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INNOVATION IN ENERGY: CHALLENGES AND PROSPECTS

Abstract. One of the industry's most pressing innovation needs is energy digitalization. Right now, power engineers need to develop domestic software for managing electric networks and micro energy systems, information security systems of critical infrastructure, data analysis technology and predictive analytics. World crisis and energy. Oil reserves are depleted. Experts say that it will end on the planet with a continuing level of consumption in 20-30 years. There are more optimistic forecasts that indicate the existence of a large number of undiscovered reserves and the possibility of increasing production efficiency.

Keywords: energy, innovation, problems, prospects, crisis, raw materials.

INTRODUCTION

The limits of the oil economy are determined not by the threat of exhaustion of hydrocarbons, but by whether “black gold” allows production to develop on the achieved technological base. The years of the global crisis show that the existing energy sector is not able to provide cheaper goods, and consequently, to expand their sales and achieve economic growth. Given the environmental dimension, one cannot discount the negative consequences of using hydrocarbon fuels.

The reduction in oil and natural gas consumption under the influence of the economic crisis will not create a basis for overcoming it, although it will somewhat ease the situation of the industry due to lower prices. The modern crisis is a crisis of demand, a crisis of the end consumer. To overcome it, on the one hand, a policy of stimulating consumption is required, and on the other, it is necessary to create conditions for reducing the cost of industrial products. It is impossible to do this on the old technological base, since the limit of possibilities for using cheap labor has been reached, and raw materials are expensive. Sustainably low prices are needed for sustainable recovery, which is also impossible to achieve. Attempts by companies and governments to further reduce the cost of labor are destroying demand (narrowing the consumer market).

MAINPART

The crisis is extremely acute raises the question of new sources of energy. There is a version that investments in the development of alternative energy sources based on renewable resources made in Western countries can provide a gradual replacement of old sources.

“Before starting to introduce innovations, it is necessary to clearly calculate the consequences. Support for innovations that optimize current technological activities, which significantly reduce the operating costs of companies and thus increase their competitiveness, is clearly needed. In this direction the attention vector should be directed.”

Factors determining the development of new technologies:

• The volume of consumption of electric and thermal energy, which has recently been falling;

• Consumption pattern, changing towards decentralized consumption;

• Fuel policy, which is based on the rejection of coal, gas and nuclear energy, and the transition to fundamentally new sources;

• Automation of control and monitoring systems.

Based on these factors, we can conclude that in the near future a transition to a combined system of centralized and decentralized energy supply will be made.

At the same time, people will abandon traditional sources of energy that harm their health and have a devastating effect on the environment; instead of obsolete and inefficient resources, more productive sources, such as methane and hydrogen, will be used.

New technologies need to be introduced in the following segments:

• Private sector;
• Networks;
• Local generation;
• Industrial capacitive capacitors (drives);
• Heat supply.

It is worth noting that work on the introduction of innovations in each of the sectors is ongoing in our time, but the development has not yet found widespread acceptance and widespread adoption.

The development of small-scale energy requires various types of state support - from the formation of regulatory legal conditions to financing programs for the development and implementation of advanced technologies. The work is ongoing, but a new impetus will be given to it after all interested parties are actively involved in the process and the priorities of the transition of the Russian economy to an innovative development path are provided. And this will happen thanks to technology platforms, the formation of which began by decision of the Presidium of the Government Commission on High Technologies.

Technological platforms are a communication tool aimed at intensifying efforts to create and implement promising commercial technologies, new products, services, and to attract additional resources for research and development with the participation of business, science, the state, and civil society.

