
ҚАРЖЫ-НЕСИЕ ЖҮЙЕСІ ФИНАНСОВО-КРЕДИТНАЯ СИСТЕМА FINANCIAL-CREDIT SYSTEM

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Features of risk assessment of energy saving projects

The article discusses the legislative and theoretical basics of risk management of energy-saving projects aimed at reducing the number of energy resources used. The authors highlighted a variety of risks that affect energy-saving projects: entrepreneurial, property, liability and other specific risks. The article defines the main directions of work on energy-saving projects, including certain types of energy-saving activities: project activities, procurement activities, research activities, organizational and technical activities, organizational and motivational activities, analysis and expert assessment. The authors developed an algorithm for managing the risks of energy saving projects, which consists of five stages (risk planning; risk identification; risk analysis; risk assessment methods; monitoring and risk management). A comparative analysis of the risk assessment methods used allowed the authors to distinguish two approaches: qualitative and quantitative. The authors recommended ways to improve the risk assessment of energy saving projects: to identify the main activities of energy saving projects; apply the main stages of the risk management algorithm, which determine the final effectiveness of energy-saving projects; take into account the interaction of consumers, energy companies and the state in the process of identifying and assessing risks; to determine the methodology for risk assessment for energy-saving projects at the legislative level.

Keywords: energy-saving project, energy saving, risks, risk management, risk assessment, risk assessment methods.

Energy saving projects of strategic importance for industrial companies all over the world, as making a significant contribution to maintaining their competitiveness by reducing energy costs. To this end, industrial companies strive not only to plan investments in improving the energy infrastructure but also to justify the volume of such investments, providing an adequate risk assessment for each project.

Usually, a risk is an event (or combination of circumstances), which, if implemented, would have a significant positive or negative impact on the enterprise achieving its long-term and short-term goals. Risks that can have a positive impact called opportunities, while risks that can have a negative influence called threats. One or more reasons may cause the risk and, if it arises, may affect one or more aspects. The reason may be a requirement, assumption, restriction, or condition that creates the likelihood of negative or positive results. For example, the cause of the risk may be the need to obtain permission from the local environmental committee or the lack of personnel involved in the development and implementation of the project. Risk conditions may also include aspects of the organization or project environment that contribute to increased risk. These may include an unsuccessful choice of methods in project management, the simultaneous implementation of several projects, or dependence on external project stakeholders, which are impossible to control.

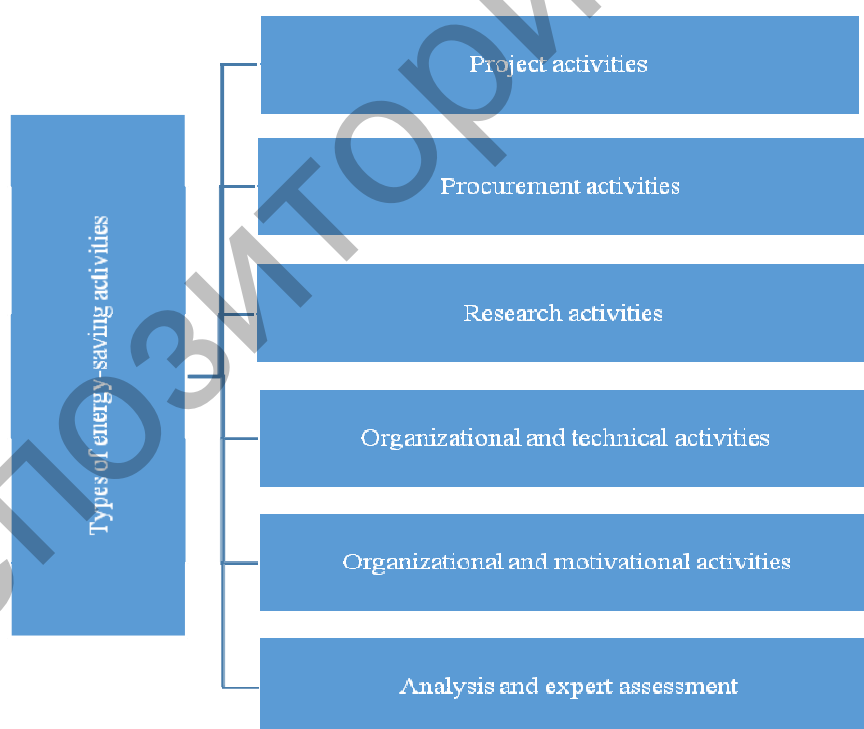
Risk management of an energy-saving project covers processes related to planning for risk management, their identification, and analysis, response to risks, as well as monitoring and managing risks within the project. The objectives of risk management of an energy-saving project are to increase the likelihood of occurrence and impact of favorable events and to reduce the possibility of appearance and impact of adverse events for the project during its implementation.

