



ENERGY SAVING, ALTERNATIVE SOURCES OF ENERGY, ENERGY SECURITY

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ABSTRACT

The article considers energy saving, alternative energy, electrical safety and gives an idea on the way of introduction of renewable energy in Russia.

Key words: Energy saving, alternative energy, energy security

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1. INTRODUCTION

Over the last decades of the twentieth century, as a result of the scientific and technological revolution, there have been tremendous changes in the structure of the productive forces, the world economy, and the financial system. From the middle of the twentieth century, the modern world separates the whole epoch - the era of the transformation of science into a direct productive force, the era of the transfer of production into the information sphere, the era of the development of high technologies and electronic means of communication, allowing instant communication with any point of the Earth, the era of digital technologies and tremendous progress in mastering space.

Never before has the world been so interconnected and interdependent. Never before has mankind come face to face with such problems caused by the results of his own activity - the possibility of exhaustion of natural resources, the greenhouse effect, the climate change of the Earth.

With the further development of technologies, the need to increase energy resources only increases. The entire modern world economy depends on the wealth accumulated in times of dinosaurs: oil, gas, coal and other fossil fuels, and from the burning of this prehistoric inheritance.

All the governments of the Earth agree that saving energy is one of the most important tasks for preserving the natural resources of our planet. And the result of this agreement was the definition formulated at the International Energy Conference (MIREC) of the United Nations that energy saving is the effective use of energy resources through the use of

innovative solutions that are technically feasible, economically justified, environmentally and socially acceptable, do not change the habitual way of life. [9].

2. ENERGY SAVING

In various sources [3, 5, 6, 12], the definition of energy saving is given differently.

The Federal Laws of the Russian Federation state that energy saving (energy saving) is the implementation of legal, organizational, scientific, industrial, technical and economic measures aimed at the efficient (rational) use (and economical expenditure) of fuel and energy resources [1] and involving in the economic circulation of renewable energy sources [2].

For Russia, there is primarily a housing and utilities (utilities), where the energy expenditure due to climatic conditions is more spent on heating housing and buildings. So according to statistical data from [6] it is said that the biggest losses of electricity to 90% are in this sector. The loss of electricity during transmission (power grid) is from 9 to 10%. Loss of up to 1% of electricity from household appliances. This is why all major energy saving efforts in Russia are concentrated in the sphere of electricity consumption in the housing and utilities sector. And today, energy-saving technologies include methods and solutions that reduce useless energy losses in order to save resources more economically.

A number of studies have been devoted to energy saving analysis [5, 14]. Particular attention was paid to the preservation of heat in living quarters and recommendations on the use of the latest technologies. Recommendations for builders of new residential buildings use the latest energy saving technologies [21]. The problem of optimal design of power grids, taking into account possible emergency situations, was considered in [3, 6]. In articles [7, 24] it is proposed to optimize energy supply using a direct method of probable analysis. In [23], the problem of electricity consumption in a residential building was analyzed, conclusions were drawn that reduced unnecessary energy losses in order to save resources more economically and provided recommendations for saving energy resources when working with household appliances. Solutions to reduce energy costs in production were described in [12], examples of such a solution, according to the conclusions of the authors, can serve to increase the degree of automation of equipment and production processes.

The energy saving policy today has three main directions: 1) elimination or useful utilization of energy losses; 2) improvement of energy-producing plants to save electricity; 3) intensive energy saving.

Energy saving specialists call their main goal - maximizing energy efficiency in all sectors and in every locality of the Russian Federation. They consider each case, be it an enterprise or an individual building, and consider that it is necessary to obtain as much reliable information as possible about the power system of the facility. Energy auditors today, as the Government of the Russian Federation says, should be interested in the volumes of consumed energy resources, energy efficiency indicators, as well as the possibility of using energy-saving technologies to increase it, and the results of such analysis should be included in the energy passport [12].

Effective and profitable programs are being developed to update the expansion and improvement of energy-producing plants to save electricity. These programs will provide an opportunity to step by step to innovative technologies and reducing risks to a minimum. On-site analysis is being carried out, developing a modernization plan, taking into account the features of the existing equipment. [15].

Speaking about intensive energy saving, we cannot say about the use of alternative, that is, renewable energy. After all, the connection of alternative sources to the common grid allows us to save mineral resources and save the ecological balance.

3. ALTERNATIVE ENERGY SOURCES

All the economists of the European Union agree that the decisive economic advantages will be given to those countries that are the first to implement the transition to alternative sources of energy and raw materials.

