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MAIN CHALLENGES OF MANAGING A FUEL AND ENERGY BALANCE

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Abstract: The article reveals the main challenges of managing a fuel and energy balance. It emphasizes the importance of improving the methodological foundations for forming fuel and energy balances to preserve and manage economic security. The authors of the article study the existing foreign experience in this sphere. The article examines the energy market during a global pandemic. Problem areas in managing the fuel and energy complex are determined through the Ishikawa diagram and structured into four groups: "approaches and methods", "a monetary fuel and energy balance", "information structure" and "drawing up a fuel and energy balance". The development of methodological tools should form dynamic and flexible fuel and energy balances that can respond timely to trends both in the national and global markets of energy resources. At the same time, they should help to adapt to global trends in the development of alternative energy and include this component in their structure. The ambiguity of viewpoints on the management of a fuel and energy balance predetermines the increased interest of various parties, both representatives of academic science and government.

Keywords: fuel and energy balance, optimization, management, energy resources, balance model.

INTRODUCTION

A fuel and energy balance is the balance of processing, producing, transforming, transporting and consuming all types of fuel and energy resources (Rekomendatsii "kruglogo stola", 2017). An energy balance shows fuel flows in the system and the location of losses (Bejan, Mamut, 1998). According to the territorial classification, balances can be federal and regional. The development of balances comprises both projected and reported fuel and energy balances.

The former aim at adjusting the demand and supply of resources, while the latter should assess changes in the structure and efficiency of consuming fuel and energy resources. The differences between the above-mentioned balances can be noted in their base compilation. Projected balances are strategic plans, while reported balances are

nothing more than statistical reports. The main goal of a fuel and energy balance is to coordinate technological ties among enterprises of the fuel and energy complex and plan their indicators.

MATERIALS AND METHODS

Historical Preconditions of the Fuel and Energy Balance Formation

One of the important goals of public administration is to ensure stable energy supply and energy security of a particular country and its regions. Considering the current regulation of energy import and export, we need to consider the issue of balancing the consumption of primary energy resources and the development of oil, coal and natural gas production (Romanov, Alekseev, 2010). State-planned economies ensured the distribution of consumption and production (namely, solved the problem of unevenness) through limiting the use and extraction of resources.

The 20th century introduced a system of fuel and energy balances, including consolidated, comprehensive and natural balances. The documentation on fuel and energy balances consisted of about 25 subordinate and interconnected documents that ensured the continuity of data. Today, a system having similar formal characteristics is still present but it has changed its functional component. Currently, the fuel and energy balance formation is not enshrined at the legislative level.

However, projected balances are developed at the federal level by the Ministry of Regional Development of the Russian Federation and the Ministry of Energy of the Russian Federation. Taking into account the fact that the numerical data of such balances are not linked to the budget of the country and its regions, fuel and energy balances are regarded as statistical documents that are often incorrect. Consequently, a fuel and energy balance should regulate the volume of production, demand for the production of energy resources, conditions and procedures for their use, as well as consumption. Furthermore, this sphere needs strict state control.

Foreign Experience

Let us consider the experience of other countries. For example, the United States adopted a document that describes the main goals of a fuel and energy balance and is entitled the "National Energy Policy" (Rekomendatsii "kruglogo stola", 2017). This law enlists measures that should be taken if the existing balances are not effective. In Germany, special attention is paid to the interaction of energy producers and the state.

There is a specific law that reveals certain aspects of projected fuel and energy balances. Therefore, the world utilizes the centralized management of energy systems with mandatory state regulation. In foreign countries, state control over energy and fuel balances based on market regulation methods brings positive results into pricing and tariff policies. Thereby, it gives an impetus for the dynamic development of investment attractiveness and productive forces in the fuel and energy complex.

Energy Market During the Pandemic

Modern Russia needs to adhere to similar approaches since a balance should be an adaptive tool reflecting the real energy market under the influence of internal and

external factors. Thus, the methodological framework for forming balances should demonstrate the development of the market with the help of influencing factors and reflect the ability of the market to develop in a certain way through changing the factors under consideration.