The problems of energy conservation and energy efficiency are acute for the world community and, reflected in national legislation around the world. The Law «On Energy Saving and Improving Energy Efficiency» of the Republic of Kazakhstan reflects the fundamental concepts correlated to the essence of energy resources and energy policies of companies. Energy saving is understood as a complex of performed organizational, technical, technological, economic and other measures aimed at reducing the number of energy resources used [1]. Despite the consolidation of the basic concepts and procedures of energy conservation in the legislation, certain methodological viewpoints of risk management of energy-saving projects are not indicated.

The problem of risk management in energy conservation is relevant for most projects since, in a significant number of cases, they are complicated, complex plans the magnitude of which can cover not only specific companies but also cities and even entire regions. Therefore, risk assessment is carried out, first, in the interests of investors who place capital, expecting to receive a certain level of profitability.

Risks are probabilistic values that, as a rule, negatively affect the result of an investment project. In the economic analysis, first, it is necessary to take into account economic results in the form of flows of net discounted income from the implementation of the energy-saving project. There is a variety of risks of energy-saving projects: entrepreneurial, property, liability risks and other specific risks. Risks of energy saving projects increased environmental responsibility of manufacturers and high-efficient energy-saving technologies, which would provide not only reducing the direct costs of companies, but also the reduction of emissions of harmful substances into the atmosphere. Modern enterprises need energy-saving production technologies; however, their implementation is fraught with significant risks, since companies vary greatly in terms of experience in the field of energy project management.

Risk management in the field of energy consumption is one of the most promising domains of activity in energy conservation because energy conservation is a very diverse area of activity. Consequently, when assessing the risks of energy-saving projects, the directions of energy-saving activities should be taken into account (Fig. 1).



Source. Compiled by the authors on [2, 3].

Figure 1. Activities of energy-saving projects

Directions of work on energy-saving projects include certain types of energy-saving activities:

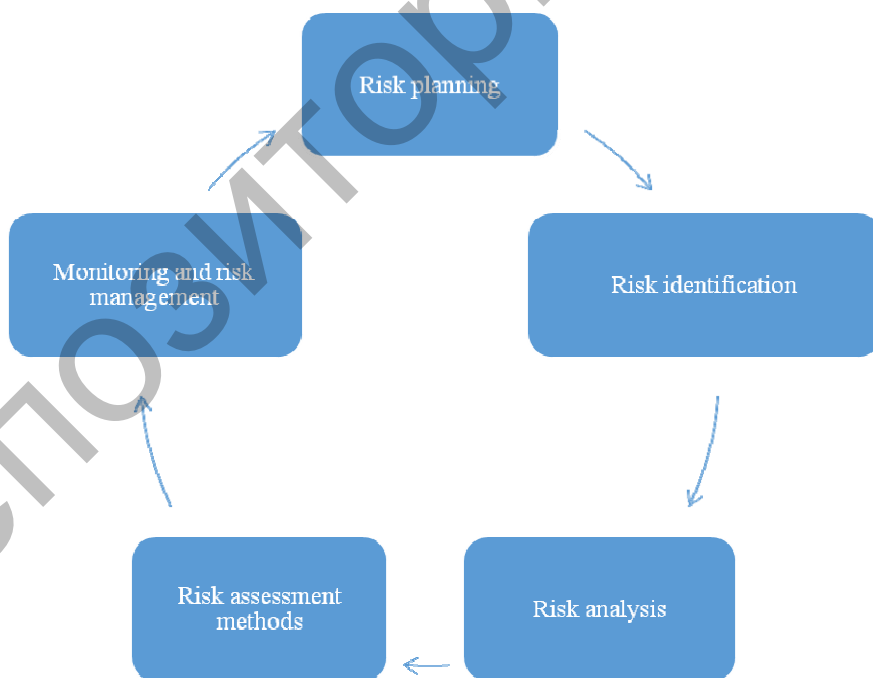
– project activities: the use of energy-efficient materials, equipment, and technologies at the design stage of construction, repair, technical re-equipment, and reconstruction of production;

