

IQanat High School of Burabay

## **IQANAT SCIENCE PROJECT**

Green energy at IQanat

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## **Annotation**

Nowadays, a technological progress along with an industrial activity have already led to plenty of problems related to ecology statement of the world as a whole. This research aims to investigate the role of solar panels in ecologically clean environment, so that we conducted a thorough research devoted to an installation of solar panels and its use on the territory of IQanat High School of Burabay. Precisely, our project is mainly about the installation of solar panels on the roof surface of the Student House. The project represents a long and grueling process of doing the whole explanation of facilities, advantages as well as disadvantages and calculations respectively.

## **Introduction**

At the moment, one of the largest problems of the world community is global warming. In turn, global warming is the result, for the most part, of human activity related to the production of electricity generated by burning minerals. Most scientists agree that emissions of pollutants and greenhouse gases from the production of electricity from fossil fuels make up a significant part of the world's greenhouse gas emissions<sup>{1}</sup>. Therefore, we decided to study this topic on the example of our school and this is the novelty of our study.

The purpose of the project is to investigate in detail the installation of panels on the roof of the Student House building, which is located on the territory of the National Park of the Republic of Kazakhstan, in order to protect and preserve its natural diversity.

To achieve this goal, we need to solve the following tasks:

1. Carefully study the operation of solar panels;
2. Explore their functions, advantages and disadvantages.

## Chapter 1. What is the problem?

Currently, it is a well-known fact that the planet is polluted exponentially. There are several similar types of pollution:

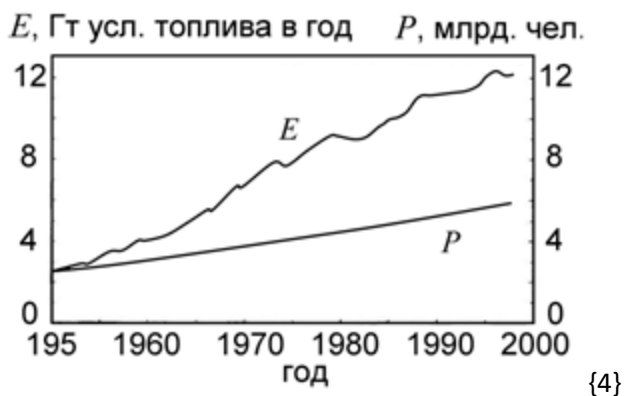
1. Chemical (ingestion of chemicals and compounds into the environment);
2. Radioactive (contamination of the environment with radioactive elements);
3. Thermal (heat emission);
4. Noise (increased noise level).

The reasons for these processes are:

- 1) Release of chemicals and compounds into the environment;
- 2) Contamination of the environment with radioactive elements;
- 3) Heat emission;
- 4) Increased noise level. {2}

Further, the chemical type of pollution will be considered, since it is this type of environmental pollution that is directly related to global warming. Indeed, researchers and scientists massively agree that emissions of pollutants and greenhouse gases from the production of electricity from fossil fuels account for a significant part of the world's greenhouse gas emissions. 1} It's no secret that at the moment the cost of electricity is skyrocketing as is the amount of fuel burned to extract it. Below is a graph that gives an estimate of the amount of electricity consumed per certain number of people in the 20th century.

From the graph we can see that in comparison with 1950 the amount of gas fuel produced in 2000 increased by almost 6 times. This is a significant factor in order for humanity to think about the rational consumption of fuel and its conservation. Thus, in just a few decades, the reserves of fossil fuels and gas have decreased significantly. So, scientists are sounding the alarm about the impending depletion of oil and gas, which, according to available estimates, may be enough for only 40-60 years. {4}



This leads to a logical question:

1. How does this apply to IQanat?
2. What can we do about it in the conditions here?

Now our task is to clarify the role of IQHSB in this problem, and why it is worth paying attention to such a confluence of circumstances in this territorial point. Aikanat School originates in the Burabay National Park, which is an ecologically clean point of the Republic of Kazakhstan and many of its locations are carefully protected and traced. Shchuchinsk-Borovaya resort zone is known for clean lakes, special climatic conditions and developed tourist infrastructure. Often people come to Burabay in order to relax on the shore of the lake and strengthen their health with mineral waters and healing mud. {3} It turns out that Borovoye is of particular importance for our country and requires an even more reverent attitude than any classical corners of our state. It follows that the residence of a large number of people in a particularly valuable part of our country also requires a huge amount of costs: water supply, electricity, food, and so on. Being here, we must not only admire the nature around us and its beauties, Our project focuses on the reasonable consumption and production of electricity for further use by students of the IQanat High School of Burabay. To better understand the full scale of electricity consumption in the territory and all the costs that it requires, we conducted a study and found out the following:

3. In the months of the winter season (November-March), the largest amount of electricity is consumed.
4. The area of the Student House building is 2240 square meters.
5. About 325 IQHSB students live in this area.

