

обозначают многие реалии повседневной жизни (например, "магазин", "камера", "холодильник", "врач", "медсестра" и т.д.), а также ряд незначимых слов, таких как "короче" или "уже".

Произошедшие геополитические изменения превратили Россию и Таджикистан из братских республик в независимые страны, разделёнными границами. Однако является отрадным тот факт, что во многих сферах социальной жизни существуют возможности сотрудничества и взаимного культурного обогащения, и высшее образование является одной из таких сфер.

ENVIRONMENTAL IMPACTS OF SOLAR POWER

Ю. Н. Пахоменко, Е. С. Тарасова
Tomsk Polytechnic University

What does humanity use to heat homes, power grids and for the transport fuelling? There are oil, nuclear reactors, fuel, hydroelectric power. However, each day the Earth gets a lot of sunlight - almost inexhaustible energy, which only needs to be taken and used. Existing solar panels I have not gained significant popularity. Humanity is just beginning to think about the impact on the environment and nature, and we may enter into the electric age, completely dependent on solar energy and safe nuclear energy. No emissions, no greenhouse effect, without tons of garbage.

According to many projects solar energy is one of the most promising renewable energy industries. The development of solar energy is also associated with an ambitious program of support for renewable energy implemented in the developed countries such as Europe, USA and Japan.

The amount of solar energy reaching the earth is greater than the energy of the world's reserves of oil, gas, coal and other, including renewable, energy resources. Only 0.0125% of solar energy could provide all global energy needs today, and the use of 0.5% - to cover fully the needs in the future. The potential of solar energy is so high that, it is estimated that the solar energy reaching the Earth every minute is sufficient to meet the current global energy needs of humanity for a one year.

If compared to other types of electricity production from renewable sources, solar energy has the greatest potential for long-term growth.

The schedule drawn up by the agency Woods Mackenzie and published in its latest report shows the rapid growth of the profitability of investing in solar energy in comparison with the combined-cycle power plants and natural gas (<http://www.vestifinance.ru/articles/53546>).

This is a trend across the country, which is gaining momentum, as costs of solar generation continue to decline.

By 2020, according to the forecast agency, 19 states reached grid parity, even though the Obama administration will cancel the tax breaks.

This rapid spread of solar energy is quite possible, however, the electrical system and the market is not yet ready for a huge influx of solar energy. Electrical still needed reserve capacity at the time when the sun does not shine. [1]

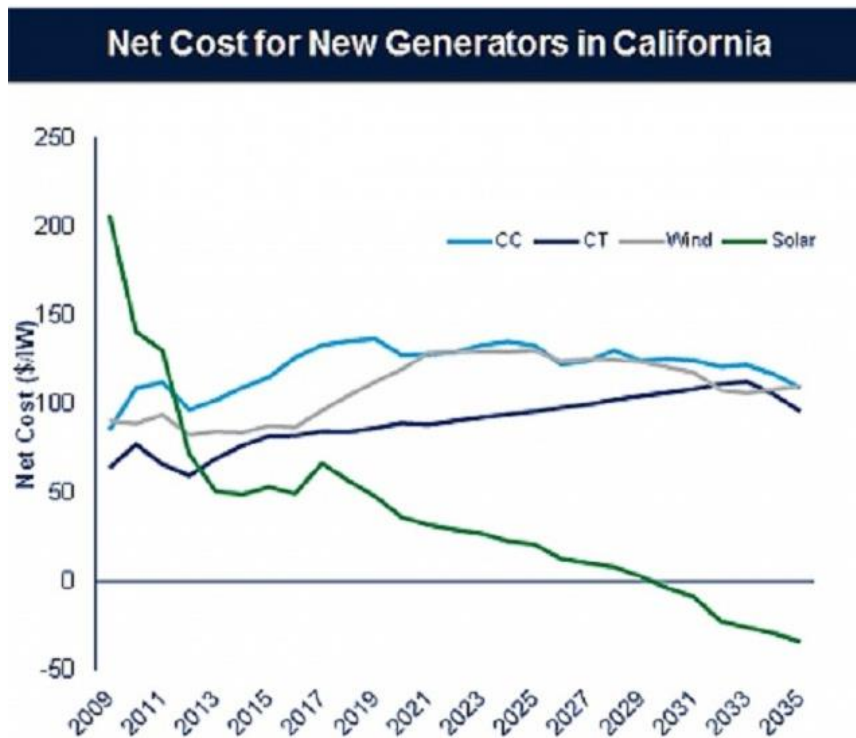


Fig. 1. Growth of the profitability of investing in solar energy.