- procurement activities: energy efficiency requirements for materials and equipment supplied;
- research activities: energy surveys, compilation of energy balances, determination of load centers and factors affecting energy consumption;
- organizational and technical activities: are connected with the development and support of the stages of project implementation, ensuring interaction and coordination of actions of project participants in the field of energy conservation and improving energy efficiency at the enterprise;
- organizational and motivational activities: work on motivating employees, teaching the basics of energy conservation and improving the corporate culture of energy consumption;
- analysis and expert assessment: analysis and expert assessment of risks, and of their management; aimed at finding solutions necessary to increase the efficiency of use of all types of energy resources. Application of the network analysis method for ranking and determining the most effective risk management techniques.

One of the main factors of the company's commercial success is the construction of an effective and integrated risk management system. Currently, the restructuring of the energy market is creating new risks for its participants and often leads to irreversible changes. As a result, in competitive market conditions, the adoption of managerial decisions by energy industry enterprises requires a thorough analysis of possible risks and development of the main directions for their minimization and leveling.

As you can see, the risk management of energy-saving projects is associated with identification, risk analysis, and decision-making, which include maximizing the positive and minimizing the negative consequences of risk events. In our opinion, the risk management algorithm for energy conservation projects consists of the following steps:

- risk planning;
- risk identification;
- risk analysis;
- risk assessment methods;
- monitoring and risk management (Fig. 2).



Source. Compiled by the authors.

Figure 2. Risk Management algorithm for energy saving projects

Taking into account the main stages of the risk management algorithm, largely, determines the ultimate effectiveness of energy-saving projects.

Riskplanning — the process of determining the procedure for the implementation of risk management actions within the framework of an energy-saving project.

Riskidentification — the process of identifying risks that may affect an energy-saving project and documenting their characteristics.

Riskanalysis — the process of arranging risks according to their priority for further analysis or management by summing the probabilities of their appearance and influence on an energy-saving project.

Riskassessment methods— the process of applying risk assessment methods to develop options and actions that contribute to the expansion of opportunities and reducing threats to achieve the goals of an energy-saving project.

Monitoring and risk management — the process of using risk response plans, tracking identified risks, monitoring residual risks, identifying new risks and assessing their effectiveness throughout the project.

Risk management of energy-saving projects requires that each stage related to the project is interconnected with other stages to facilitate coordination. Actions taken during one stage usually affect this stage and other related processes. These interactions within the process often demand a compromise between the requirements and purposes of the project, besides, certain compromises, regarding implementation features, will vary between different projects, and organizations. Successful project management should include the active management of these interactions in order to meet the requirements of the investor, customer and other interested parties in the energy saving project.

It should be noted that a lot of evidence is given in the literature on the use of various statistical and simulation methods for assessing risks in energy saving projects most of the works are devoted to the field of civil engineering [4] in addition, a significant part of the research is dedicated to energy service problems and assessment of risks arising in such projects [5].

Scientists mainly identify various methods for assessing the risks of energy-saving projects.

Risk assessment methods are an important element of the risk management system of any organization. Risk assessment methods, as well as risk management methods, vary from organization to organization and depend directly on the specifics of the activity, and energy service (energy service companies) is no exception to this rule. The most relevant risk assessment methods for energy service companies are qualitative assessment methods (the method of constructing event trees, the «event-consequence» method, the failure tree method, the hazard index method), and the expert assessment [6].

Risk assessment during the implementation of energy-saving projects is one of the key areas of investment analysis since such an assessment allows us to predict the likelihood of a decrease in the expected income stream due to the negative impact of various factors. A promising area of research is an in-depth assessment of the typical technical, climatic and socio-economic risks that industrial companies face when implementing energy saving projects around the world [7].