The leading states are already implementing programs for the gradual transition to clean and renewable energy sources.

In his message to the Federal Assembly in 2015, President Vladimir Putin said: "If we do not invest in this money, we will not invest our knowledge, in the long run, when the next scientific revolution takes place, we can be on the sidelines together with its gas and oil, will lose its competitiveness "[15].

What sources of energy can be considered alternative? And why the transition to their use will bring so many economic benefits?

The definition of alternative energy sources is given in [8] - these are environmentally friendly and renewable sources of energy. The authors consider them to be the main ones: solar, wind, tidal, geothermal and hydroelectric power stations. In fact, there are many more such sources.

The violent development of life for several billion years clearly demonstrates the provision of the Earth with energy sources. Sunlight, heat of the bowels and chemical potential allow living organisms to carry out multiple energy exchanges, existing in an environment created by physical factors - temperature, pressure, humidity, chemical composition.

Including technological progress all over the world does not stand still and this list can be expanded today. With the expansion of the list, the very definition of "alternative energy sources" also changes - these are types of energy, in the processing of which harm was minimal for the environment and ecology, with acceptable indicators of production costs, processing and transportation of energy resources. This definition was given by experts of the international venture fund I2BF. According to their forecasts, in 5-10 years, alternative energy technologies will become more competitive and will get mass distribution. According to them, even now the gap in the cost of alternative and traditional energy is rapidly declining. [8].

Geographical distribution of alternative energy resources, instability and variability of weather conditions, and at the same time, the generation of the energy of a thermal or nuclear power plant is constant and easily regulated. Because of these and many other complexities, the development of alternative energy in the world is slowing down. Burning fossil fuels is still easier and cheaper. In Fig. 1 shows the growth in consumption of fossil and renewable energy sources.

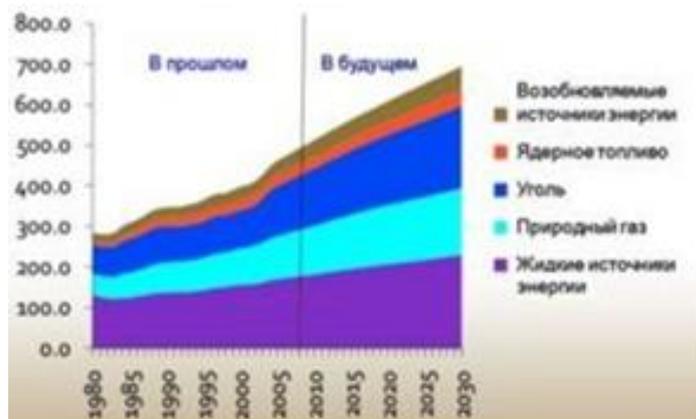


Figure 1 Scheme of consumption of renewable and fossil energy sources [16]

However, if in the global economy alternative energy sources do not provide much benefit, then within a single house they can be very attractive. The popularity of renewable alternative sources of energy, as before, is driven by economic priorities.

The cost of energy means the price that the producer of alternative energy wants to get during the life of the project to compensate for its capital expenditures and to ensure a return of 10% on invested capital. This price will also include the cost of debt financing, since most alternative and traditional energy projects are built with the involvement of a serious leverage lever. Today, as they say in [22], it is much easier to introduce the technologies of a nuclear power plant in a country not included in the IAEA than to obtain technologies for obtaining alternative energy.

But there are also widely available alternative energy sources for the home, such as sunlight, wind power, biological gas, and temperature difference. For these types of alternative renewable energies, there are ready solutions successfully implemented in mass production: solar batteries, wind generators, biogas plants and heat pumps of various capacities. They can be purchased together with delivery and installation for a private house, as well as for a small production, for example, an agricultural farm or a repair garage.

There are a lot of popular science and technical literature, specialized sites on the Internet, where the operation of plants and the physical or chemical laws used by these plants, working on the basis of alternative, renewable energy, are described in sufficient detail. Schemes, drawings, photos and videos are given as how to independently assemble the installation you like, where and how to properly place it on your site or on the balcony of a high-rise building. Also, any reader will be able to find information on the synthesis of biogas from the waste products of animals and birds, how to install a methantank in the area outside the city with their own hands to produce methane, how methane to cleanse the impurities of hydrogen sulphide and other organic compounds and use as fuel for burners in thermal generators or fuel for the engine of tractors.