However, there are several problems associated with solar energy, such as a large land, the construction of stations, not a small water use for cooling and the use of hazardous materials in the manufacture of solar cells.

The problem of land tenure is that in the construction of solar power plants require huge land area for the installation. For example, a solar thermal power plant "Ivanpah" in the Mojave Desert to the south-west of Las Vegas - the largest in the world. It covers an area of 13 thousand square kilometers - the same as the area of the Bahamas. The station consists of three towers with 40-storied buildings as well as almost 350.000 mirrors the size of a garage door. They focus the sun's rays on the towers where the water under the influence of temperature is converted into steam and drives the powerful turbines.

This problem can be solved by placing the solar plants on the lower quality sites, such as brownfields, abandoned mines or existing transport and transmission corridors. If it is required to provide electricity for a house, you should probably put the plant on the roof.

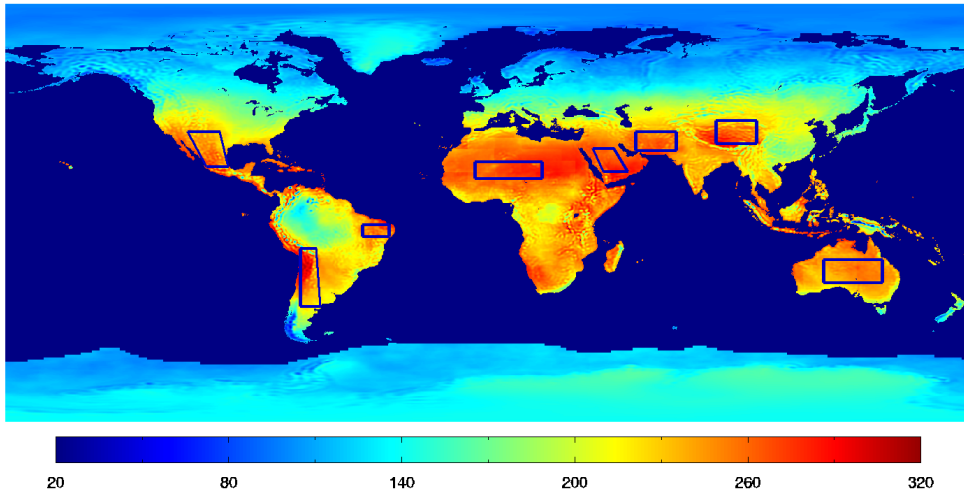


Fig.2. The Map of solar power distribution.
Average surface of solar power (W / m^2). (The water is not shown).

The next problem in the use of solar energy, it is a great water consumption for the production of solar photovoltaic cells.

Concentrating solar power (CSP), as well as all thermal power plants, require water for cooling. The use of water depends on the design of the installation for the plant and the type of cooling system.