For instance, when performing energy-saving projects at coal enterprises, the following industry risks are possible [8]:

- the risk of decline in world prices for coal and carbonaceous products;
- the risk of depletion of reserves, the occurrence of accidents in mines and other hazardous industries, the deterioration of production conditions and, as a consequence, a decrease in the volume of supplies;
- the risk of increased energy consumption due to climatic conditions.

As measures to reduce these risks, we can note a research of the dynamics of changes in the indicators of the world and domestic economies and the situation in the markets of fuel and energy resources; study of weather forecasts for enterprises of the industry. Besides, analysis of other features of the enterprise can be carried out, depending on the specifics of the company (underground or open-pit mining technology, enrichment, and processing of raw materials).

The guarantee of successful activity of the energy industry enterprise is to keep the level of losses caused by various risk factors within the established risk capital, and an integrated approach to risk management at the level of the entire energy company.

In addition to the standard risks characteristic of any economic activity, production with dangerous production facilities has its own range of risks connected to liability to third parties. Therefore, one of the main methods of risk reduction is energy efficiency insurance [9].

The company can expand the insurance program to protect its interests in other types (for example, environmental insurance). It is important to choose a financial partner that has the most acceptable risk insurance conditions; however, depending on the strategic policy of the insurance company, these conditions can

differ significantly and to some extent limit the ability to cover losses, and, consequently, the list of insurance cases in production.

A well-written insurance contract allow the company to get real insurance coverage for its specific processes, and not to pay for insured events that do not meet its interests.

The integration of different levels of risk management into strategic planning is a painstaking process that can be performed by attracting external consultants to monitor the work performed.

Due to the complexity of energy-saving projects, most companies turn to specialized services of energy service companies that make investments in the energy infrastructure at the client's enterprise and charge the savings from ongoing energy-saving projects as income [10].

Consequently, energy companies need to form risk management departments and use an organized system of analysis, control, placement, and transfer of risks to the counterparty. Such risk control systems help the company to manage production personnel, which means that they respond to the expectations of insurance companies in complying with insurance rules that directly affect insurance payments and save of unplanned costs of owners and company administration.

A comparative analysis of the risk assessment methods used allowed us to distinguish two approaches: qualitative and quantitative. The main specific feature of the qualitative approach in risk research is that the risk identification of the project is first carried out, and then a cost estimate of the consequences of the risk and the developed measures of resisting them are carried out. A qualitative analysis should be conducted at the planning stage of activities. Quantitative analysis is based on the tools of probability theory and mathematical statistics. It includes, in numerical terms, the impact of changes in project risk factors on project effectiveness and relies on the basic version of the project's business plan and qualitative analysis.

The energy sector has significant specifics due to the need to carry out an investment of social and infrastructure functions, therefore the goal of investment projects in the energy sector cannot be only to maximize the benefits. Their realization is correlated with explicit or implicit social or infrastructural burdens. It is also important to note that the circle of foreign investors attracted to participate in such projects is usually quite limited.

The process of creating a risk management system at energy enterprises is moving quite spontaneously, in the face of growing uncertainty about further goals and actions, therefore when choosing an effective strategy and tactics of behavior, enterprises in this industry need to combine risk management into strategic and tactical decision-making.

The use of appropriate risk management methods, as well as their assessment, allows you to choose the best business strategy according to the ratio «risk value — risk premium», and also provide an opportunity to assess the amount of capital required to cover possible losses.

It is necessary to include a risk control procedure in the enterprise's strategic planning procedure so that the system of performance indicators adopted by the company makes it possible to evaluate the effectiveness of risk management.

Thus, a review of the theoretical aspects of risk assessment of energy-saving projects made it clear that risk assessment involves the development and implementation of an appropriate strategy consistent with the overall development strategy of the company. The main factors determining the need to create an effective risk management system in industry companies are: solving current and strategic issues of company development, ensuring stable growth and predictability of results, increased attention to risk management problems from investors, rating agencies and partners. The company's ability to effectively manage its risks is one of the decisive advantages in the face of growing competition in the market and a guarantee of the continued existence of the company.

