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## **ALTERNATIVE ENERGY SOURCES: APPLICATIONS AND PROSPECTS**

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### **Abstract**

The article analyzes the use of alternative energy sources mainly in Russia. It is shown that political and economic instability in countries specializing in the extraction of fossil energy sources and their production cannot increase indefinitely due to the limited natural resources. The author comes to the conclusion that the process of forming a management system that ensures the efficient use of alternative energy sources is still in its infancy. A scientifically-based state policy and economic strategy for the use of alternative energy sources have not yet been developed. The tools and forms used by States in creating the development of alternative energy sources, as well as in pricing surplus electricity, are very limited and insufficiently effective.

**Keywords:** resources, man, energy, agriculture, globalization.

### **I. INTRODUCTION**

The infrastructural conditions necessary for the development of alternative energy are extremely insufficient. They do not allow the creation of new energy sources adequate to the needs of the time, the introduction of mechanisms to stimulate the participation of business entities in the development of alternative energy and outperform competitors.

The process of forming a financial model for the use of alternative energy sources, which makes it possible to quickly recoup investments, export energy services to actively developing countries and make a profit, requires scientific approaches.

The system for managing the use of non-traditional energy sources in Russia is built in such a way that ordinary electricity producers are not interested in the development of non-traditional energy sources, and even with state funding for research programs in this area, they are in no hurry to introduce their results into mass production due to lack of proper motivation and appropriate incentives.

Due to the particularly high intellectual intensity of non-traditional energy sources, non-standard approaches to financing scientific developments in this area are required, which have not yet been implemented in practice, and the existing scientific potential of the state is practically not used.



## II. METHODOLOGY AND RESULTS

The theoretical and methodological basis of the article are the achievements of the scientific thought of domestic and foreign scientists; applied work on this problem; programs, concepts, normative and other materials related to the management of alternative energy sources. In general, statistical processing of information, economic analysis, and the results of sociological research are used.

New scientific results obtained by the author in the course of the study consist in clarifying the conceptual foundations of the management of alternative energy sources. The management system of alternative energy sources is largely determined by their essence, features and development prospects. The conducted research shows that alternative (non-traditional) energy sources include wind, solar, tidal and geothermal types of energy. Recently, thermonuclear energy of a controlled explosion, released with minimal fuel consumption, has also been included here. The advantages of alternative energy sources are: renewable, ubiquity of most of their types, as well as low operating costs, environmental friendliness. The development of alternative energy can significantly reduce harmful emissions into the atmosphere and improve the environment. Compared to nuclear power plants here, there is almost no harmful waste left. In the future, the widespread use of alternative energy sources will reduce the greenhouse effect, which poses a great threat to humanity. Negative qualities can be considered — the low density of the energy flow, which forces manufacturers to use large areas of power plants and the instability of energy production over time. To provide humanity with energy for several centuries, only a hundredth of the energy that reaches the Earth from the Sun in one year is enough. Solar energy is the least amount of pollution for the planet and the most inexhaustible of all known energy sources. Humanity is just beginning to identify and use its potential. The energy of the sun can be used for a variety of tasks. One of them is the conversion of solar energy into electrical energy. Tidal energy is an important alternative source for Russia. Its advantages include: low cost of electricity generation; long service life of the plant with relatively low maintenance costs; predictability of energy generation in comparison, for example, with wind or solar power plants; minimal noise effect; aesthetics of the structure; weak impact on the environment and water balance; insignificant change in the flooding zone of the structure, not harmful to the aquatic population. The disadvantages are: high capital costs for the construction of the station; possible obstacles to navigation; changes in the power flow of electricity during the day. In terms of the cost of costs per 1 kW, tidal power plants are in 5th place. They generate about 1% of all electricity.





In the last decade, an assessment of the potential of tidal energy has been carried out in all countries whose shores are washed by the World Ocean; the most promising areas for the placement of power plants have been identified. The most favorable places for the construction of tidal power plants in the world include Northern Europe, North America, Canada, South America, Australia, New Zealand, China, India, Japan, Indonesia and Africa, and Russia. The theoretical energy potential of the tide is estimated by various authors at 2500-4000 GW. The total capacity of operating tidal power plants in the world is estimated at 350 MW.

Unconventional energy sources have a steady growth trend, despite the fact that it requires the creation of appropriate infrastructure and large investments, which only rich countries with sustainable economic development can do. According to experts' forecasts, with a high level of investment in the development of unconventional energy sources, by 2022 it would be possible to provide: 10% of global energy from solar energy; wind energy — 15%; hydropower — 9%; tidal and geothermal — 1%; nuclear - 7%; and due to the energy obtained by burning biomass and industrial waste - 4%.

It is necessary to develop a new energy strategy, the state, aimed at the use of alternative energy, and the diversification of energy sources.