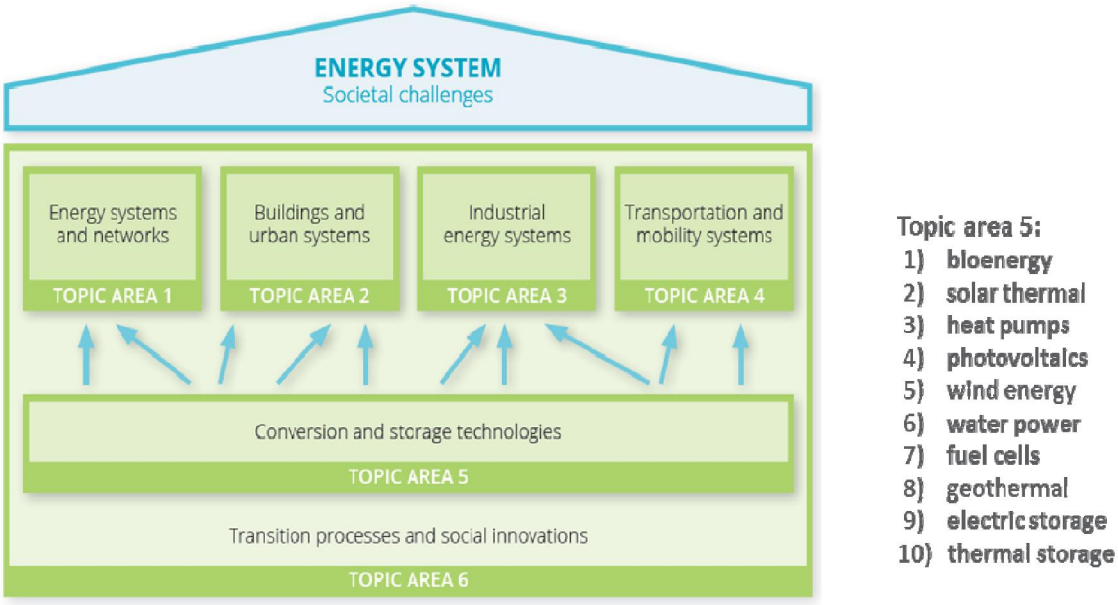

Figure 1 - Types of energy systems

We will examine each category in more detail to understand how new technologies in the electric power industry will help to improve them.

Energy-saving innovations in the private sector will help consumers significantly reduce utility bills. To accomplish this task, solar panels, wind generators, climate control systems, home generators, smart homes, heating elements, batteries, thermal insulation, building materials with enhanced operating characteristics are being developed.

Networks need to be upgraded primarily to increase their efficiency, security and the ability to manage a decentralized connected load.

To achieve these goals, we need automatic and automated control systems, new network technologies and micro-network complexes.

Local generation should develop the construction of electric and thermal stations that operate on alternative energy sources, for example, solar panels, wind generators, small hydropower plants, tidal energy, bio-generation, geothermal energy, waste generation, low-power hydrogen generators, small thermonuclear plants.

Industrial drives are being upgraded very rapidly, respectively, and their popularity among owners of residential and commercial premises is growing. With the invention of new technologies in this sector, the cost of finished products is significantly reduced, because experts predict that the cost of capacitors in 1-2 years will be one and a half to two dollars per 1 MW.

Heat supply needs modernization in the field of accounting, control, monitoring and management of decentralized networks and optimization of the configuration of load systems.

Investments are being made in the electric power industry to create a new level of a safe working environment for power plant personnel, and one of the leading directions here is the commercialization of robots that are resistant to extreme working conditions and remotely controlled. The reduction in oil and natural gas consumption under the influence of the economic crisis will not create a basis for overcoming it, although it will somewhat ease the situation of the industry due to lower prices. The modern crisis is a crisis of demand, a crisis of the end consumer. To overcome it, on the one hand, a policy of stimulating consumption is required, and on the other, it is necessary to create conditions for reducing the cost of industrial products. It is impossible to do this on the old technological base, since the limit of possibilities for using cheap labor has been reached, and raw materials are expensive. Sustainably low prices are needed for sustainable recovery, which is also impossible to achieve. Attempts by companies and governments to further reduce the cost of labor are destroying demand (narrowing the consumer market).

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Biofuel is a dead-end branch of technological evolution. It is acceptable for automobile corporations and does not seriously bother commodity monopolies. It is powerless to provide increased efficiency. Biofuel producers cannot do without government subsidies. A picture of the future with the widespread use of biofuels is nothing more than a conservative illusion. In addition, it must be borne in mind that biofuel production reduces food production and depletes soils.

