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Theoretical approaches of development of energy saving projects in the modern world

In the article the need to develop energy-saving projects in connection with the annual increase in energy consumption is revealed. The author of the article notes that the development and implementation of energy-saving projects depends largely on the availability of investment resources and energy-saving measures focused on obtaining resource savings through energy audit and analysis of energy efficiency indicators. In the article, all energy-saving measures are divided into two groups: technical and economic. The author reveals the following features of the activity direction on energy saving: project activity, procurement activity, research work, organizational and technical activity, investment activity and others. It might also be highlighted that different criteria can be used as a benchmark for energy conservation. The most common reference point for control actions is the direction of energy saving. This direction of energy saving is known as the probable saving of energy and energy resources as a result of the implementation of a set of energy saving measures, which includes the involvement of renewable energy sources in the economic turnover and the reduction of consumption of expensive and scarce resources.

Keywords: energy saving project, energy saving, energy saving measures, energy saving potential, technological potential, economic potential, market potential.

One of the main problems of the modern economy is the modernization of energy and energy efficiency. Every year, there is an increase in energy consumption despite the implementation of strategic documents in the field of energy saving. Meeting the demand becomes a challenging priority and thus there is a need to develop energy-saving projects.

Development and implementation of energy-saving projects depend largely on the availability of investment resources. However, in terms of limited financial resources for the implementation of the portfolio of projects and energy-saving measures, it is necessary to develop methodological tools, which allow to identify crucial areas of energy saving and to choose the most important activities and projects that affect resources.

The main prerequisites for the formation of energy saving projects and activities are: a significant share of expenditure in the cost of production; determining of the connection of energy consumption with other resources of the enterprise; systematization, on the basis of this connection, design solutions and their assessment; requirements for the methodology of energy resources regulation on the basis of project activities.

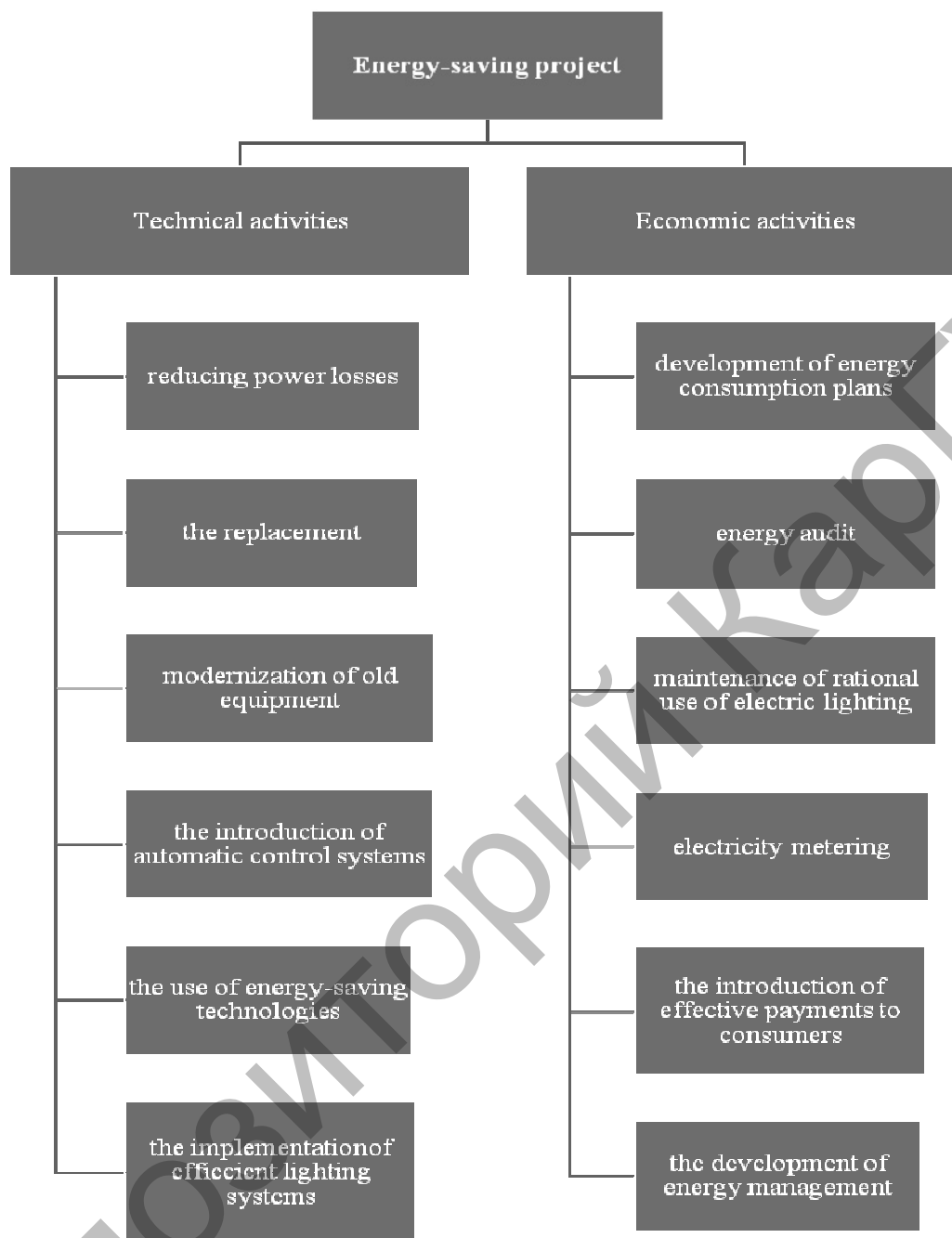
According to D.E. Abdullazyanov, the energy saving project is a complex of technical and economic measures aimed at ensuring energy saving. [1]

