Management of mechanisms ensuring sustainable functioning and economic development of the electric power complex

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\textbf{Abstract.} The study is dedicated to ensuring sustainable functioning and economic development of the electric power complex. The article analyzes the impact of the fuel and energy complex on the economy of the Russian Federation. The paper presents the stages of the formation of the electric power industry, which ensures the functioning of industrial production and the vital activity of mankind. The study proved that the electric power complex is a capital-intensive industry and is connected by a single technological process. Of course, in order to maintain the stability and efficiency of the industry, it is necessary to ensure the management of the stable functioning and economic development of the electric power complex. The study analyzed the definitions of stability, which contain a set of indicators containing both technical and technological parameters, and economic. Based on the results of the study, factors were formulated that affect the sustainable functioning and economic development of the electric power complex. In conclusion, the study presents the main findings and results of the work.

1. **Introduction**

The fuel and energy complex (FEC) of Russia is an industry system for the extraction of natural resources, transmission, processing, transportation and consumption. The fuel and energy complex can be considered the basis of modern Russian economy. For several years, the Russian Federation has been a leader in the extraction of fuel and energy resources, for example, natural gas production makes up 30% of world production, oil about 17%, electricity production about 5%, and coal production - 8%. In the Russian Federation, the fuel and energy complex affects all sectors of the economy, primarily industrial production \cite{1; 2; 3}. Effective consumption of energy resources serves as the basis for the formation of territorial production complexes in Russia.

The fuel and energy complex significantly affects the development of the Russian economy, about 30% of the gross domestic product is generated by the extraction and sale of fuel and energy...
resources, it is also an instrument for conducting foreign and domestic policy of the state, and more than 50% of the country's budget is formed through the sale of fuel and energy products [4; 5].

The electric power industry is distinguished in the fuel and energy complex, which ensures the functioning of all types of economic activity and makes human life more comfortable. As a result, it becomes necessary to search for mechanisms to achieve a balance in the production and consumption of electric energy, to maintain stable functioning and ensure the economic development of the electric power complex in the long term [6; 7].

2. Materials and methods
The purpose of this study is to search for mechanisms to ensure the sustainable functioning and economic development of the electric power complex. To achieve this goal, the following tasks:
- analyze the existing concepts of «sustainability» and adapt it to the electric power industry;
- identify factors whose management will ensure the achievement of sustainable functioning and economic development of the electric power complex.

The study used the methods of historical, factor, statistical, comparative and system analysis, the method of expert assessments, which allowed the authors to solve the tasks.

3. Results
The beginning of the development of Russia's energy industry was laid by the adoption in December 1920 of the GOELRO plan (State Commission for the Electrification of Russia) [8]. The GOELRO plan contained the main directions for the development of the electric power industry in Russia, which was to create the electric power industry in the Russian Federation. In the future, the functioning of the industry was transformed, unified energy systems were created, the transition to new forms of management and operation, however, the basis of the industry, related to the interconnection of production, transmission, distribution and consumption of electricity, remains unchanged (figure 1) [9].

Figure 1. Scheme of a unified technological chain of the electric power industry.
At the same time, the volume of electric energy production is increasing every year, which requires the industry to develop mechanisms to ensure the stable functioning and economic development of the electric power complex (figure 2) [10].

![Graph showing volumes of electric energy production, billion rubles.](image)

**Figure 2.** Volumes of electric energy production, billion rubles.

Let us analyze the occurrence of the definition of «sustainability» and adapt it to the electric power industry of the Russian Federation. The history of economic thought shows that the concept of "sustainability" arose in Western Europe at the stage of the emergence of capitalism, which testified to the existence of capitalism that ensures the progress and functioning of the company. Sustainability was the subject of detailed research by Western economists on the eve of the 1929 crisis and the era of the Great Depression. A significant contribution to its development was made by our compatriots - V.V. Novozhilov and N.D. Kondratiev, studying the problems of economic dynamics. We can say that V.V. Novozhilov laid the foundations of the theory of sustainable economic development, which were combined with market-based planning and management mechanisms [11; 12].

Other scientists understood stability as stable functioning, which is considered in relation to the structure or functions of the system, and is understood as the preservation by the system of predetermined parameters under the influence of various kinds of disturbances.

In our opinion, stability is the ability of a system to maintain specified parameters for a certain period of time under the influence of internal and external disturbances [13].

In turn, development is considered as a progressive movement, which allows for a more qualitative transition from one state to another. The development of industrial production is carried out in the following areas:

- integration development is the expansion of spheres of influence, for example, the merger of several enterprises or increased control over suppliers;
- concentration development is the concentration of an enterprise on a specific management object that can ensure economic growth;
- intensive development - expansion of technical and scientific capabilities with the help of existing production facilities;
- innovative development is the replacement of existing equipment with equipment with more efficient technological and economic indicators;
digital development consists in the transition to automated, digital and intelligent processes that will autonomously manage industrial production and maintain the stability of a group of enterprises [14].

At the same time, sustainable development must be carried out in the following areas:

- the presence of predetermined development guidelines (customer satisfaction, economic development and the preservation of predetermined work parameters);
- the use of intensification at certain stages of the production process;
- correction of development directions (deviations from the designated trajectory) arising from interactions with endogenous and exogenous factors;
- maintaining the state of the production complex as a result of changes in its individual components [15].

In our opinion, in order to achieve sustainable development, it is necessary to provide for a number of measures aimed at managing sustainability, which should include:

- organizational preparation for planning at the enterprise;
- the opinion of the management staff on the further development of the enterprise;
- development of options and evaluation of their implementation;
- analysis of selected areas, the search for the necessary funds to achieve the goal [16; 17].

Moreover, the specified set of measures aimed at ensuring sustainable development may contain a number of organizational and managerial mechanisms that allow you to manage, regulate and adjust the process of achieving sustainable functioning and economic development of industrial production.

4. Discussion

The analyzed definitions of determining sustainability and achieving sustainable development provide for various concepts, the formation of which are based on general rules and laws. We single out the generalized factors and adapt them to the electric power complex of the Russian Federation:

- the level of influence of external factors on the stable functioning and economic development of the electric power complex;
- level of financial stability;
- level of technical and technological stability;
- volumes of investment resources aimed at economic development;
- the level of environmental safety of the functioning objects of the electric power complex;
- the level of development of market relations in the electric power industry;
- the share of electric energy flows between power systems;
- level of innovative development of electric power facilities.

Thus, a combination of factors creates a system that ensures the stable functioning and economic development of the electric power complex. Of course, to achieve full sustainability, it is necessary to manage these factors and reduce the negative impact of the identified factors. It should be noted that in the electric power industry the process of production, transmission, distribution and consumption of electric energy is inextricable and unified, which requires a complex of joint decision-making at all stages of the production cycle and levels of managerial decision-making.

5. Conclusion

In the presented study, the electric power complex was analyzed. Among the main features, the work revealed its indissolubility in the production, transmission, distribution and consumption of electric energy, which requires the industry to search for various mechanisms that ensure stable functioning and economic development in modern realities of the external and internal environment. In the study,
an analysis of the definition of stability was carried out, according to the results of which the authors proposed that stability is the ability of a system to maintain specified parameters for a certain period of time under the influence of internal and external disturbances. At the end of the study, factors were identified that affect the sustainable development of the electric power complex.

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