Wind power. Along with biofuels, excessive hopes are placed on wind energy. It represents the electricity industry specializing in converting the kinetic energy of air masses in the atmosphere into electricity. To solve this problem, special units are used - wind generators.

Wind generators are often aesthetically perceived as a symbol of the energy of the future. Wind power plays an important role in the projects of the "green economy". From the point of view of the theory of limited resources for development, mankind can no longer do with extracted irreplaceable energy resources. The advantages of wind energy are reliance on natural sources of kinetic energy. But the wind far from everywhere on the planet can possess the necessary strength to provide a solution to the energy problem even at a local level. The convenience of wind generators for supplying power to remote farms or coastal zones does not yet make this technology convenient for industry and megacities. Even the rise in electricity prices in the 2000s. did not make wind generators comparatively economical. The noise and vibration they produce is additional interference. Another problem is the possible icing of the installation blades.

Wind power is rather a means of private solution to the energy problem than a general fundamental response to the energy challenge of time.

Geothermal energy. Geothermal energy provides a model of "inexhaustible energy", which is extremely important in the face of rising prices for the main XX century. sources of energy. This direction of energy is based on the production of thermal and electric energy due to the thermal energy contained in the bowels of the earth. Its receipt is provided by special geothermal stations. Geothermal sources are used economically in New Zealand, Iceland, Italy, France, Lithuania, Mexico, Nicaragua, Costa Rica, the Philippines, Indonesia, China, Japan, Kenya and the United States.

In the context of expensive hydrocarbon fuels, geothermal sources began to acquire greater importance: not so much government support for this area as the cheapness of obtaining heat and electricity made this line promising. Its main problem is the nature of the application associated with the limited availability of geothermal energy sources. Their operation cannot replace hydrocarbon fuel, which retains the significance of the world's main energy source. Geothermal energy remains a promising area, but cannot become a new locomotive in the energy sector. Its successful development is possible only in conjunction with other trends.

Solar energy. In solar forecasts, the forecasts predict the production by 2060 of 20-25% of all electricity needed by mankind.

Of much greater importance in the countries of southern Europe is the use of solar panels for heating water in homes. The limited domestic use of solar energy indicates its modest capabilities.

There are plans for the industrial development of electricity generation through solar power plants. One of the most famous projects is the construction plan for a huge power plant in the Sahara Desert (Tunisia). It is assumed that the deployment of huge solar panels in this region will allow to receive a significant amount of energy. The problems of the project lie in the difficulty of supplying electricity to Europe, unreasonably high costs for the construction and maintenance of units, sandy winds and other "climate tricks".

Environmentalists say the harmfulness of solar cell production. The construction of solar power stations is also expensive. Their payback is directly related to the increased situation on the world market of electricity, oil and gas. The development of solar energy is ensured by a rise in the cost of energy production using traditional - previously more economical - sources. The possibilities of the expanded use of solar energy devices directly depend on whether mankind can find new solutions in the energy sector. With a radical reduction in the cost of electricity (obtained in large volumes by new methods), the solar energy field will not be able to grow rapidly. On the contrary, the absence of such breakthroughs will provide more favorable conditions for it. But even adherents of this direction do not see the revolutionary future of solar energy.

The first concept involves the instantaneous calculation of the cost of energy consumed by an enterprise or household, up to the conclusion of the exact cost of daily consumption on a special panel or on mobile devices of consumers. The second is to create and use an interactive network resource control panel that real-time optimizes load balancing to prevent blackouts.

Hydrogen Energy The use of hydrogen as a means of accumulation, transportation and energy consumption is the basis of hydrogen energy. The development of this industry allows the use of hydrogen in production and for the needs of transport infrastructure. Hydrogen is very common on the surface of the Earth. The heat of combustion is extremely high. In oxygen, water becomes the combustion product. The problem is only the need to obtain hydrogen fuel from water.

