

## **SOLAR ENERGY**

M.P. Pustovalova

Scientific Supervisor: S.N. Chegrincev,

Linguistic Advisor: PhD, Associate professor T.G.Petrashova

Tomsk Polytechnic University, Russia, Tomsk, Lenin str., 30, 634050

E-mail: [pustovalova\\_madina@mail.ru](mailto:pustovalova_madina@mail.ru)

### Annotation

This article is about the development of renewable sources in the form of solar energy. It features comprehensive discussions of many aspects of solar energy development in Russia and around the world. The purpose this article is to tell about advantages of solar energy.

Key words: Solar radiation, crystalline silicon, renewable, Rusnano, development, Ben Peters, power stations, potential.

Solar energy is energy derived from the Sun's radiation. The Sun is an powerful source of energy and provides the Earth with as much energy every hour as we collectively use in a year worldwide. It is important that we continue to harness and increase our use of solar energy (and other clean, renewable energies) as fossil fuels become depleted, expensive, and fall out of favor with their consumers [1].

As the global demand for energy grows and conventional energy resources become increasingly costly to extract, people are looking to the power of the Sun. Solar has been growing exponentially for the last 20 years, while the price of photovoltaic (PV) cells has dropped 20% whenever manufacturing capacity doubles; PV cell prices are 99% lower now than they were in 1976. It is no longer the cost-prohibitive energy source it once was [2].

Solar power is important because every beam of light that we can convert into electricity is another step in reducing our dependence on polluting fossil fuels. Each year more and more people are investing in their own energy portfolios by installing solar panels on their homes, but not everyone has that option (e.g. due to home ownership, geographic location, home orientation, etc.). The «Mosaic» company allows people to become investors in solar projects to earn competitive returns while also helping out the environment. When one thinks of solar power, PV or solar panels come to mind. Even within the category of PV there are many applications and variants of the technology, but fundamentally, PV enables us to directly convert sunlight into electricity. Semiconductor materials (like those used in computers) make up solar cells and are used to convert photons (e.g. light) to electricity. PV arrays consist of solar cells which can come in a variety of shapes and sizes. The PV array on a house generating electricity is likely made of traditional crystalline silicon. Alternatively, thin film solar utilizes stacked semiconductors only a few micrometers thick that can be applied as roof shingles or solar window tinting to generate electricity. What thin film gains in versatility and price reductions, it loses in terms of conversion efficiency. Typical solar cells have an efficiency of around 15%, although there are models that are up to 21% efficient [3].

The experience of many countries shows that under certain climatic, economic and political conditions, solar energy today can become a real competitor to traditional energy. In many countries, solar energy received strong government support and rapidly evolving. In Europe, Germany has a leading position on the established solar

station, but China has become a leader in the use of solar radiation for the past year. Last year, Saudi Arabia's plans to launch a massive renewable energy program was the big news coming out of the Middle East – but internal wranglings have resulted in uncertainty about the future of the project. Australia is one of the sunniest countries in the world and there is huge potential for solar PV to make a significant contribution to electricity generation. Japan, Germany, and the United States are major markets for solar cells [4].

Roughly, 10 companies in Russia are involved in production of solar collectors that are used to produce heat. The Ministry of Fuel and Energy estimated the total area of all solar collectors in 1994 at 100,000 m<sup>2</sup>. In most cases, these installations work in the south of the country and only during the warm seasons of the year. Beside the commercial solar collectors, it is a common practice in the countryside of Russia to use showers that use water heated by the sun. Even the use of these primitive devices throughout the country eliminates the need to burn millions of tons of coal, oil, and gas to heat water. The use of solar power, though still in its infancy, is starting to shine through as a promising alternative energy source in Russia's regions.

Russia may be associated more with long, dark winters than sun-drenched days, but that does not stop private companies from tapping into a growing market for solar energy. Solar Wind produces panels mostly for export hopes to see the domestic market grow. A number of Russian private companies are creating joint ventures with Rusnano, the state nanotechnology corporation, to address local needs. Solar Wind is starting a \$160m project, with Rusnano as a partner, in which it will make double-sided solar panels for domestic use. The plant, which may start working at the end of this year or in the first quarter of 2011, will have an initial annual manufacturing capacity of 30 megawatts (MW), ramping up to 120 MW per year. Private firms and regional governments are his customers locally, and the company exports solar panels to more than 22 countries, including Germany, Britain and the United States. Industry insiders said solar energy could become a real alternative to traditional energy sources in a number of the country's regions. The Krasnodar Region and most parts of Siberia have insolation levels comparable to the south of France and central Italy, where solar energy is currently booming, while the Zabaikalsky Region gets more solar energy than Spain head of the environment monitoring department at the Electricity and Energy Council of the Commonwealth of Independent States [5].

The Krasnodar Region turned its attention to solar energy after it launched an energy-efficiency programme in 2006. The region uses solar power for electricity production and heating water. The roof of the central hospital in Ust-Labinsk, a town northeast of Krasnodar, is being covered by 300 solar panels. The installation will heat water for the hospital's daily needs all year-round.

Solar energy use has a future in Russia, but only in combination with other renewable energy sources a board member of Eurosolar Deutschland, the German division of the European Association for Renewable Energy. Solar energy is not yet popular in Russia because of the country's focus on oil exports. Another obstacle is the cost of solar power-station construction, compared with traditional power stations. The construction cost of a solar power station ranges from \$10,000 to \$17,000 per kilowatt. In comparison, one kilowatt of installed capacity at a nuclear power station costs up to \$3,000, while the figure for a hydroelectric power station is \$1,000. That makes building solar power stations less effective for Russia's economy than construction of traditional power stations adding that hydroelectric and biofuel energy generation are the best options.

One of the biggest question marks facing the future of the solar industry is the ability to provide cost effective storage. Solar energy's nature is a fact that many say could prevent more widespread adoption of the technology as a viable replacement for traditional energy generation. Ben Peters, director of solar finance and policy at REC Solar, predicts improved technologies – bolstered by involvement from large-name corporations – will pave the way for more affordable solar storage. Ben Peters explained «I see more and more of the large tech conglomerates getting into solar plus energy storage,». Ben Peters statement that «You have a large number of big names like Bosch, GE and Panasonic that recognize the economic value of solar storage to customers. We're really starting to see it take off from an actual innovation standpoint.» Solar Energy - one of the most promising directions of development of renewable energy sources . According to experts, by 2100, the sun will be the dominant source of energy on the planet [6].

Thus, thanks to modern equipment solar energy helps to solve the needs of cities - from savings on electricity production to environmental protection. Global consciousness of humanity is changing. In the new millennium, it finally recognized the need to transition to new energy sources. More and more countries are interested in the promotion and development of technologies for the production of solar energy, more is created and improved photovoltaic modules, inverters, power increases for energy conversion.

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