Currently, the volume of the global fuel and energy balance amounts to 24% of gas, 40% of oil, 26% of coal, 7% of nuclear energy and 3% of hydropower. In contrast to the world indicators, most energy resources in Russia are made by gas (more than 50%), oil (30%) and coal (14%). Unconventional resources comprise less than 2% (Valiullina, Livshits, 2017). It is worth mentioning that alternative energy develops rapidly and it is difficult to accurately forecast indicators for 10 years. Olga Samofalova wrote an article for the "Vzglyad" business newspaper and noted that the world started to return to traditional energy during the pandemic.

Thus, the OPEC and coronavirus caused tectonic changes in the global energy market. Being a relatively cheap mineral, coal began to rise in price. In turn, oil and gas prices significantly decreased during the pandemic, which negatively affected the demand for renewable energy sources. Black gold fell in value if compared to coal contracts in the energy content (Pandemiya vernula mir k traditsionnoi energetike, 2020). Low prices for gas and oil cannot affect their production.

However, coal can be replaced with gas since the latter is a more cost-effective solution. Igor Yushkov, a leading expert of the National Energy Security Fund, believes that "the cheaper oil and gas are, the more willing consumers are to switch to them. This seriously undermines green energy. During the current price drop, traditional energy gains some advantages". The declining interest in renewable energy was noted in 2014 due to the collapse of oil prices. The year 2017 was marked by the largest number of global investments in renewable energy.

The above-mentioned facts do not mean that green energy projects will be suspended since environmental factors play an important role and are among the main values of the European Union (Pandemiya vernula mir k traditsionnoi energetike, 2020). Therefore, as soon as the global market stabilizes, renewable energy will become relevant again.

Fuel and Energy Balance Management Systems

A balance model aims at solving the optimization problem of allocating available resources. In some cases, the interests of companies are taken into consideration, for example, when it comes to corporate and private property. There is a direct dependence of a company's viability on the compliance of balance sheets with the existing conditions of the market economy.

The fuel and energy balance management system should be improved through the competition of energy and fuel upon their consumption and interchangeability. It is also necessary to increase the efficient use of resources, including renewable, to stimulate their production and consumption.

Thus, it is necessary to develop a special program to solve the problems presented in Figure 1 and optimize the work on drawing up a fuel and energy balance. Some scholars determine the following tools for the fuel and energy balance formation: models for optimizing economic forecasting at all levels; simulation models for forecasting the demand for fuel and energy; sectoral simulation and optimization models for forecasting the supply of fuel and energy; simulation models for forming an integrated system of

forecasting fuel and energy balances in federal districts and constituent entities of the Russian Federation; intersectoral optimization models for determining the optimal balances of commercial energy resources (Fuel and Energy Balances, 2018).