Hydrogen energetics gives a lot of hope. In South Korea, a plan has been adopted to build up its importance in the economy, even building a "hydrogen economy". By 2050, it is planned to produce 22% of all energy, electricity consumed by the private sector on hydrogen fuel cells - 23%. No less impressive are the plans of the United States. The country expects to build "hydrogen energy" by 2025. Iceland's plans determine the date of the wide transition of the economy to hydrogen by 2050. However, the main use of hydrogen is associated with the production of ammonia and gasoline. The United States receives about 11 million tons of hydrogen annually. This amount is considered sufficient for annual consumption of 35-40 million cars. In the EU and the USA, special hydrogen pipelines operate; in Europe their length is 1,500, and in the USA - 750 km. Pipelines through which natural gas is transmitted can be used to transfer hydrogen to a distance after minor refinement. The problem is only economic feasibility.

The situation of the global energy impasse is characterized, on the one hand, by the exhaustion of the economic resource of oil and gas energy, and, on the other hand, by the presence of alternatives that are not capable of ensuring the revolutionary development of the energy sector in the near future. A sharp reduction in the cost of electricity as a result of a coup in the energy sector should ensure the expansion of applications in the production of robotics. It is also necessary to reduce the cost of production of synthetic materials, the development of new types that are advantageous in production. The emergence of opportunities to generate large amounts of cheap electricity can be a decisive condition for the emergence of new industries.

They use the kinetic energy of tidal waves to generate electricity. Their disadvantages are obvious: low power and the ability to use only in coastal areas. However, governments are eager to subsidize all of the alternative energy projects outlined, recognizing that they are not a threat to the old energy sector and are not even able to influence the decline in oil and natural gas prices. It is logical to conclude that the limitations of well-known alternative projects are their main attractive side. In no country of global capitalism do corporations and government bureaucracies seek to discount their investments.

CONCLUSION

Traditional power engineering needs not so much to be supplemented as to crowding out, swiftly replacing it with innovative technologies. This means the inevitability of a kind of "investment shock", when significant investments made earlier will be devalued at the same time and there will be a need for massive new investments. Development in such conditions can hardly be achieved without the active participation of the state and the nationalization of the industry, which allows it not only to withstand the investment shock, but also to carry out the transformation comprehensively and effectively on the basis of a single scenario.

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ЭНЕРГЕТИКАДАҒЫ ИННОВАЦИЯ:
ҚАУІПТІЛІКТЕР ЖӘНЕ ПРОЦЕПТЕР

Аннотация. Саланың ең маңызды инновациялық қажеттіліктерінің бірі - энергияны цифрландыру. Қазіргі уақытта энергетиктерге электр желілері мен микроэнергияны басқаруға арналған отандық бағдарламалық қамтамасыз етуді, маңызды инфрақұрылымның ақпараттық қауіпсіздік жүйелерін, деректерді талдау технологиясын және болжамды аналитиканы әзірлеу қажет. Әлемдік дағдарыс және энергетика. Мұнай қоры таусылды. Сарапшылардың пікірінше, бұл планетада 20-30 жылдан кейін тұрақты тұтыну деңгейімен аяқталады. Ашылмаған қорлардың көптігін және өндіріс тиімділігін арттыру мүмкіндігін көрсететін оптимистік болжамдар көп.

Түйін сөздер:энергетика, инновация, проблемалар, перспективалар, дағдарыс, шикізат.

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ИННОВАЦИИ В ЭНЕРГЕТИКЕ:
ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ

Аннотация. Одной из более актуальных потребностей отрасли в инновациях является цифровизация энергетики. Прямо сейчас энергетикам нужны разработки отечественного ПО управления электрическими сетями и микроэнергосистемами, систем информационной безопасности критической инфраструктуры, технологии анализа данных и предиктивной аналитики. Мировой кризис и энергетика. Запасы нефти исчерпаемы. Эксперты констатируют, что она закончится на планете при сохраняющемся уровне потребления через 20—30 лет. Существуют и более оптимистические прогнозы, указывающие на существование большого количества неразведанных запасов и возможность повышения эффективности добычи.

Ключевые слова:энергетика, инновации, проблемы, перспективы, кризис, сырье.

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