Based on the information received, we received data on monthly electricity consumption separately on the territory of the hostel and made the following calculations:

1. On average, a dormitory building consumes about 40,000 kW per month
2. The amount paid to cover this kind of electricity consumption is 920,000 tenge per month
3. The school spends about 11040000 million tenge per year.

So, why don't we try to contain the already dwindling waste of the earth's interior and make a small part of our planet a little cleaner and more environmentally friendly?

Next, options for solving the problem, methods of its solution and the way of solving it, to which our project is devoted, will be considered and studied.

Have there been any previous attempts to address this problem?

Looking ahead, we want to warn and inform the reader that nothing like this has been studied, studied or applied before on the territory of the Student House. That is why our team strives to become the first people who will work on this topic and its application in Aikanat.

What can we offer in the fight against the decline in fossil fuels spent?

Deeply studying this section, we approached quite seriously to the study of possible sources that, although they will not eliminate the problem, but will prevent its spread and urgency in the ecologically clean territory of the Republic of Kazakhstan. The research work led us to the following variations for the preservation of the environment of Burabay:

1. Wind energy
2. Hydropower plants
3. Solar energy (solar panels)

Let's look at each item separately:

1) Wind energy:

1. Pros:

1) Environmentally friendly type of energy

2) Renewable energy

3) Wind energy is the best solution for hard-to-reach places

1. Cons:

1) Instability

2) Relatively low power output

3) High cost

4) Danger to wildlife

5) Noise pollution{6}

At first it may seem that this is an excellent option, but our project, one way or another, does not consider this option due to the noise vibrations that the wind turbine spreads. This noise can cause indignation in students, people living near the school, as well as in the fauna that surrounds us. Moreover, the fauna living here is especially valuable, so we are obliged not to cause them discomfort and provide any danger.

2) Hydroelectric power plants:

1. Pros:

1) Application of renewable energy.

2) Cheap electricity.

3) Absence of harmful emissions into the atmosphere.

4) Very quick transition to the mode of issuing working power after the first switching on the station.

5) It is advantageous to use as an emergency reserve, since the generators of the stations can be easily turned on/ off depending on the needs.

6) Less negative impact on the air environment than that of other types of power plants.

2. Cons:

1) Flooding of large areas of land.

2) Construction is possible only in places of large reserves of water energy.

3) On mountain rivers, such stations are very dangerous due to the high seismicity of the areas.

4) Unregulated discharges of water from reservoirs lead to the restructuring of unique ecosystems along the riverbed, so rivers are polluted, the number of fish decreases, nesting sites of migratory birds disappear.

5) The flow of nutrients into the oceans decreases.

6) To build a large dam requires a lot of material and is expensive.

7) The construction of hydroelectric power plants, in comparison with other energy sources, is longer and more expensive. {7}

This option alerted us to the fact that there is a risk of losing any species of animals living on the territories where hydroelectric power plants will function. Subsequently, this option is not considered.

3) Solar energy (solar panels):

1. Pros:

1) It is a renewable energy source;

2) Does not consume electricity, respectively, does not require combustion of fuel;

3) Various methods of placement and application;

2. Cons:

1) High cost;

2) Dependence on weather conditions;

3) Requires a lot of space. {5}

On the one hand, this proposed option is safest and most reliable against the background of other methods of solving the problem in the territory of the National Park.

What method may be the most suitable for use at IQanat?

## **Chapter 2.Solar Panels at IQanat.**

Solar energy is a direction of alternative energy, based on the direct use of solar radiation to obtain energy in any form. {9}

Solar panels are devices capable of absorbing sunlight and converting it into electricity, which can be used in various directions.

Now we offer the installation of solar panels in connection with the following factors:

1) They will not occupy the territories on which a person's foot steps

2) The surface of the unused roof will be beneficial

Our team became interested in installing solar panels on the roof of student house, since this roof has no application and actually does not carry any benefit to others compared to the surface of the roof of the school itself, on which nothing can be installed due to the use of this roof for recreation purposes. we decided to consider this link in the fight against pollution.

At this stage, we can provide specific calculations against the background of which we can fully consider the entire scheme of operation of solar panels, as well as understand whether they are profitable or not.

First, let's deal with the classic costs and requirements for obtaining electricity at the moment:

1. Months of peak electricity consumption: November-March;
2. Roof area: 2240 square meters;
3. Number of people on the territory of the building:325;
4. Electricity consumed monthly: 40000kW;
5. Price 40000kW per month:920000 tenge;
6. Cost per year: 11040000 million tenge.

