Risk-based approach towards energy production

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Abstract. In modern digitalization conditions, reducing operating costs in order to increase profits in the energy sector is one of the fundamental tools for the company's growth and planning the production sector for the long term. One of the most modern approaches to work is risk-based. The article discusses the main aspects of the formation of this approach, the probability and consequences of failure, as well as the methodology for calculating technical risk.

1. Introduction
Until now, there is no clear approach to taking measures to protect enterprises from external and internal threats [1]. That is why, when planning production, specialists are forced to apply numerous approaches, trying to determine which of the methods will be most effective in this or that case.
In the course of work, the risk is considered as the result of an erroneous or incorrect action, or inaction. In addition, the likelihood of future damage is also a risk. Therefore, the very purpose of the approach considered in this article is to minimize the entrepreneurial unforeseen or undesirable course of events [2].
Since the mechanism for implementing the risk-based approach is based on the analysis of a large number of risks, the implementation of this approach is advisable to apply in areas with a high level of risk. It is worth noting that during implementation, both unintentional risks and special mistakes made in order to identify weaknesses and work out the technique itself can be used [3]. It is a clearly structured and well-functioning system that allows managers to take preventive measures practically without outside help and eliminate problems that in the future may negatively affect the work of the entire company.
There are several tools for assessing the effectiveness of safety management of an energy enterprise: logical analysis, qualitative analysis and modeling of the impact of undesirable factors. It should be borne in mind that the company's security system has a complex structure and requires systematization.
2. Risk-based approach in the energy sector

The transition to a risk-based approach is usually carried out by creating a production asset management system (AMS) on the 1C platform, or SAP. The SAP is the base for entering various data into it. And not only financial, but also technical and labor [4-9].

As a result of the formation of a fairly extensive database of the energy company SAP, it is possible to make a transition to risk-oriented management. In the future, this approach, offering structured data on the technical state of the object, will help in making decisions about possible methods of exposure, digitalization and modernization of the technological process [10-17].

In planning with a risk-based approach, three calculations are implemented:

- probability of failure;
- consequences of refusal;
- technical risk.

The calculation of the probability of failure is based on the forecast of changes in the technical condition index (TCI) and the forecast of the probability of failure of the units of the unit of the main equipment.

This stage characterizes the work by the probability that under certain operating conditions, within the specified operating time, no single failure will occur [18].

This is followed by an assessment of the consequences of the failure of the main equipment. It is already measured in terms of possible losses, damage that will be caused in the event of equipment shutdown. It is calculated in monetary terms as the sum of all losses [19-20].

Usually, the calculation is made according to the following points:

1. Damage caused by failure of a piece of equipment:
   A. The cost of new equipment, or the cost of repairing old equipment, including spare parts.
   B. Payments (fines) for environmental damage resulting from equipment failure.
   C. Costs of compensation for workers who have suffered harm to life and health as a result of equipment failure.
2. Damage caused by the need to pay compensation to consumers in case of harm to them.
3. Damage as a result of late delivery of electricity to consumers.
4. Damage from causing damage to all equipment as a result of a breakdown of the unit.
5. Decrease in the required gross proceeds.

Equipment technical risk assessment is carried out as a product of the probability and consequences of equipment failure. This stage is necessary for the magnitude of the optimal impact on the equipment and prioritization in the further operation of the system and production planning.

By itself, the structure of risk management in the transition to a digital economy can be divided into four stages [21]:

1. Setting goals for management. The stage includes methods of economic analysis and identification of the needs and capabilities of the enterprise and consumers within the framework of the development strategy and the current economic state of the enterprise.
2. Risk analysis. The use of various methods of structuring existing information and collecting new information. Modeling the activity and development of the enterprise.
3. Evaluation of the effectiveness of various methods and their impact on risk. The stage is characterized by the search for ways to avoid or reduce the risk.
4. Obtaining new information about the risk. On the basis of the first three stages, the most effective method of influencing the risk is selected, the strategy for managing the energy sector and the goals of the enterprise is adjusted.
When assessing the safety of an energy company, an analysis of various types of risks is performed: information and technical, reputational, internal corporate, organizational, technical and financial [22].

One of the most important risks in the digital age is information technology. It includes data about employees, the level of protection of confidential information from hacking, personal data that are prohibited from disclosure or destruction. In particular, you need to pay attention to ensuring the security of personal information from hacking by third parties.

Reputational risk includes the likelihood of loss of the company's business reputation due to the presence among employees, especially management personnel, of persons involved in condemned behavior. In the era of digitalization, due to the emergence of the Internet and gadgets, this risk has increased significantly [23].

Conflicts between employees of the same company can lead to the emergence of so-called internal corporate risks.

Organizational and technical risks are also increasingly becoming the cause of damage. Failure to comply with technical security measures, control, and management of access to the company can be seriously damaged.

Financial risks are characterized by protection from unscrupulous employees, financial fraudsters of the organization.

The risk-based approach is becoming more and more popular both in our country and around the world. In Russia, it is described in the federal law "On the Protection of the Rights of Legal Entities and Individual Entrepreneurs in the Exercise of State Control (Supervision) and Municipal Control." In 2015, risk management was included in the international standard ISO 9001. This document describes a system of planning and implementation of planning and risk management at enterprises [24].

In order to minimize the risk, various methods and approaches are used. As an example, we can model the current situation in the energy market and then predict it in the long term [25].

It is convenient to present forecasts in the form of diagrams, graphs, and other visual ways of displaying information. Similar data that have been analyzed are presented in Figures 1-4.

Figure 1 shows a map of China, on which the scale of SCS energy consumption in the country in 2017 is displayed using color [25].

![Figure 1. Energy consumption scale in China [25].](image-url)
Figure 2 shows a map of China, on which the intensity of ECI energy consumption in the country in 2017 is displayed using color [25].

Figure 2. Intensity of energy consumption in China [25].

Figure 3 shows a map of China, which shows the structure of ECS energy consumption in the country in 2017 [25].

Figure 3. Structure of energy consumption in China [25].

The data structured in this way is already the result, according to which it is easy to establish the dynamics of energy development of energy conservation in China.
Figure 4 shows an indicator of the spread of the Internet in China in 2017 [25].

![Internet spread in China in 2017](image)

**Figure 4.** The spread of the Internet in China in 2017 [25].

3. Conclusion

Thus, the article analyzed the basis for managing an energy company using a risk-oriented approach, and provided methods for calculating risks. The structure of risks was also systematized precisely in the era of digitalization.

The findings suggest that digital progress increases the likelihood of favorable conditions for risks, including reputational ones. This, in turn, proves that at the moment the risk-oriented approach is promising in the management of the energy industry.

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