In modern conditions, the main result of the implementation of energy-saving projects is not additional revenue, but money savings as a result of improving the efficiency of fuel and energy resources, reducing material costs, saving investment and labor resources. In this regard, energy-saving projects are determined by a set of measures aimed at obtaining resource savings through energy audits and analysis of energy efficiency indicators.

Adhering to the opinion of different scientists [2, 3] we believe that the energy-saving project includes technical and economic measures (Fig. 1). Thus, it is necessary to consider that development of actions for energy saving projects is carried out for each enterprise individually. It is a final product of fruitful work — result of energy inspection along with development of the energy passport of the enterprise. Therefore, the development and implementation of energy-saving projects is a complex and systematic task associated with cost reduction through the implementation of energy-efficient measures.

As it can be seen all the activities can be divided into two groups: technical and economic.

The first group is related to the activities, namely the installation of additional energy-saving equipment, the replacement or modernization of old equipment for new, energy surveys, elimination of leaks and aimless consumption of energy resources, the introduction of automatic control systems, insulation of enclosing structures, replacement of lighting systems, etc.



Note. Compiled by the author [1, 2, 3].

Figure 1. The main measures for the formation of energy saving projects

The second group is represented by activities, the need for which is due to the requirements of the relevant regulatory and policy documents, measures to restore elementary order in energy use, measures to develop a new style of energy saving, the development of energy management system in the enterprise, the development of instructions for the organization of accounting and control of energy consumption and others.

Implementation of energy-efficient measures at any cost means only one thing — the insane waste of resources. The issues of implementation of energy-saving measures at the enterprise should be resolved within the requirements of economic feasibility and technical reliability, compliance with technological parameters and ensuring the necessary comfort.

The analysis of works on the economy of energy saving shows that there are many definitions of the concept of «energy saving». However, there is no clear and consistent definition, as most definitions focus on technical aspects, which does not fully characterize the essence of the category.

According to the law of the Republic of Kazakhstan «On energy saving and energy efficiency» the term «energy saving» is interpreted as «implementation of organizational, technical, technological, economic and other measures aimed at reducing the amount of energy resources used» [4].

Golovanova L.A. believes that energy saving is the process of rational use of energy resources and involvement of renewable energy sources in the economic turnover in order to ensure energy-efficient economic development and improve the welfare of the population of the country and its regions, as well as the preservation of the ecosystem and non-renewable energy resources for future generations [5].

According to E.V. Mataras and L.V. Olekhovich [6], «energy saving means the transition to energy-efficient technologies in all sectors of the economy, including the fuel and energy complex, and, above all, energy-intensive industries, as well as the utilities sector». However, the term «energy efficiency» needs to be clarified in this definition.

Mozhina I.V. adheres to the point of view that energy saving is «actions for the implementation of legal, organizational, scientific, industrial, technical and economic measures aimed at the effective use of energy resources and involvement in the economic turnover of renewable energy sources» [7].

V.S. Stepanov also considers energy saving as a consequence of increasing the efficiency of energy use, but does not give an exact definition [8].

From the position of B.V. Kopeikin and E.A. Smirnov, energy saving should be aimed at saving fuel by saving specific types of energy in the stages of its processing [9]. In this definition, the technical approach is obvious, which does not fully reveal the essence of the category.

