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СОВОКУПНОСТЬ ПРОЕКТОВ ПО ЭНЕРГОСБЕРЕЖЕНИЮ МЕЖДУНАРОДНОЙ МАРИИНСКОЙ АКАДЕМИИ В ДУБАЕ

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Аннотация

Мариинская Академия имени М. Д. Шаповаленко разрабатывает серию проектов, которые существенно дополнят перечень традиционных альтернативных источников энергии, используемых в настоящий момент в быстро развивающемся Дубае.

Ключевые слова: Дубай, альтернативный источник энергии, электроэнергия, вибрация, зелёная энергетика, Объединённые Арабские Эмираты, энергосбережение.

SET OF ENERGY SAVING PROJECTS AT THE INTERNATIONAL MARIINSKAYA ACADEMY IN DUBAI

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Abstract

Mariinskaya Academy named after M. D. Shapovalenko is developing a series of projects that will significantly complement the list of traditional alternative energy sources currently used in the rapidly developing Dubai.

Keywords: Dubai, alternative energy source, electricity, vibration, green energy, United Arab Emirates, energy saving.

Introduction. The object of this study is system of alternative energy sources in Dubai. The relevance of the study lies in the need to completely abandon the use of hydrocarbon energy sources, the supply of which is coming to an end. At the same time, this should improve the environmental situation in the emirate of Dubai through the introduction of a system of alternative energy sources. In modern world literature, unfortunately, the results of research aimed at introducing a system of alternative energy sources into the energy system of megacities built in the hottest, arid climate have not yet been reflected. In the literature sources reviewed in this study, the lack of a solution to this problem is noted. Nevertheless, as predecessors on whose research this work is based, we consider it our duty to name such scientists as S. V. Alekseenko, A.

Alkhasov, V. V., N. J. H. Almukhtar, V. N. Ilyin, S. Kudiyarov, G. R. Mashori, L. N. Makarova, V. A. Podkopaeva, Yu. S. Osipov, V. Sidorovich, V. Ya. Ushakov and many others. The purpose of this study is to present a holistic system of alternative energy sources in Dubai. The list of tasks planned for solution includes demonstrating the combined capabilities of solar energy, wind, water, pressure, vibration and many other alternative energy sources. Their integrated use is intended to play a decisive role in the formation of a comprehensive system for overcoming dependence on hydrocarbon energy sources and creating the prerequisites for improving the environmental situation in the UAE emirate in question.

Materials and methods. This work uses such productive and non-productive research methods as analysis of scientific literature, observation, experiment and others.

Results and discussion. The Mariinskaya Academy is developing a series of projects to significantly supplement the list of traditional alternative energy sources.

Project "Solar City". Strategically, every square centimeter of the area of each building in the exterior and interior, as well as the roofs of the autobahns and any other structures should generate electricity from solar panels transformed into cladding, decor and all hard surfaces. The free provision of land plots and full tax exemption quickly enough leads to the opening of the maximum necessary in this case, the number of companies that specialize in the production and installation of solar panels, the accompanying inventories, batteries and their other components. Thanks to this, solar panels have different sizes and different configurations, which makes it possible to efficiently use each square decimeter of a building in order to generate solar energy for its lighting, cooling, as well as for operating a variety of electrical appliances. At the same time, solar panels should be placed on internal and external walls, floors of internal premises and sidewalks in the area adjacent to the building, as well as, as it is legally enshrined and implemented by 2030 in Dubai, on roofs. Windows, in which electric glasses will be placed instead of ordinary glasses, should also function as solar panels. At the moment, the efficiency of electric glass is still significantly inferior to wall-mounted solar panels. But the key principle in this case is that the building's space is fully utilized for energy production, and all components of its design, regardless of efficiency, are included in the international energy chain. At the same time, electric glasses can completely replace the outer skin of a building, due to which the required amount of light gets into it, although some of it will be taken away by electric glasses. Their rather low efficiency is compensated by the fact that they take on part of the energy flow of sunlight. This will be all the more efficient as the electric glasses will be tilted to further reduce the level of natural overheating of the building. This reduces the natural heating of the building structure during particularly hot months of the year. At the same time, electricity for the operation of air conditioners and fans will be consumed to a much lesser extent. Although the efficiency of using electric glass currently does not exceed 7%, this does not prevent the entire building from being a solar power plant at the same time. It is necessary to find optimal ways to increase the efficiency of electric glass. This will allow not only the building itself, but also the electric cars of

its residents to be charged in the parking lot near the house while the owners are not leaving.