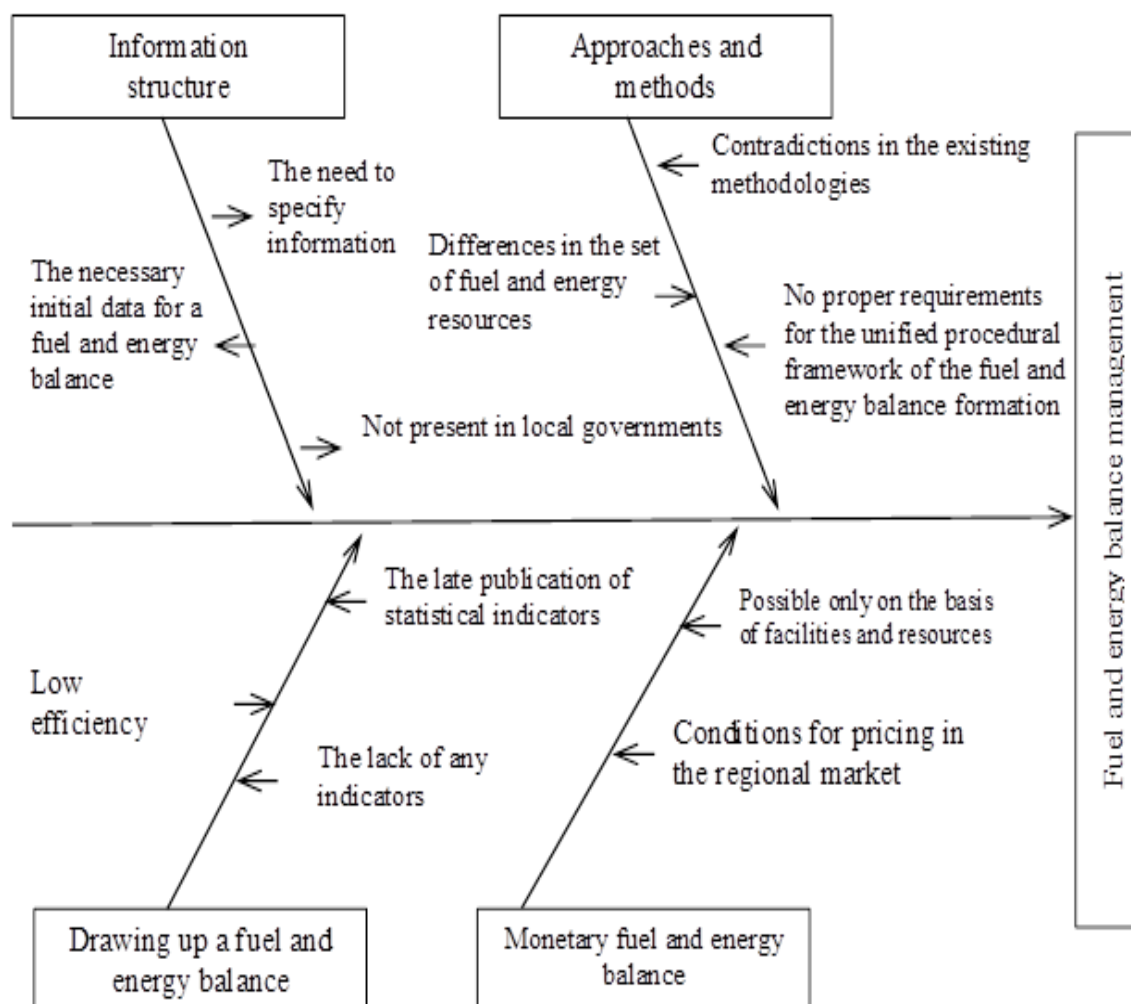


Figure 1. Bottlenecks in the fuel and energy balance management

The development of models forecasting economic needs in the main indicators of fuel and energy balances and energy resources is based on a database, namely, time series containing characteristics of the Russian fuel and energy balance in the format recommended by the International Economic Agency (Slobodyanik, 2015). The information base is built over calculations of the Russian fuel and energy balance. It considers the provisions outlined in methodological materials of international organizations, "Methodological regulations for calculating the fuel and energy balance of the Russian Federation in accordance with international practice" (approved by the decree of the State Statistics Committee of the Russian Federation of June 23, 1999, as of July 2011), "The official statistical methodology for compiling the fuel and energy balance of the Russian Federation" (approved by the Order of the Federal State Statistics Service of April 4, 2014) (Slobodyanik, 2015).

While forming the Russian fuel and energy balances in the format developed by the International Energy Agency, legislators asked specialists for help and received the

necessary consultations. Many studies have been conducted for the expert formation of the Russian fuel and energy balances in accordance with methods of the International Energy Agency, but they have not been published.

Therefore, scholars need to independently estimate a series of Russian fuel and energy balances. Considering the experience of the International Energy Agency, the Russian Federation and the Statistical Office of the European Communities, it is worth noting that the summary table for a fuel and energy balance can be presented in different ways.

The main condition is that such a scheme for organizing the relevant information should be drawn up to enable economic analysis. Let us consider the fuel and energy balance conducted in the format provided by the Federal State Statistics Service and the International Energy Agency (Table 1).