Many modern authors focus on attracting renewable energy sources, giving a definition of the concept of «energy saving» and «energy efficiency», along with the use of definitions from the current legislation. For example, N.N. Sergeyev indicates the following characteristics of the category «energy saving»:

- reduction of final specific consumption of energy resources;
- efficient use of non-renewable natural energy resources;
- attraction of renewable energy sources in economic activity [10].

It can be noted that the first sign — a decrease in specific consumption — might be attributed to the results of activities, as it can be achieved only via the implementation of some activities. While the second and third signs are activities related to energy saving.

The course of the implementation of energy saving policy in the enterprise can be developed in several alternative energy efficiency projects. Separation of energy-saving measures into projects is advisable when using several types of energy resources at the enterprise.

Energy saving is a very diverse field of activity. Karpenko M.S. identifies the following activities for energy saving: project activities, procurement activities, research and other [11].

Areas of energy saving activities include various types (Fig. 2).

The following features are typical for the direction of energy saving activity:

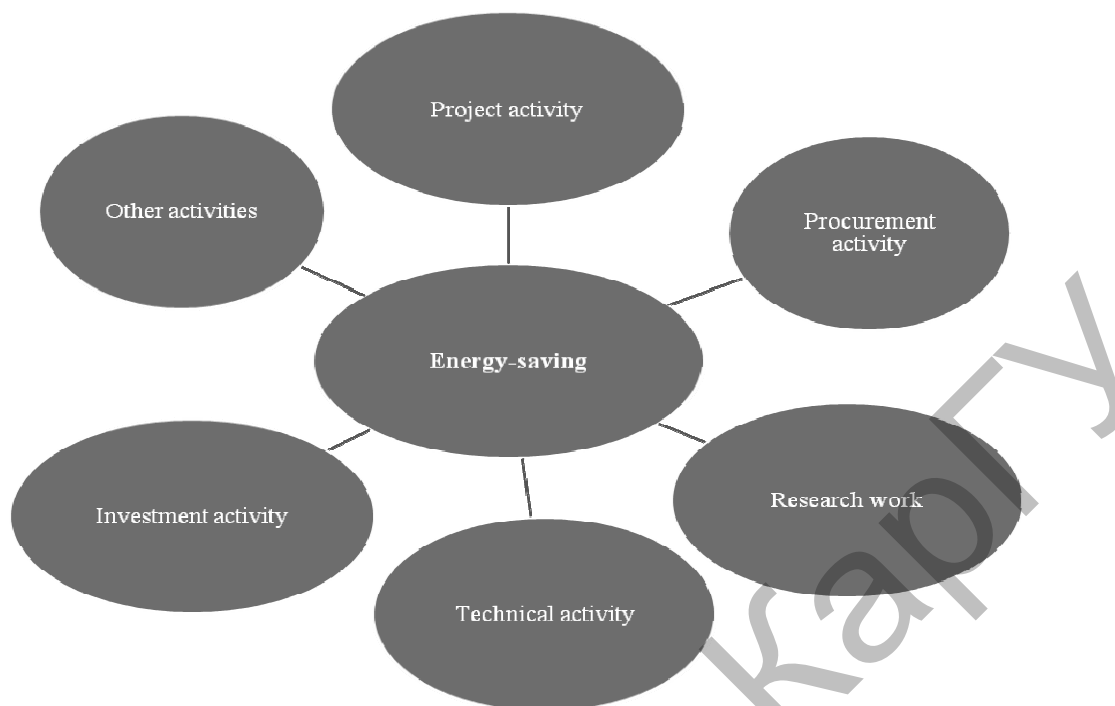
- project activities are carried out on the basis of a comprehensive and thorough analysis at the stage of project development. This activity is characterized by the presence of a clear pre-defined plan, minimizing risks and deviations from it, effective change management;

- procurement activities consist of energy efficiency requirements for the supplied materials and equipment. In the process of its implementation, technical and technological alternatives, terms of development and implementation of energy-saving measures, technological availability of energy-efficient equipment and technologies are studied;

- research work is related to the search for solutions aimed at improving the efficiency of use of all types of energy resources;

- organizational and technical activities related to the development and maintenance of stages of project implementation, ensuring interaction and coordination of actions of project participants in the field of energy saving and energy efficiency at the enterprise;

- investment activity is considered as a unity of two interrelated processes: the investment process and the process of functioning of the production facility. The efficiency assessment is carried out on the basis of comparison of the received profit with investment costs.



