Chapter 18
Digitalization of the Development of the Fuel and Energy Balance of Russia's Northern Territories:
Example of the Republic of Sakha (Yakutia)

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ABSTRACT

The urgency of the energy budget research practice in the Republic of Sakha (Yakutia) on settlements with software for effective formation, implementation, management, monitoring, analysis, evaluation, rapid response, and strategic management of the entire complex of the energy budget is substantiated. The chapter reveals the lack of problems of unified methodology for the development of the energy budget and the use of different fundamentals of its preparation. The necessity of using digital technologies to develop a control system for a complex network of production and consumption of fuel and energy resources is rationalized.

INTRODUCTION

This chapter of the book demonstrates the importance of energy security for all, without exception, the world's northern regions with severe climatic conditions. Hence, it means a need to develop optimal and long-term fuel and energy balances (FEB) of the region in the context of each population item and consumer groups. In the long term, it is possible to effectively develop the fuel and energy balance for

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each region, which takes into account the fuel and energy potential of neighboring territories only using digital technology programs.

This work aims at compiling a large number of digital and analytical materials on the production and consumption of energy resources; analysis and assessment of the effectiveness of their use; compiling and selecting from many forecast scenarios for the development and use of different types of fuel and energy the one that is the most effective in a specific period of time, in the context of each settlement and consumer groups, including households, organizations and large industrial companies.

The main goal of such a digital FEB is to provide data analysis and digital modeling to efficiently generate, implement and modify a prospective FEB for the long-term period, for example, 100 years ahead. It is important even in using such types of energy as the friendliest for the environment for 100-150 years ahead. Digital technological software enables future generations to quickly respond and adapt the digital FEB. It will be modified to meet the conditions of the global energy and power markets, global and regional energy sectors, including potential generation, on a large scale, of renewable energy.

The chapter identifies the lack of a unified methodology for the development of FEB, the use of different fundamental principles of its compilation. It presents examples of compiling an information and analytical database for fuel and energy indicators in the Western economic zone of the Republic of Sakha (Yakutia) in the context of its villages and various consumer groups, using the example of the region. The balance development stages for settlements in the region are presented.

The chapter substantiates the use of digital technologies to develop a control system for a complex network of production and consumption of fuel and energy resources. Using a digital fuel and energy balance facilitates to expansive and efficient monitoring, analyzing, and evaluation the effectiveness of each type of local, regional or imported energy resources. It also enables operational and strategic management of the entire fuel and energy complex of the regions, taking into account the long-term energy needs of consumers. The ultimate goal of the fuel and energy balance is the continuous and reliable supply of high-quality and efficient fuel and energy resources to all consumers for the long-term period.

BACKGROUND

The strategy for sustainable development of regions provides for the prevention and protection from existing and new dangers and threats. All kinds of challenges and threats imply the creation of appropriate security systems, including an energy security system in a particular region, taking into account the development of an integrated system of social, economic and energy security across the country and each territory. One of the priority factors of sustainable social and economic development of the region that determine the life of economic facilities and the standard of living of the population is to ensure its energy security.

Security is the state of an object in the system of its connections in terms of its ability to self-preserve and develop in the face of internal and external threats, as well as the actions of unpredictable and difficult to predict factors (Ilyin et al., 2015). Ensuring the energy security of the region is a primary state task, since it is so important for any state to reliably provide its citizens with heat and light, and to freeze life-supporting facilities without any special threats or dangers, especially in the extreme climatic conditions of the North and the Arctic. Therefore, the State energy policy and Energy strategies for sustainable energy development of the regions and countries are based on a competent compilation