Project "Mighty Wind". Wind turbines should be included in all structural elements of buildings and other structures, the presence of which will allow maintaining the proper level of safety for residents, workers and the comfort of their stay in the building.

Project "Green noise". Special membranes will collect the energy of the noise emitted by the human voice and the voices of animals and birds, as well as artificial sources of noise, and will allow the use of this energy flow for human needs. Another important component of energy supply, which is designed to serve as compact wind turbines installed on balconies, terraces, roofs and any other suitable surfaces for this. To do this, an elegant architectural solution has to be found, as a result of the implementation of which the wind turbines will not only not spoil the original architectural concept, but will also add a spicy and interesting addition to it. For example, the shape and design of a building can imitate a certain aircraft, and wind turbines, respectively, can simulate propellers on its surface. Since the abundance of wind turbines on the surface of the building will cause significant noise, as the project is introduced into the capital's urban environment, it will be necessary to find quite effective means of noise reduction.

Vibrolight project. Noise is often either accompanied by vibration or is its consequence. It can also be used to receive vibrational energy and convert it into electrical energy. It seems possible to add energy to solar panels, wind generators and recuperators thanks to the generator of electricity from vibration. Membranes of such devices, as well as noise absorption membranes, can be included in the decoration of walls and ceilings of educational institutions (especially school recreation), stadiums, and concert halls. In this concept, wind has already been presented as a source of energy twice. The third time it is mentioned in connection with the significant vibration that it produces, which means that it can also serve as a source of vibrational energy [8]. Using piezoelectric materials, the energy harvesting materials will produce energy from any kind of vibration that influences the surface of such materials. Such an energy source will become more and more noteworthy as more and more devices are developed that require the lowest power consumption. In this case, we are not talking about the transfer of energy over any significant distance, but at the same time it can be fully used at the same place where it was received. In the same way that cars moving on the road can “recharge” economical LED traffic lights.

Green Light Project. Sunlight and the light of lamps in the room is intended to become a secondary resource, which at the moment, for the most part, is not used in any way. But built into all surfaces of the home interior, solar panels of various colors and configurations allow the same light to be used repeatedly. Sunlight entering the building, as well as the light of the electric lamps working inside it, is captured by the now opaque solar panels placed on the inner walls, doors, floors and ceilings of each room in the building. At the same time, it should be noted that the usual appearance of solar panels placed in the interior of a residential building could hardly arouse the enthusiasm of its residents [9]. Therefore, in the process of implementing this project, it will be necessary to achieve a highly aesthetic performance of solar panels, due to the

proper design solution, capable of pleasing the eye with their appearance to all those who are in this room. In the future, it will be necessary to find a type of solar panels that will meet environmental requirements for residential and non-residential premises. In this case, the solar panels should be left, especially located on the floor. , so their service life increases the profitability of this material. Also, according to the author's intention, furniture and household appliances in the building are also sheathed with solar panels [7]. Household electrical appliances are designed to at least to some extent provide their own need for electricity, and objects in the room environment will have to transfer the energy they have accumulated to storage batteries.

Project "House asset" or "House plus energy". Ideally, "Home Plus Energy" should use the entire range of renewable energy sources - both directly and indirectly. Perhaps, for example, not every home can have a biofuel station installed. But in this case, all the missing fuels must come from centralized stations. The new regulation on energy saving and energy efficiency of operated buildings will allow commissioning at least only houses with zero energy consumption - 0 kW / m2 per year. And ideally - "active houses", or "home plus energy", which will be designed to generate electricity not only for their own, but also for other needs. An organic addition to the zero-energy home, as well as to the active home, will be the road leading to it, the energy resources of which were announced in the Mohammed bin Rashid Al Maktoum highway project [10].

The Road to Home project. Unlike many high-profile projects, it is much better not to put solar panels under the wheels of cars, where they will quickly become unusable, but to make autobahn roofs with an adjustable angle, for which the solar panels placed on them must be of a much lighter design. On the road, only a rail should be left for recharging cars and electric vehicles while driving. The Road to Home project involves a rethinking of the world's best practices in building roads capable of generating electricity. Thus, it seems to scientists that the revolutionary projects of Solar Roadways, Qilu Transportation Development Group and others should be significantly improved [6]. This should be done in such a way that between the layer of transparent concrete proposed in such projects and the insulating underlying layer, solar panels are installed at an optimal angle of inclination. For each geographic zone, this angle must be specific, and be in direct proportion to the latitude of the area for which the roadbed is made. In section, this structural layer will be a series of equilateral triangles, the value of equal angles in which will also be determined by the expediency of the angle of inclination of the solar battery for a given geographical latitude. It is also desirable to develop an appropriate device that allows you to create a change in the angle of inclination of the solar panel depending on the season. For example, from 30-40 degrees in summer to 70 and more in winter. Regarding the project developed for the Chinese city of Jinan by Qilu Transportation Development Group, the authors of this strategy consider it their duty to provide the following impressive data: “a kilometer section with two lanes can generate up to 1 million kWh of electricity per year. This amount is enough to power 800 residential buildings. The electricity generated is used for street lighting, billboard lighting, security cameras and toll vending machines. In addition,

energy is spent on heating the track so that snow does not accumulate on it. The company gives the excess output to local power grids [5].

