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SUSTAINABLE "GREEN ENERGY"

The twenty-first century is the century of information technology. It is obvious that mankind will never abandon the devices designed to make our lives easier. Most of us would prefer to live now than 100 or 200 years ago, although from the point of view of ecology 100-200 years ago, environmental conditions were more favorable than today. Technologies increase our quality of life. However, in the long run they have a threat. Economic activity, as a rule, is unthinkable without the use of energy.

Traditional energy resources are non – renewable. They include gas, oil, coal, uranium. The technology of producing and converting energy from these sources is worked out, but, as a rule, environmentally unfriendly, and many of them exhaustible (table. 1). Permanent renewable energy sources include solar, wind, energy produced in hydroelectric, etc. (table. 2).

Table 1. Non-renewable energy resources and their value (J)^{10}*

Inventory type	Inventory
Thermonuclear energy	$3,6*10^{26}$
Nuclear energy	$2*10^{24}$
Chemical energy of oil and gas	$2*10^{23}$
Internal heat of the Earth	$5*10^{20}$

*Source: Wikipedia

Table 2. Renewable energy resources and their annual quantity (J)^{10}*

Вид ресурса	Запасы
Solar energy	$2*10^{24}$
Energy of the sea tides	$2,5*10^{23}$
Wind energy	$6*10^{21}$
Energy of rivers	$6,5*10^{19}$

*Source: Wikipedia

From the data given in the tables we can conclude that if you use all the resources of green energy, you can get at least the same amount of energy that exists in all finite sources for one year. We emphasize that it is the same amount as all the reserves of oil, gas, coal, and uranium can give for one year .

Of course, this is good news. I believe that the efforts of humanity should be aimed at finding technical solutions to tackle the issue of carbon

dioxide emissions into the atmosphere from the combustion of oil, gas and coal.

Basing on Table 2 rivers have the highest potential capacity, but constructing a dam we have quite a strong influence on the nature balance. Hydropower has a detrimental effect on the environment like flooding of forests that provide habitat for many different organisms, reducing biodiversity, losing fishing opportunities, deterioration of the water quality in rivers, etc. In addition to it you must consider the social and cultural harm. People are forced to relocate due to the fact that vast territory is flooded and become uninhabitable. Hydropower is also a source of technological risk. Over the last 50 years there have been 300 accidents around the world.

The idea of using solar energy looks very attractive, but if we're talking about the energy supply of not a cottage settlement but a big city located in a region with a large number of sunny days a year, we encounter problems: where to locate solar panels, how to transport energy. When transporting energy over distances energy losses amount to 20-30% of the volume of electricity generated. What is more, seasonality has a strong influence on the volume of energy production. We have not yet found a way to get energy from the sun in sufficient volume that will allow to refuse hydrocarbons energy.

Finally, wind energy is a relatively permanent method of obtaining energy. With the sunrise the surface of the planet heats up, cools down with time. It is a constant ongoing process. Air masses due to uneven temperature start to mix. We call these movements wind.

I am inclined to believe that until we found an affordable way to collect solar energy in sufficient quantities, wind energy is the most promising way of obtaining renewable energy.

Today industrial wind energy has some problems like the need for long-term studies (constancy and strength of the wind), wind turbines possible locations, heavy weight of accessories, quite a large distance to the consumer, and, perhaps, the main problem is the amount of noise (70 decibels), while rotating the blade horizontal wind turbine speeds up to 240 km/h.

Advanced development (based on open data, Wikipedia):

The turbine called Hywind, developed by Siemens Renewable Energy, weighs 5 300 tons with a height of 65 meters. It is located 10 kilometers from the island of Karmoy, near the south-western coast of Norway. In the future the company is planning to bring the power of the turbine to 5 MW and a rotor diameter to 120 meters.

The company Magenn has developed a special device with a wind turbine, which rises to a height of 120-300 meters. There is no need to build a tower and to occupy the land. The device works in the range of wind speeds from 1 m/s to 28 m/s. The device can move in the wind regions or quickly be installed in disaster sites.

At the end of 2010 the Spanish company Gamesa, Iberdrola, Acciona, Alstom Wind, Técnicas Reunidas, Ingeteam, Ingeciber, Imatia, Tecnitest Ingenieros and DIgSILENT Ibérica created a group for the joint development of wind turbines with capacity of 15.0 MW.

The European Union has established a research project UpWind for the development of offshore wind turbines with capacity of 20 MW.

The possibilities of wind power, as we see, are quite seriously developed and practiced.