Note. Compiled by the author on [10, 11].

Figure 2. Areas of energy saving activities

Practically, all services of the enterprise, all personnel, including a management structure, thus processes and business communications on an energy-saving can be involved in activity integrated into general production processes. The above causes the risks typical for complex control systems of production processes, one of which, of course, is the energy management system in the enterprise.

It might also be noted that different criteria can be used as a benchmark for energy conservation. The most common reference point for control actions is the energy saving potential, i.e. reserves that can be mastered in time.

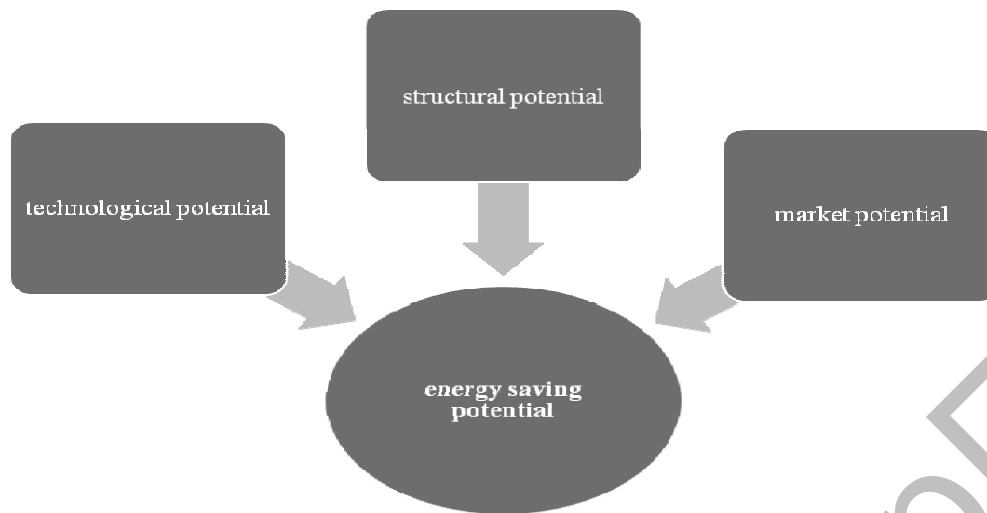
To quantify the maximum possible results of energy-saving activities introduced characteristic energy saving potential. The following definitions are given in the literature:

1) reserves that can be mastered in time. In addition, the energy saving potential is characterized by such indicators as energy resource saving, replacement of a certain resource by cheaper and less scarce [12];

2) the possibility of reducing energy consumption as a result of the full implementation of economically feasible energy-saving measures. The authors have differentiated the types of energy saving potential according to the degree of taking into account various restrictions in its implementation, namely the allocation of economic, technological and market potential of energy saving [13];

3) the maximum loss of fuel, heat, mechanical and electrical energy at the level of installation, cycle, shop, plant, which may be fully or partially returned to the energy cycle through appropriate energy-saving measures. By the nature of the measures necessary to realize the potential of energy saving, it distinguishes three components: technological, structural and technical [14].

Legislative acts under the potential of energy saving understand the likely savings in energy and energy resources as a result of the implementation of a set of energy saving measures, including the involvement in the economic turnover of renewable energy sources and reducing the consumption of expensive and scarce resources. In this regard, we believe that the energy saving potential includes: technological potential, structural potential and market potential (Fig. 3).



Note. Compiled by the author on [13, 14].

Figure 3. Structure of energy saving potential

The technological potential of energy saving is characterized by an increase in the efficiency of production, preparation, transportation and consumption of energy resources and, accordingly, a decrease in the energy intensity of products and services through the introduction of advanced energy-efficient technologies.

Structural potential characterizes the reduction of the share of energy-intensive industries and industries in energy, manufacturing and transport through the development of knowledge-intensive industries and industries with low energy and material intensity.

The market potential of energy saving is due to the market situation at the time of making management decisions on the implementation of energy saving measures.

Known problems of practical implementation of energy-saving measures can be considered as limitations or criteria for the choice of an approach to assessing the potential. In turn, the results of comparing the effectiveness of possible energy saving measures may serve as a basis for a comparative analysis of various technical methods of calculating the energy saving potential.