In our opinion, in order to improve the risk assessment of energy-saving projects it is necessary:

- to identify the main activities for energy-saving projects;
- to apply the main stages of the risk management algorithm, which determines the final effectiveness of energy-saving projects;
- to take into account the interactions between consumers, energy companies and the state in the process of identifying and assessing risks;
- to determine the methodology for risk assessment for energy-saving projects at the legislative level.

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Ф. Курбанов, Б.С. Есенгельдин, А.А. Ерманова, А.А. Жансейтов

Энергия үнемдеу бойынша жобалардың тәуекелдерін бағалау ерекшеліктері

Мақалада қолданылатын энергетикалық ресурстардың көлемін азайтуға бағытталған энергия үнемдеу жобаларының тәуекелдерін басқарудың заңнамалық және теориялық негіздері қарастырылған. Авторлар энергияны үнемдеуші жобаларға әсер ететін түрлі тәуекелдерді анықтаған: кәсіпкерлік, мүліктік, жауапкершілік тәуекелі және басқалар. Мақалада энергия үнемдеу бойынша жекелеген қызмет түрлерін қамтитын энергия үнемдеу жобалары бойынша жұмыстың негізгі бағыттары айқындалған: жобалау, сатып алу, ғылыми-зерттеу, ұйымдастыру-техникалық, ұйымдастыру-мотивациялық қызметі, талдау және сараптамалық бағалау. Авторлар энергия үнемдеу бойынша жобалардың тәуекелдерін басқару алгоритмін әзірлеген, ол бес кезеңнен тұрады (тәуекелдерді жоспарлау; тәуекелдерді сәйкестендіру; тәуекелдерді талдау; тәуекелдерді бағалау әдістері; мониторинг және тәуекелдерді басқару). Қолданылатын тәуекелдерді бағалау әдістерінің салыстырмалы талдауы мақала авторларына екі тәсілді бөліп көрсетуге мүмкіндік берді: сапалық және сандық. Энергия үнемдеу бойынша жобалардың тәуекелдерін бағалауды жетілдіру жолдары ұсынылған: энергия үнемдейтін жобалар бойынша қызметтің негізгі түрлерін анықтау; энергия үнемдейтін жобалардың түпкі тиімділігін анықтайтын тәуекелдерді басқару алгоритмінің негізгі кезеңдерін қолдану; тәуекелдерді анықтау және бағалау үдерісінде тұтынушылардың, энергия компаниялары мен мемлекеттің өзара іс-қимылын ескеру; энергия үнемдеу жобалары бойынша тәуекелдерді бағалау әдістемесін заңнамалық деңгейде айқындау.

Кілт сөздер: энергия үнемдеу жобасы, энергия үнемдеу, тәуекелдер, тәуекелдерді басқару, тәуекелдерді бағалау, тәуекелдерді бағалау әдістері.

Ф. Курбанов, Б.С. Есенгельдин, А.А. Ерманова, А.А. Жансейтов

Особенности оценки рисков проектов по энергосбережению

В статье рассмотрены законодательные и теоретические основы управления рисками энергосберегающих проектов, направленных на уменьшение объема используемых энергетических ресурсов. Авторами выделены разнообразные риски, влияющие на энергосберегающие проекты: предпринимательские, имущественные, риски ответственности и др. Определены основные направления работы по энергосберегающим проектам, включающие отдельные виды деятельности по энергосбережению: проектная, закупочная, научно-исследовательская, организационно-техническая, организационно-

мотивационная деятельность, анализ и экспертная оценка. Авторами разработан алгоритм управления рисками проектов по энергосбережению, который состоит из пяти этапов (планирование рисков; идентификация рисков; анализ рисков; методы оценки рисков; мониторинг и управление рисками). Сравнительный анализ используемых методов оценки рисков позволил авторам статьи выделить два подхода: качественный и количественный. Рекомендованы пути совершенствования оценки рисков проектов по энергосбережению: выявить основные виды деятельности по энергосберегающим проектам; применить основные этапы алгоритма управления рисками, которые определяют конечную эффективность энергосберегающих проектов; учесть взаимодействия потребителей, энергокомпаний и государства в процессе выявления и оценки рисков; на законодательном уровне определить методику оценки рисков по энергосберегающим проектам.

Ключевые слова: энергосберегающий проект, энергосбережение, риски, управление рисками, оценка рисков, методы оценки рисков.

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