Next, we will need to find out which panels we need to install and based on this, we used the information from the site [hevelsolar.com](https://hevelsolar.com).Here's what we managed to find out and calculate accordingly:

1. The warranty of the panels that are offered on the site is 25 years;
2. On the surface available to us (2240 sq.m.) we are able to install 3 sets of solar panels of 650 sq.m., one set, which will consist of 320 modules each, with the allocation of electricity equal to 400 kWh / day one set;
3. As well as one set of 221 sq.m., containing 96 modules, giving about 121 kWh / day.Their cost will approximately cost 14207503.5 million tenge.;
4. Thus, the first three sets will occupy an area of 1950 sq.m and the number of modules will be equal to 960 modules.Therefore, the three complexes will allocate about 1200 kW \* / day.The cost of one such set is 43409083.5 million tenge. And three sets will cost 130227250.5 million tenge;
5. Together, the two types of kit can give the following indicators:
  - 1)Total number of modules:1056;
  - 2) The total cost of purchase, equipment and installation of panels (this is all included in the above cost) will be equal to 144434754 million tenge;
  - 3) Number of kWh/day:1321 kW\*h/day.;



- 4) In a month, the received electricity will be equal to 39630 kWh / day;
- 5) Costs for all equipment, installation and purchase of panels in the amount of 144434754 million tenge. In fact, for the next 12 years, until the expiration of the warranty period, we will receive electricity for free, which is quite profitable and advantageous within the framework of our territorial location and local conditions in principle. If everything goes so stably, then over these 12 years of free electricity, we will be able to save about 132480000 million tenge. (the same amount of money that would have been spent on the classic payment for electricity absorbed by student house).

It is important to note the fact that our project is aimed at studying solar panels, their operation and installation on the surface of the roof of our campus. However, we all know about the sharply continental climate in the north of Kazakhstan. That is, the likelihood that we will constantly receive exactly the amount of electricity that was calculated by us will be unstable due to the variability of weather conditions. It is also important that the calculations made by us regarding the monthly allocation of electricity by solar panels do not fully cover the monthly consumption, since the hostel requires about 40,000 kW / month, and the panels that we can conditionally install emit about 39630 kW / day, which does not reach the amount we need.

How can we solve the problem?

Here's what we offer:

We studied two types of solar panel connection:

1) Autonomous:

A solar power plant of this type is designed for autonomous houses and various objects located at a distance from the centralized network. {6}

2) Network:

A solar power plant of this type is designed to power objects connected to a centralized network, that is, with a shortage of energy generated by the panels themselves, an additional resource will get from the network. {6}

From this we conclude that it will be possible to use a network connection for panels on our territory, thereby we insure ourselves in terms of guaranteeing to obtain sufficient resources to provide students with electricity, and we can also reserve excess energy, if any.

## CONCLUSION

Thus, we want to say that our project aims to offer an environmentally friendly and truly affordable alternative to the use of natural resources for the purpose of generating electricity in the form of installing solar panels and consuming solar energy without damaging the nature around us. Therefore, having studied and carefully studied all the advantages and disadvantages of solar panels, we found out that they are an excellent tool in the fight against pollution and depletion of natural resources!!

## RESOURCES

{1} [https://ru.wikipedia.org/wiki/%D0%93%D0%B5%D0%BD%D0%B5%D1%80%D0%B0%D1%86%D0%B8%D1%8F\\_%D1%8D%D0%BB%D0%B5%D0%BA%D1%82%D1%80%D0%BE%D1%8D%D0%BD%D0%B5%D1%80%D0%B3%D0%B8%D0%B8](https://ru.wikipedia.org/wiki/%D0%93%D0%B5%D0%BD%D0%B5%D1%80%D0%B0%D1%86%D0%B8%D1%8F_%D1%8D%D0%BB%D0%B5%D0%BA%D1%82%D1%80%D0%BE%D1%8D%D0%BD%D0%B5%D1%80%D0%B3%D0%B8%D0%B8)

{2} <https://geographyofrussia.com/racionalnoe-i-neracionalnoe-prirodopolzovanie-prichiny-i-posledstviya-zagryazneniya-okruzhayushhejsredy/>

{3} <https://ppt-online.org/480989>

{4} <http://nuclphys.sinp.msu.ru/ecology/ecol/ecol05.htm>

{5} <https://www.greenmatch.co.uk/blog/2014/08/5-advantages-and-5-disadvantages-of-solar-energy>

{6} <https://www.hevelsolar.com/kz/b2c/>

{7} <http://nacep.ru/novosti-energetiki/gidroenergetika/vidy-sovremennyx-ges-preimushhestva-i-nedostatki.html>

{8} <http://priroda.su/item/1183>

{9} [https://ru.wikipedia.org/wiki/%D0%A1%D0%BE%D0%BB%D0%BD%D0%B5%D1%87%D0%BD%D0%B0%D1%8F\\_%D1%8D%D0%BD%D0%B5%D1%80%D0%B3%D0%B5%D1%82%D0%B8%D0%BA%D0%B0](https://ru.wikipedia.org/wiki/%D0%A1%D0%BE%D0%BB%D0%BD%D0%B5%D1%87%D0%BD%D0%B0%D1%8F_%D1%8D%D0%BD%D0%B5%D1%80%D0%B3%D0%B5%D1%82%D0%B8%D0%BA%D0%B0)