Thus, according to the results of the study of the theoretical essence of the development of energy-saving projects, the following conclusions can be drawn:

- energy-saving projects are determined by a set of measures aimed at obtaining resource savings through an energy audit. All actions can be divided into two groups: technical (the actions connected with installation of the additional power saving-up equipment, with replacement or modernization of the old equipment on new) and economic (the actions connected with need of development of system of power management at the enterprise, development of instructions on the organization of accounting and control of power consumption and others);

- energy saving is a very diverse area of activity. For directions for energy saving activities have the following characteristics: project activities, procurement activities, research work, technical-organizational activities, investment activities and others;

- energy saving potential is realized through specific energy saving measures. Therefore, any numerical value of the potential is not an absolute criterion for the adoption of drastic measures and is declared at the initial stage of the energy audit in order to select areas for further examination, promising, in the sense of the subsequent development of energy-saving measures.

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Ф. Курбанов

Қазіргі жағдайдағы энергия үнемдеу жобаларын дамытудың теориялық жақтары

Мақалада энергия тұтынудың жыл сайынғы ұлғаюына байланысты энергия үнемдейтін жобаларды әзірлеу қажеттілігі ашылған. Мақала авторы энергия үнемдеу жобаларын әзірлеу және іске асыру көп жағдайда энергетикалық аудит жүргізу және энергетикалық ресурстарды пайдалану тиімділігінің көрсеткіштерін талдау жолымен ресурстарды үнемдеуге бағытталған инвестициялық ресурстар мен энергия үнемдеу шараларының болуына байланысты екенін атап өткен. Мақалада барлық энергия үнемдеу шаралары екі топқа бөлінген: ұйымдық-техникалық және ұйымдық-экономикалық. Мақала авторы энергия үнемдеу бойынша қызмет бағытының мынадай ерекшеліктерін анықтады: жобалау қызметі, сатып алу қызметі, ғылыми-зерттеу жұмысы, ұйымдастыру-техникалық қызметі, инвестициялық қызметі және тағы басқалар Сондай-ақ энергия үнемдеудің бағыты ретінде түрлі өлшемдер қолданылуы мүмкін. Басқару әсерлері үшін неғұрлым жиі бағдар ретінде энергия үнемдеу әлеуеті, яғни уақыт бойынша игерілуі мүмкін резервтер қызмет етеді. Энергия үнемдеу әлеуеті деп энергия үнемдеу жөніндегі іс-шаралар кешенін іске асыру нәтижесінде энергия мен энергетикалық ресурстарды ықтимал үнемдеуді түсінеді, оның ішінде жаңартылатын энергия көздерін шаруашылық айналымға тарту және қымбат және тапшы ресурстарды тұтынуды қысқарту. Сондықтан, мақаланың авторының ойынша, энергия үнемдеу әлеуетінің құрылымына технологиялық әлеует, құрылымдық әлеует және нарықтық әлеует кіреді.

Кілт сөздер: энергия үнемдейтін жоба, энергия үнемдейтін іс-шаралар, энергия үнемдейтін әлеует, технологиялық әлеует, құрылымдық әлеует, нарықтық әлеует.

Ф. Курбанов

Теоретические аспекты развития энергосберегающих проектов в современных условиях

В статье раскрыта необходимость разработки энергосберегающих проектов в связи с ежегодным увеличением потребления энергии. Автор статьи отмечает, что разработка и реализация энергосберегающих проектов зависят во многом от наличия инвестиционных ресурсов и энергосберегающих ме-

роприятий, направленных на получение экономии ресурсов путем проведения энергетического аудита и анализа показателей эффективности использования энергетических ресурсов. В статье все энергосберегающие мероприятия разделены на две группы: организационно-технические и организационно-экономические. Автором статьи выявлены следующие особенности направления деятельности по энергосбережению: проектная деятельность, закупочная деятельность, научно-исследовательская работа, организационно-техническая деятельность, инвестиционная деятельность и др. Необходимо также отметить, что в качестве ориентира энергосбережения могут использоваться различные критерии. Наиболее часто ориентиром для управляющих воздействий служит потенциал энергосбережения, то есть резервы, которые могут быть освоены во времени. Под потенциалом энергосбережения понимают вероятную экономию энергии и энергетических ресурсов в результате реализации комплекса мероприятий по энергосбережению, в числе которых — вовлечение в хозяйственный оборот возобновляемых источников энергии и сокращение потребления дорогих и дефицитных ресурсов. Поэтому автор статьи в структуру потенциала энергосбережения включает технологический, структурный и рыночный потенциалы.

Ключевые слова: энергосберегающий проект, энергосбережение, энергосберегающие мероприятия, потенциал энергосбережения, технологический потенциал, структурный потенциал, рыночный потенциал.

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