The Sandstorm Energy project. The Sandstorm Energy project has something in common and can, if necessary, form a single whole with the Mighty Wind and VibroLight projects. Heat from hot sand and friction from the surface of buildings can heat water for steam turbines, and noise and vibration energy can be converted into electricity [1]. The Sandstorm Energy project has something in common and can, if necessary, form a single whole with the Mighty Wind and Vibrolight projects. The places for the construction of residential, office and industrial buildings will be used in a variety of ways, since technologies will make it possible to withstand sandstorms, and an increase in the water level in the world's oceans, and the level of maximum air temperature. Moreover, none of these factors will have to be resisted. Each of them will be rationally used by all architectural structures to convert the entire set of natural impacts into electrical energy. It will convert both the wind pressure on the walls of buildings, and hot air through the transformation of thermal energy into electric current, and vibration of the air into outdoor and indoor lighting [2].

Project "Biolight". The combination of primary and secondary energy flows becomes possible due to the introduction of a cycle of the most complete processing of raw materials, as well as the direction of the steam leaving the plant to steam turbines. Biogeneration stations can be significantly improved during this period, so that the result of biofuel processing in them can be added to additional processing until such a stage when none of them can have a negative impact on the environment. Very fine filtration is required so that only water vapor is generated at the outlet. And it can also provide electricity by building a combined power plant that combines its biological nature with the nature of a steam power plant.

Project "Cleansing Stream". If the wastewater reaches the turbines directly at the treatment plant, the accompanying methane can be burned to generate electricity. The use of turbines in wastewater treatment plants should be complemented by the production of methane for refueling vehicles and gas cylinders used for cooking on camping trips [3].

Project "Emotions of entertainment». The need to search for renewable sources of energy can and should be consequently somewhat reduced by adjusting educational programs around the world, thanks to which a person will more clearly understand his real needs instead of immersing his numerous funds, time and effort into "an endless wardrobe and just as much" endless refrigerator. Resources, with the realization that real needs are much less than imagined, will require much less.

Thus, the development of renewable energy projects in Dubai can gain significant momentum if the above and other similar projects are consistently implemented, which can be discussed in the following works. The vast majority of Dubai's huge shopping malls are to be transformed into shopping and entertainment centers, where the line between shopping and paying for services will gradually disappear, just as the distinctive border between the emotions of shopping and the emotions of entertainment will dissolve [4]. The more entertainment there is, the less shopping will be required, which is also more entertainment for well-to-do people than smart purchases. The load on

factories, which are forced to produce more and more new things, will decrease. And this will, in turn, reduce the burden on the environment. Especially - taking into account how many diverse resources are required to produce a kilogram of cotton, nylon or any innovative material.

Conclusion. The totality of the projects proposed in this work constitutes an integral system of alternative energy sources that will help the emirate of Dubai in the UAE to completely free itself from the need to use petroleum products. This will be carried out with the aim of providing an alternative energy supply to the city infrastructure and meeting the needs of each of its residents or guests. It is proposed to draw the following conclusions:

1. Depending on the rate of increase in the efficiency of electric glass, the interest of architects and development teams in Dubai in using them not only in window openings will increase. They are also expected to be used in cladding the facades of buildings designed to transmit sunlight filtered from excess infrared and ultraviolet radiation into the premises.

2. A fundamental increase in the level of strength of the materials from which solar panels are traditionally made will make it possible to use them not only for the manufacture of highway roofs. At the same time, they are also expected to be used for inclusion in road surfaces, as well as in the coating of playgrounds, parking lots, sidewalks and other ground surfaces that are subject to increased pressure.

3. The more the area of the buildings of cinema halls, concert halls, circuses and sports arenas increases, the greater the effect will be brought by the project of using noise vibration for their energy supply, which appears in abundance during the use of each such building.

4. The process of development of technologies, which at the moment are not yet in any way connected with the creation of a system of alternative energy sources, can push for the development of these sources themselves, fundamentally expanding their list and significantly updating the models presented in this work.

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