In this article I propose to review the proper design of the vertical (rotary), low-speed, sailing wind power, estimated power of which may be about 25-30 MW(own calculations). I am planning to get such a capacity from 10 000 m2 of working surface of the wind turbine. The total area of all sails (blades) will be about 60 000-80 000 m2, and the working area that will have constant exposure to wind would be 10 000 m2. Of course, you will need a powerful design to control such a volume of the "sail", so why not to use tall building for this?!

According to UN projections, by 2025 the urban population will increase by 1.5 billion people. It turns out that about one hundred cities like Moscow should be built. Many constructions will be built, and the necessary amount of energy consumption in the next 10 years will increase twice according to some forecasts.

In addition to important ecological factor, this idea has several other cumulative advantages in comparison with similar methods of obtaining electrical energy. Namely:

1. This design has the ability to be completely silent (is there a lot of noise from the tank parachuting in?). The issues of vibration and others are also easily solvable (sorry, I can't announce them here, as every spoken sentence on the intricacies of this device has the potential to get a patent on the invention).

2. This wind power will work in any climatic zone, it is indifferent to the direction of the wind, it will work even at wind speed of three meters per second. A large torque.

3. The favorable location of the "sails" (blades) generator 20- 300 meters from ground level.

4. The proximity to the consumer. No loss during transmission of electricity over a distance. Savings on lines and transformer substations.

5. If to locate such wind power (Fig. 1) between four residential towers (houses) with a height of 90 floors and 35,000 inhabitants, energy consumption for own needs and maintaining of the buildings will not exceed 4-6 MW, and the amount of energy produced will be about 25-30 MW. Consequently, a surplus of approximately 19-24 MW can be implemented on adjacent buildings.

6. The towers can be positioned like a "funnel", so you get a wind flow two or three times more than would fall on the working surface of the "sails" (blades) in the case of free accommodation.

7. Small weight (two or three hundred times) relative to the horizontal windmill.

Thus, by combining the vertical wind power with a multi-story building we receive the world first building completely autonomous in the matter of electricity, and therefore potentially autonomous in all aspects of its operation.

The owner of the apartment in such a building (in the case where the installation for the production of energy belongs to all the owners of the building) will never pay for energy (within the limit).

The cost of electricity in the world is about 5-10 rubles per kilowatt. We give background information on specific countries and the USA (table 3).

For example, one kilowatt-hour of electricity for the population of Dubai with the consumption from 0 to 2000 kWh is 23 Fils,

from 2001 to 4000 kWh - 28 Fils,

from 4001 to 6000 kWh- 32 Fils,

more than 6001 kWh - 38 Fils

For reference: 1 dirham = 100 Fils = 15.76 RUB.

In Malaysia the price also depends on consumption and ranges from 0.21 PM (2.8 ruble) to 0.45 PM (6 rubles).

In China the cost of 1 kWh is 0.7 – 0.8 yuan (5.95 - 6.8 rubles).

Table 3. Cost of 1 kilowatt in the United States

State	The cost per kW $
Connecticut	0,22$
New Hampshire	0,19$
New York	0,19$
Pennsylvania	0,14$
Indiana	0,11$
Minnesota	0,13$
Nebraska	0,12$
Florida	0,12$
Texas	0,12$
California	0,17$
Washington	0,09$
Hawaii	0,3$

After spending some simple calculations, we calculate excessed energy produced by wind power in terms of money. Let's say it's 20 MW*h

(megawatt*hour) or 20 000 kW*h. Multiplying by 0.1 Euro per kilowatt we get about 2000 euros. This is the amount of energy produced per hour. Two thousand euros per hour in recalculation for a year is about 17 million 280 thousand euros. Considering the average cost of construction of such building (about 700 million euros, the cost depends on the climatic conditions) it is possible to return the invested funds on average for 30-50 years.

The world's first building that supplies itself with "green energy". The owner of the building may invest the revenue from electricity sales in payment of invoices from the management company and never receive a bill for payment. In short, the device of the wind power has great potential.

Assume that the experts in wind energy, joined by European Union to create a research project UpWind with the aim of developing offshore wind turbines with capacity of 20 MW, will be surprised to such a simple solution, which is able to give out even more than 5-10 MW installed strap (which they have not achieved yet) in the absence of noise and the distance of electricity transmission. And after the erection of such construction and fixing of the physical indicators, it is expected to be the world record with entering the Guinness book of records. Currently the world record, as far as I know, is fixed at 8 MW.

Bibliography

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