In information and science-popular magazines and websites on the Internet, you can find a very specific receipt of electricity from our everyday life. For example, the source [24] refers to the Japanese company East Japan Railway Company, which equip each turnstile at the railway stations with generators. These facilities operate at the station in Tokyo's Shibuya district: on the floor under the turnstiles, it has built in piezoelectric elements, producing electricity from pressure and vibration when rising, passing through the turnstiles of people. Of course, the generation of electricity in this case can cover only the costs of lighting the

given station, but the developers of the idea do not want to stop there. And such examples can be found more hundreds around the world for each calendar year.

The introduction of alternative technologies in Russia takes place without planning and only at the expense of enthusiasts of new technologies. Support of the state of entrepreneurs in this industry, in the best case, only information is provided. No tax rebates or any incentives for implementing alternative energy are envisioned. It is for this reason that the cost of assembled installations from the exported parts costs the domestic producers a substantial amount, and this affects the final buyer and the user. Hence the minimal interest in the use of renewable energy in the population of our country.

Anatoly Chubais, chairman of the board of Rosnano state corporation, said in an exclusive interview during the Davos Economic Forum on January 24, 2018: "Ten-year efforts to create a national renewable energy project in Russia have come to the end successfully. The Russian solar power industry has taken place, even the first wind power station has been launched. ". He also talked about the large-scale localization of renewable energy projects on the territory of our country and noted why one should not be afraid of shale oil. [25].

At the consumer and the supplier with different interests there is one common goal - energy security.

4. ENERGY SECURITY

Energy security is only one of the components of the security of the state as a whole, as well as the security of the structures of state power and administration.

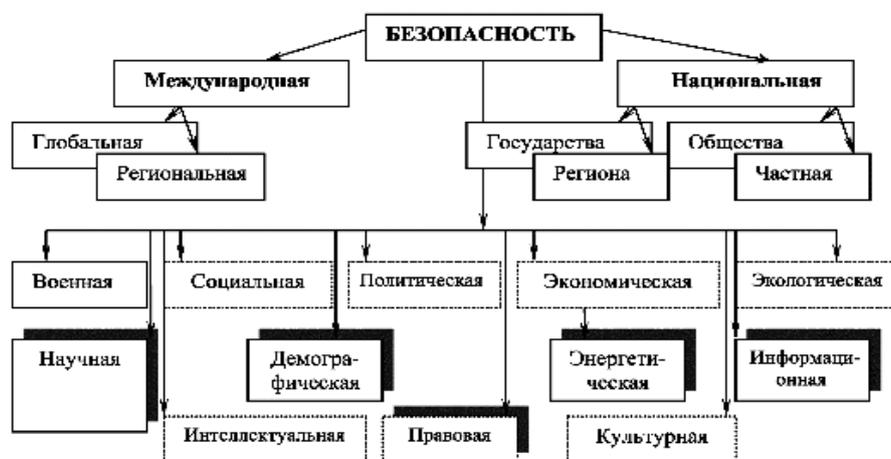


Figure 2 The scheme of the structure of state security [22].

After analyzing the various formulations of energy security, we can confidently say that there is no single definition of this term today. The absence of such a definition does not allow us to set competent tasks and draw the right conclusions regarding this important component of the security of both the state and the security of the structures of state power and administration.

The best definition of energy security according to the authors' thinking of this article is given in the source [19]: "Energy security implies such conditions under which the consumer has reliable access to the necessary energy, and the supplier - to its consumers. That is, it is not just about uninterrupted flows, but also about stable and reasonable prices. " Thus, ensuring energy security is necessary for both consumers and suppliers.

Energy security according to [1] is a complex concept related to several levels:

- political energy security;
- economic energy security;
- technogenic energy security.

In the source [2], it is said that the energy interests of the state and its citizens are vital and long-term, that energy security is reduced to the rational use of available energy resources obtained from all types and sources of energy, as well as to the production, conservation and accumulation of energy potential and energy resources of high quality, including through alternative sources of energy.

In article [13] it is said that the stability of energy security can be threatened by the need to conduct exploration and production of energy resources in increasingly difficult conditions, which is possible only with the use of cutting-edge technologies, so the author considers the issue of preserving the environment.

The author [9] points out that significant difficulties of suppliers of energy resources in 2030 will be with its transportation. He asks the question: "what will be the cost price and the cost of extraction, how much will it cost to deliver them and how much will the consumer ultimately have to pay if, according to specialists, up to 2030, it will take about 3 trillion. investment in the oil sector, including exploration of new deposits, construction of tankers, pipelines and oil refineries. "

Fossil energy resources, of course, "have the property of ending." Based on the level of oil consumption and economic growth forecasts, by 2030 the daily consumption of oil, according to the calculations of the IEA [22], should increase to 121 million barrels, or up to 6 billion tons per year. Practically in all oil-producing regions, oil production will be close to the maximum. However, the largest increase in production will be achieved in offshore fields, as well as in fields known in Russia and Iraq, but which have not been developed to date. In addition, new fields will be put into circulation in Canada and Venezuela.