Table 1. Similarities and differences of a fuel and energy balance in the Federal State Statistics Service and the International Energy Agency

	Federal State Statistics Service	International Energy Agency
Balance structure (similarity)	Matrix structure, relationships between energy products and energy flows.	Matrix structure, relationships between energy products and energy flows.
Balance columns (difference)	The columns of the aggregated fuel and energy balance compiled in the format developed by the Federal State Statistics Service contain both primary and secondary energy products (for example, natural fuel and fuel refined products), which does not allow to sum columns since there will be double counting.	The columns of the fuel and energy balance compiled in the format developed by the International Energy Agency present different types of energy products: fossil fuels (columns 1-4), alternative energy sources (columns 5-7), biofuels and waste. The resource section reflects the supply of only primary energy products to the domestic market. Upon consolidating data on the movement of energy flows in the economy, this allows considering all energy resources and avoiding double counting. The final column of the aggregated energy balance compiled in the format developed by the International Energy Agency reflects the total primary energy supply or energy consumption in the national economy.
Balance lines (similarity)	The balance principle of equality of resources and their use.	The balance principle of equality of resources and their use.

The above-mentioned formats have significant differences. However, the process of drawing up a fuel and energy balance should not only reformat its columns and balance

lines. The main issue is to select a method for converting primary non-fuel energy products into standard energy units (Slobodyanik, 2015).

Statistical bodies recommend using a method for accounting the stock of physical energy contained in the produced volume of energy products, which enables to estimate the actual volume of energy consumption. Russia still uses the method of "partial replacement" that has long been outdated, as believed by foreign experts. According to this method, a certain energy value is set for the production of electricity, which is equal to the hypothetical amount of fuel required to generate the same amount of electricity at thermal electric power stations.

RESULTS

While studying the available data, considering fuel and energy balance management systems and determining bottlenecks in the fuel and energy balance management, we also compared various formats for forming the fuel and energy balance and analyzed the resource market during the pandemic.

At the same time, we should note that the study results proved the need to ensure the flexibility of fuel and energy balances and improve their adaptation to the global trends emerging in the energy market. In addition, it is necessary to consider alternative energy sources, include them into the structure of fuel and energy balances and gradually increase their share. However, this issue requires a more detailed study and will be the subject of further research.

DISCUSSION

The research topic is relevant since many scholars considered the problem of developing a fuel and energy balance and sought possible solutions. O.N. Vishnyakova emphasized the importance of optimizing fuel and energy balances to assess the general state of the fuel and energy complex in a certain region, characterize the actual level of energy and fuel use and identify the reserves and losses of increasing energy and fuel use (Vishnyakova, 2002).

A.A. Belitskii noted that the optimization of fuel and energy balances is a strategic task, whose solution presupposes the following conditions: the efficient structure of fuel and energy consumption, a guarantee of the fulfillment of social and export obligations, the development of transport infrastructure and the replenishment of the resource base.

According to Belitskii, fuel and energy balances are inextricably linked with socio-economic development and are the second most important document after the forecast of socio-economic development (Belitskii, 2017). G.L. Ryabtsev introduced a number of the necessary measures preceding the optimization of fuel and energy balances: the selection of unified methodological approaches, the formation of a regulatory and information base for operational, consolidated and projected fuel and energy balances; the consideration of international recommendations on the structure, powers and functional responsibilities for drawing up fuel and energy balances; the development of tools for optimizing fuel and energy balances; the determination of the level of energy security and monitoring of indicators; the reduction of the time required for compiling reporting documents (Ryabtsev, 2018).

The following scholars wrote about fuel and energy balances, the problems of their development and other aspects related to the optimization of fuel and energy

components: V.V. Zyryanov, M.V. Goryainov, M.L. Baskova, B.G. Saneev, A.D. Sokolov, S.Yu. Muzychuk and R.I. Muzychuk (Zyryanov, 2006; Goryainov, 2015; Baskova, 2016; Saneev et al., 2013).

CONCLUSION

Thus, we can conclude that there is a need to improve fuel and energy balance models, optimize their structure, develop uniform requirements for their methodological base and specify the data contained in such models. Fuel and energy balances should be optimized in accordance with the principles of resource interchangeability, economic efficiency, environmental safety and rational consumption.

It is also necessary to apply a monetary fuel and energy balance to further study new organizational structures of the fuel and energy complex. However, its formation is possible only based on material balances.

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