The creation of a management system for alternative energy sources and its implementation program should take into account the totality of the dominant factors and the consequences of their influence not only on the state of development of the energy sector of the state, but also on the socio-economic situation of Russia as a whole. The state energy policy should be focused on stimulating the development of alternative energy sources by using effective state regulators for this purpose. Currently, alternative energy is still experiencing its youth. But this picture is changing rapidly under the influence of political pressure processes, global environmental disasters (droughts, famines, floods) and improvements in renewable energy technologies. For example, as of 2015, the world's energy needs were still mainly provided by coal (41.3%) and natural gas (21.7%). Hydroelectric power plants and nuclear power accounted for 16.3% and 10.6%, respectively, while "renewable energy sources" (solar, wind, biomass, etc.) accounted for only 5.7%. Everything has changed since 2013, when global consumption of oil, coal and natural gas amounted to 31.1%, 28.9% and 21.4%, respectively. Nuclear and hydroelectric power accounted for 4.8% and 2.45%, while renewable sources accounted for only 1.2%.





In addition, there has been an increase in the number of international agreements on curbing the use of fossil fuels and the development of alternative energy sources. For example, the Renewable Energy Directive signed by the European Union in 2009, which set targets for the use of renewable energy for all participating countries by 2020.

At its core, it follows from this agreement that the EU will meet at least 20% of its total energy needs with renewable energy by 2020 and at least 10% of transport fuel. In November 2016, the European Commission revised these goals and has already set 27% of the minimum renewable energy consumption by 2030.

Some countries have become leaders in the development of alternative energy. For example, in Denmark, wind energy provides up to 140% of the country's electricity needs; the surplus is supplied to neighboring countries, Germany and Sweden.

Iceland, due to its location in the North Atlantic and its active volcanoes, reached 100% dependence on renewable energy sources already in 2012 due to a combination of hydropower and geothermal energy. In 2016, Germany adopted a policy of phasing out dependence on oil and nuclear energy.

In 2019, the active stage of the implementation of projects for the construction of generating facilities in Russia within the framework of the Renewable energy DPM program continued: 594 MW of green generation were put into operation on the wholesale market. The entire volume of commissioned facilities fell on solar generation, which showed an almost twofold increase in the pace of construction: from 290 MW in 2018 to 594 MW in 2019.

Considering the prospects of alternative energy, it is also worth noting that a number of countries have already outlined plans to introduce renewable energy into economic life:

- By 2035, Germany (population more than 82 million people) plans to transfer 55-60% of its electric power industry to renewable energy sources (RES), by 2050 – at least 80%
- Portugal (population more than 10 million people) plans to meet its electricity needs at the expense of RES by 80% by 2030 and by 100% by 2050.
- Spain (population more than 46 million people) will also fully switch its electric power industry to renewable energy by 2050.
- Denmark (population more than 5 million people) intends to fully switch to renewable energy in all energy sectors, including transport, by 2050.
- In the USA, 153 cities have set a goal of 100% renewable energy in the electric power industry. Similar plans have been adopted by 9 states, counties and territories, including the state of California (population of almost 40 million people).

These events take place for two reasons. First, because of the rapid reduction in cost of renewable energy that has occurred over the last 10 years (according to Lazard, in the period from 2009 to 2019. 1 kWh of electricity produced by the wind, fell by 70%, due to the sun – at 89%). Secondly, due to the growth of environmental literacy of the population and the formation of a civil society request for a favorable environment with the minimum possible negative anthropogenic effect.

In Russia, by 2035, according to the current General Layout of electric Power facilities for the period up to 2035, a total of 11.6 GW of renewable energy power plants will be built, which is equivalent to less than 5% of the total installed capacity of power plants in the country and 1.5–2% of generation, based on the actual current Russian values of installed capacity utilization coefficients (CIUM – the ratio of the amount of electricity actually generated to the amount of electricity that would be generated if the power plant was constantly operating with a load corresponding to its installed capacity).





### III. CONCLUSION

In Russia has accumulated unique experience in the design and construction of tidal power plants. Potential energy reserves that can be obtained from tidal power plants Russia is one of the three world leaders in the development of tidal power plants, including France and the UK. The world's largest tidal power plants can be built in the Mezen Bay of the White Sea and in the Tugur Bay of the Sea of Okhotsk. The organization of the process of creating tidal power plants should involve the implementation of a system of interrelated processes, ranging from identifying the needs and capacity of the energy consumption market, the location of the construction site, and ending with the sale of products in the form of an energy service.

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## АЛЬТЕРНАТИВНЫЕ ИСТОЧНИКИ ЭНЕРГИИ: ПРИМЕНЕНИЕ И ПЕРСПЕКТИВЫ

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### Аннотация

В статье анализируется использование альтернативных источников энергии преимущественно в России. Показано, что политическая и экономическая нестабильность в странах, специализирующихся на добыче ископаемых источников энергии, и их производство не может бесконечно увеличиваться из-за ограниченности природных ресурсов. Автор приходит к выводу, что процесс формирования системы управления, обеспечивающей эффективное использование альтернативных источников энергии, находится еще в зачаточном состоянии. До сих пор не разработана научно-обоснованная государственная политика и экономическая стратегия использования альтернативных источников энергии. Инструменты и формы, используемые государствами при кредитовании развития альтернативных источников энергии, а также при ценообразовании излишков электроэнергии, весьма ограничены и недостаточно эффективны.

**Ключевые слова:** ресурсы, человек, энергия, сельское хозяйство, глобализация.

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