Threats to energy security are short-term or long-term events that can destabilize the energy complex, limit or disrupt energy supply, lead to accidents and other negative consequences for the energy, economy and society.

Conventionally, threats to energy security are divided into groups: economic, socio-political, foreign economic and foreign policy, man-caused and natural threats, as well as threats associated with imperfect management. All these groups of threats have the most direct relation to the energy complex of Russia.

The uninterrupted operation of energy facilities depends on the technical condition of the equipment, actual wear and other factors. The financial condition of energy enterprises and the monopolization of production and supply of fuel and energy can also be the causes of the security threat.

In articles [23, 25], the authors argue that in recent years negative trends have emerged in the energy sector, that in the Russian energy sector, the necessary funds are not being invested in upgrading or modernizing equipment, which leads to aging, accidents and reduced availability. Reorganization of the energy structure led to the emergence of a number of independent organizations. More and more acute are issues of affordable and reliable energy supply to the economy and population, as well as ensuring the sustainable operation of the energy complex itself.

In this regard, it seems appropriate to use alternative sources more widely. And this applies to all sorts of modern "craftsmen" who independently collect wind generators and other sources of energy, as the author [21] seems to be ripe for the question of bringing the efforts of these craftsmen to a single denominator. Of course, no one has the right to limit the creativity of people, including technical ones. But it is unlikely that anyone will welcome the launch of this creativity on its own.

What is meant? In our opinion, the issue of deciding on the state level bringing into the uniform system of technical creativity of those who are engaged in this - first of all in practice and using auxiliary materials - is on its own. For this, it is necessary to create, with local authorities, a kind of clubs that unite such craftsmen. These clubs-associations should include not only representatives of government bodies, but also representatives of the Union of Industrialists and Entrepreneurs, supervisors, law enforcement agencies, as well as health care workers and educational institutions. In these clubs, it is possible to concentrate all that is "to the touch", by trial and error (often non-harmful) by people who are engaged in technical creativity, including in the field of energy, including alternative sources.

These clubs will be not just a place for communication and exchange of experience. Why is the representation in such clubs of industrialists and entrepreneurs extremely necessary? It is necessary to take into service and use in industry what has already been found "to the touch." To use, of course, taking not everything completely, but bringing the idea itself, cutting off the superfluous, applying not to handicraft, but to industrial production and using on their sites, of which the independent inventor, perhaps, had no idea.

This has not only scientific and technical, but also political significance. There is no need to repeat the words of the leaders of Russia about the importance of import substitution. But after all, the import substitution should concern also such spheres as the production and use of energy in accordance with the energy security of the country.

Not only is the technical aspect of creating such clubs important. One of the most serious problems of modern Russian society is the problem of awareness of adolescents of their lack of demand by society. In conditions where social elevators, especially in the Russian outback, even in the regional centers, not speaking already about small towns, have largely played a role, the number of waves of deviant behavior among adolescents is sharply increasing. In many respects this is due to the natural desire for adolescence to self-assert itself, to show oneself, to stand out from the ordinary atmosphere, especially in cities with a high percentage of unemployment and depressed production. This propensity for self-affirmation in the world around us, characteristic of adolescence, finds expression in the heroization of criminal pseudo-haberdashery, and in the armed attacks of substratums swept in early 2018 in schools, and often this adolescent desire for self-assertion results in a wave of teenage suicides, which public figures, sociologists and parents are already sounding alarm [15]. Therefore, as soon as possible measures are required to counteract all these destructive forms of behavior of actions directed at positive. One of such measures can be the creation and activities of clubs of technical creativity, in which adolescents feel themselves to be creators of even fantastic ideas, but those who are involved in the society. These clubs, especially with the competent work of local authorities, can attract adolescents who, while communicating among their peers, and among the same enthusiasts of invention and technology, can fully play the role of social elevators, especially for children from low-income families.

Thus, the study of the problems mentioned in the topic is of a complex nature and is at the junction of the directions of various branches of science and the social life of society.

Therefore, their research is not only today, but also tomorrow's science and opens up a vast space and prospects for researchers.

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