Energy saving and energy efficiency improvement in the Russian Federation

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Abstract. The article emphasizes the need for developing and implementing energy-saving technologies to improve energy efficiency. Technological terms used in the process of energy saving are defined. The system of energy saving and energy efficiency improvement as an integral part of the federal energy policy of Russia is described taking into account the development of various industries. The current trends in the regulation of relations in this area are analyzed. The article describes energy-saving technologies that can be used by industrial enterprises. Based on the world and Russian practices, organizational measures in the field of energy saving and energy efficiency are suggested.

1. Introduction
At present, the most important conditions for the development of the Russian economy and in the energy sector are energy-saving technologies and increasing energy efficiency. Environmental requirements and energy efficiency guide the formation of energy systems and equipment, resource extraction technologies, and other industries [1].

In the Russian economy, energy conservation and energy-saving technologies have been implemented by various industries [4].

Many global problems are associated with energy conservation: limited world reserves of fuel and energy resources with a constant increased power generation, environmental consequences of an increased energy production and consumption, or the greenhouse effect [10].

At present, energy conservation is quite a topical issue in Russia. The RF has all required natural resources to provide the population with fuel and energy and export energy resources in volumes that are strategically important for importers [9].

2. Materials and methods
During the study, the authors derived technological terms that define the nature of the energy-saving process [12]. The technological terms [5] that determine the energy saving process are presented in table 1.
Table 1. - Technological terms defining the process of energy saving.

| Technological terms                  | Measures to implement the energy conservation process                                      |
|--------------------------------------|---------------------------------------------------------------------------------------------|
| Energy Saving                        | Techniques and methods that affect the rational use of energy resources.                    |
| Energy Conservation Indicator        | Qualitative or quantitative coefficient of projected or implemented energy supply measures |
| Energy saving policy                 | A comprehensive and systematic program of measures at the state level to create the necessary organizational, material, financial and other conditions to rationalize and save energy resources. |

The urgent task of industrial enterprises is to implement energy-saving technologies that help reduce the specific volume of energy consumption by all industries [6]. The speed with which the reserves are used depends on the implementation of technical, economic and legislative measures [8].

In the system of measures required for the improvement and development of energy saving processes, there are two possible approaches: theoretical and methodological and professional and practical [14].

Technologically, the energy economy of an industrial enterprise is divided into a number of interconnected energy supply systems: electricity, water, heat, gas, air and other power management systems. In turn, the development of energy-saving technologies consists of several stages [16]. The stages are presented in figure 1.

![Stages of energy-saving technologies](image)

**Figure 1.** Stages of energy-saving technologies.

The rational choice of equipment has the greatest impact on the energy efficiency and energy saving of industrial enterprises, since modern equipment can reduce energy losses [3].

Reliable and economical supply of power consumers with quality electricity is a necessary condition for the normal operation of any industrial enterprise [18]. This approach involves energy efficiency in the operation of the power supply system, power quality requirements, and the use of the process machine [13].

3. Results
Identifying organizational measures that will contribute to the process of energy conservation and energy efficiency. Organizational measures are one of the tools aimed to improve the efficiency of energy-saving at industrial enterprises (figure 2) [2;11].
Organizational measures to improve energy efficiency

- Introduction and application of the energy management system of an industrial enterprise
- Developing and adopting a program for energy conservation and energy efficiency processes
- Drawing up an energy balance on the basis of data on energy consumption
- Information support and training
- Conducting energy equipment
- Encouraging and promoting energy conservation
- Conducting energy efficiency benchmarking
- Statistical data analysis and monitoring

**Figure 2.** Organizational measures to improve energy efficiency.

Organizational measures, namely the introduction of energy meters and energy audits, are not aimed at real energy saving and energy efficiency [7]. These measures precede the actual reduction of consumption of energy resources and improvement in the energy efficiency.

4. Discussion
The energy saving potential in the Russian Federation is one third of the current volume of energy consumption [25]. Over the past ten years, the level of energy intensity has decreased by 9.7% due to the improved energy efficiency of energy-consuming equipment and the implementation of production capacities [17]. Energy intensity levels of Russian industrial enterprises are 1.2-2 times lower than the world average, indicating ample opportunities to increase energy in many industries [26].

The development of the institutional environment in the field of energy saving and energy efficiency improvement by the government enables enterprises to intensify the implementation of projects based on distribution energy technologies [15;21].

The Law "On Energy Saving and Energy Efficiency Improvement" has been amended; its provisions are dynamic and take into account social and technological trends [23]. The law describes basic concepts, such as energy resources, secondary energy resources, energy saving, energy efficiency, energy efficiency classes, energy audit, energy service contracts that contribute to the development of relations involving distribution energy facilities [19].

The Federal Program for the Development of the Energy Industry contains a subprogram "Energy Saving and Energy Efficiency Improvement" [22]. The main tasks include development of the institutional environment as a set of legal, organizational, managerial, financial and logistical conditions that stimulate and ensure the implementation of initiatives and measures [20].

However, despite the fact that the government applies levers improvement, there are no mechanisms for implementing energy saving projects [24]. Industrial enterprises and household consumers do not participate in the improvement of energy efficiency.

5. Conclusion
Energy saving and energy efficiency improvement have been an integral part of the federal energy policy, in which the government has priority in the development and implementation of energy saving mechanisms and projects. New organizational approaches are required for the development of the energy sector. Energy consumers should be involved in this process.
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