementing current energy saving procedures, regulating internal relations at the enterprise, as well as folmulating general rules of interaction of the enterprise with the environment;

- resource saving aimed at reasonable and economical consumption of available material and fuel and energy resources due to developing appropriate measures for the introduction of advanced technologies and the use of modern equipment.

The component of the suggested ESEM at public utility companies is also the energy auditing, which is the energy analysis of the company conducted in order to establish the efficiency of FER use and to develop suggestions for savings such FER.

Energy saving procedures within energy saving programmes are financed from state and regional budgets, enterprise own funds and other sources (loans, issuing securities). One of the problems of energy saving procedures at public utility companies is the limited investement capacity of domestic enterprises. In order to solve this problem, the following procedures of energy saving should be initiated:

- performance contracting, which is a form of a leasing contract whereby the cost of the given energy saving equipment and services is returned due to the cost of the produced or saved energy after the project implementation;

- attracting energy servicing companies, which, at their own expense or at the expense of borrowed funds, implement energy saving procedures or projects and ensure FER savings;

- cooperation among state and private companies, which, on the basis of the agreement, implement energy saving procedures.

The suggested economic mechanism of energy saving at public utility companies is adapted for the enterprises of this sphere, and is determined by a set of structural elements (principles, auxiliary subsystems, economic tools and leverage, ESEM operation, energy auditing, forms of implementation and financing sources for energy saving procedures, development of energy saving procedures), which promote the implementation of energy saving procedures within the corresponding programmes due to financing with the help of issuing infrastructure bonds, which ensures the efficiency of financing energy saving procedures and leads to the achievement of the set goal of ESEM development at public utility companies.

Conclusions

The conceptual approach to ESEM development should be worked out as it is a burning issue for public utility companies, which will contribute to the achievement of the goals of the Strategy for Sustainable Development "Ukraine – 2020" and the Energy Strategy up to 2030.

In the course of the study, the concept of "energy saving" is defined as a set of economic methods, ways, tools and levers of influence on economic relations and processes, which, thanks to management functions, ensure developing and implementing procedures for reasonable and economical consumption of energy resources; the conceptual pattern of ESEM at public utility companies is suggested and its components are considered, which creates the theoretical and methodological basis for developing energy saving policies at public utility companies.

Further research in this direction will be aimed at the development of organizational and financial grounds for energy saving at public utility companies.

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ЕКОНОМІЧНИЙ МЕХАНІЗМ ЕНЕРГОЗБЕРЕЖЕННЯ НА ПІДПРИЄМСТВАХ КОМУНАЛЬНОГО ГОСПОДАРСТВА

Предметом дослідження є сукупність теоретичних, методичних і практичних підходів щодо розробки економічного механізму енергозбереження. **Метою** статті є обґрунтування концептуального підходу до розробки економічного механізму енергозбереження на підприємствах комунального господарства, як теоретико-методологічного підґрунтя політики енергозбереження на підприємствах цієї сфери. Для досягнення поставленої мети в дослідженні поставлені та вирішені такі **завдання:** проаналізувати сучасний стан енергозбереження в Україні та підприємствах комунального господарства; розглянути теоретичні підходи до розкриття сутності поняття "енергозбереження"; розробити схему економічного механізму енергозбереження на підприємствах комунального господарства та обґрунтувати його складові елементи. Для досягнення поставленої мети в роботі використано наступні **методи:** абстрактно-логічні (для теоретичного узагальнення й формулювання висновків); системно-структурний аналіз (для вивчення й узагальнення підходів до визначення енергозбереження); методи економічної й математичної статистики (для обробки й аналізу вихідних даних, виявлення тенденцій і закономірностей дієвості досліджуваних показників); графічний метод (для наочного відображення результатів дослідження). За **результатами** проведеного дослідження можна сформулювати такі висновки: необхідність розробки концептуального підходу до формування економічного механізму енергозбереження є актуальним питанням для

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підприємств комунального господарства. Його вирішення сприятиме досягненню цільових орієнтирів Стратегії сталого розвитку "Україна – 2020" та Енергетичної стратегії до 2030 р. В ході дослідження визначено поняття "енергозбереження" та запропоновано концептуальну схему економічного механізму енергозбереження на підприємствах комунального господарства; розкрито зміст складових економічного механізму енергозбереження, що створює теоретико-методологічне підґрунтя формування політики енергозбереження на підприємствах комунального господарства.

Ключові слова: енергозбереження, економічний механізм, підприємства комунального господарства, економічний механізм енергозбереження.

ЭКОНОМИЧЕСКИЙ МЕХАНИЗМ ЭНЕРГОСБЕРЕЖЕНИЯ НА ПРЕДПРИЯТИЯХ КОММУНАЛЬНОГО ХОЗЯЙСТВА

Предметом исследования является совокупность теоретических, методических и практических подходов к разработке экономического механизма энергосбережения. **Целью** статьи является обоснование концептуального подхода к разработке экономического механизма энергосбережения на предприятиях коммунального хозяйства, как теоретико-методологической основы политики энергосбережения на предприятиях этой сферы. Для достижения поставленной цели в исследовании поставлены и решены следующие **задачи:** проанализировать современное состояние энергосбережения в Украине и предприятиях коммунального хозяйства; рассмотреть теоретические подходы к раскрытию сущности понятия "энергосбережения"; разработать схему экономического механизма энергосбережения на предприятиях коммунального хозяйства и обосновать его составляющие элементы. Для достижения поставленной цели в работе использованы следующие **методы:** абстрактно-логический (для теоретического обобщения и формулирования выводов) системно-структурный анализ (для изучения и обобщения подходов к определениям энергосбережения) методы экономической и математической статистики (для обработки и анализа исходных данных, выявление тенденций и закономерностей действенности исследуемых показателей); графический метод (для наглядного отображения результатов исследования). По **результатам** проведенного исследования можно сформулировать следующие выводы: необходимость разработки концептуального подхода к формированию экономического механизма энергосбережения является актуальным вопросом для предприятий коммунального хозяйства. Его решение будет способствовать достижению целевых ориентиров Стратегии устойчивого развития "Украина - 2020" и Энергетической стратегии до 2030 г. В ходе исследования определено понятие "энергосбережение" и предложена концептуальная схема экономического механизма энергосбережения на предприятиях коммунального хозяйства; раскрыто содержание составляющих экономического механизма энергосбережения, что создает теоретико-методологическое основание формирования политики энергосбережения на предприятиях коммунального хозяйства.

Ключевые слова: энергосбережение, экономический механизм, предприятия коммунального хозяйства, экономический механизм энергосбережения.

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