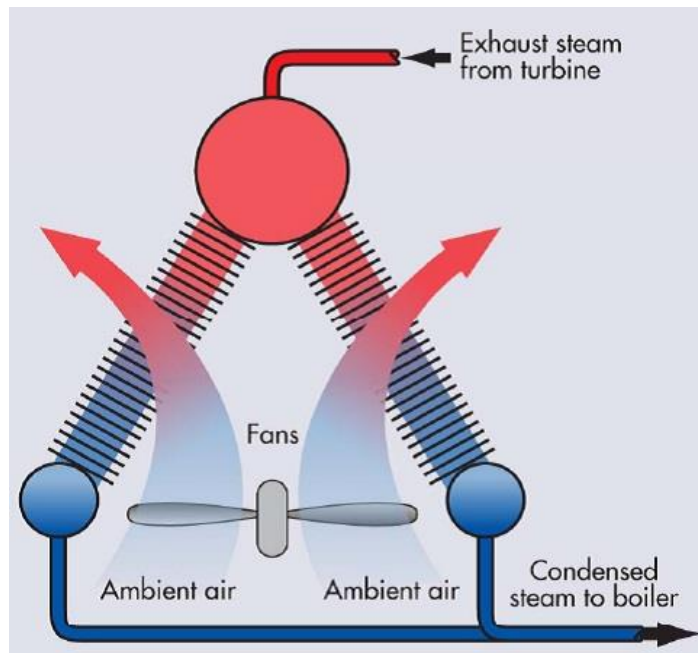


Fig.3. Scheme of concentrating solar power.

The ratio of use of water in various power stations is shown.

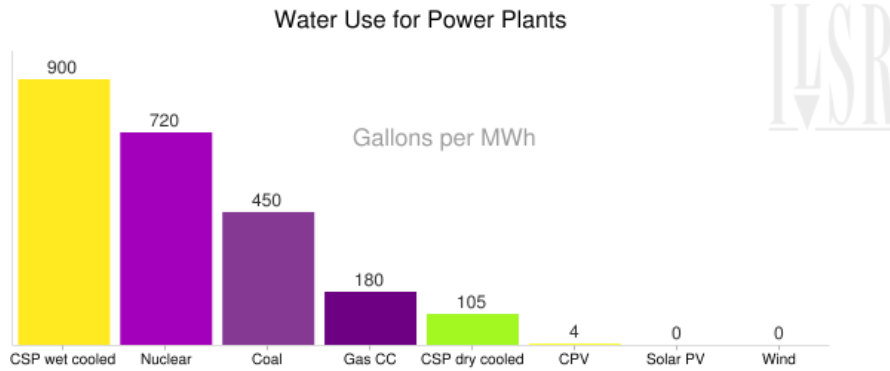


Fig.4. The ratio of use of water in various power stations.

This problem is conventionally solved by dry cooling, whereby water usage can be reduced by about 90%.

The third problem is the use of such hazardous materials during the solar cells manufacture as hydrochloric acid, sulfuric acid, nitrous acid, hydrogen fluoride, 1,1,1-trichloroethane and acetone. Most of these materials are used for cleaning the semiconductor surface. Also, employees face the risk of inhaling silica dust [2].

Thin film solar cells comprise a number of more toxic materials than those used in conventional silicon solar cells, including gallium arsenide, copper indium gallium diselenide, and cadmium telluride. If not properly processed and disposed of, these materials can pose a serious threat to the environment or public health.

However, manufacturers have strong financial incentives to ensure that these very valuable and rare materials are often recycled and not thrown away [3].

Electricity consumption worldwide continues to grow alongside with the cost of its production and transmission. The energy can be generated without the use of non-renewable natural resources and without pollution. Moreover, the energy transfer must also become more efficient. The implementation of the above tasks will positively affect the lives of all mankind.

As a conclusion it may be stated that today the generation of electricity by means of photovoltaics is the most effective way to provide electricity to remote places as well as to replace an aging power system of developed countries.

REFERENCES

1. IPCC, 2011: IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation. Prepared by Working Group III of the Intergovernmental Panel on Climate Change [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1075 pp. (Chapter 7 & 9).
2. National Renewable Energy Laboratory (NREL). 2012. Renewable Electricity Futures Study. Hand, M.M.; Baldwin, S.; DeMeo, E.; Reilly, J.M.; Mai, T.; Arent, D.; Porro, G.; Meshek, M.; Sandor, D. eds. 4 vols. NREL/TP-6A20-52409. Golden, CO: National Renewable Energy Laboratory.
3. Solar Energy Technologies Program pp. 52, 53 retrieved 28 March 2009.