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Solar Energy Statistics Review

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In modern realities, there is a heightened interest in the use of alternative energy sources, in particular the primary energy of the sun, water and wind. In the foreseeable future, the use of most fossil fuels as energy sources will become very expensive and problematic due to the likely increase in the cost of fossil resources because of their reduction in volumes and unprofitability of extraction. In this article we will review the main aspects of solar energy and the dynamics of industry development, its future prospects, potential and characteristics.

Solar energy is the sphere of alternative energy based on the direct use of solar radiation to generate power. Solar energy uses a renewable energy source and in addition to this it is environmentally friendly, so it doesn't produce detrimental waste during the active phase of use. Energy production from solar power plants is well aligned with the concept of distributed energy production, smart grids, etc.

The sun emits 3.8×10^{23} kilowatts (kW) of energy per second. But only a tiny amount, roughly 1.8×10^{14} kW is intercepted by the earth, is about 150 million km from the sun. However, only 60% of this volume or 1.08×10^{14} kW reaches the surface of the earth. The rest is reflected back into space or absorbed by the atmosphere. That's why even if only 0.1% of this potential energy would be converted at an efficiency of 10% it would be four times total generating capacity of nearly 19.4 terrawatt-hours (TWh). Taking this fact into consideration

we can confidently claim that solar energy would be quite promising, especially if the technological progress allowed [1].

In recent years, the transition to renewable energy, especially solar power, has become increasingly noticeable, so in 2005 the share of renewable energy accounted for solar power was 0.1%. Then in 2010 it was raised to 0.8%, and in 2018 soared to 8.3% (See Table 1).

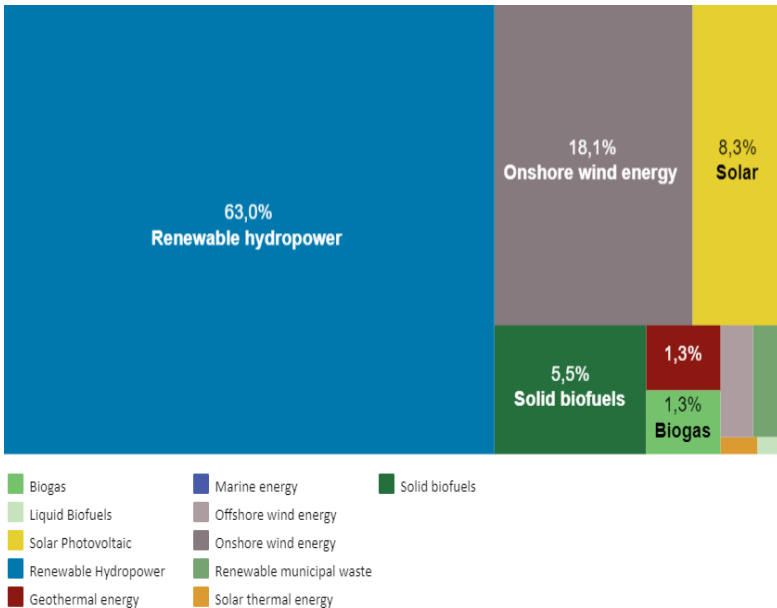


Table 1. Renewable Energy Generation Ratio in 2018

The technology is the most attractive for investors due to its inexhaustible and promising potential, so in 2013-2018 solar photovoltaic (PV) and onshore wind power technologies consolidated their dominance, attracting, respectively, 46% and 29% of the world’s renewable energy investments over the five-year period. Considering ample resource availability, significant market potential and cost competitiveness, PV

technology is expected to continue driving overall renewables growth in several regions over the next decade [2].

In the first days of solar cells in the 1960s-1970s more energy was required to produce a cell than it could generate during its lifetime. Since then significant improvements have taken place in their efficiency and manufacturing methods. It's estimated that the total installation cost of solar PV projects would continue to decline dramatically in the next three decades, reaching the range of USD 340 to USD 834/kW by 2030 and USD 165 to 481/kW by 2050, compared to the average price of USD 1,210/kW in 2018 [3].

At a country level, the average total installed cost of utility-scale solar PV projects has declined by between 66% and 84% in major markets during the period of 2010 to 2018. Germany and France witnessed a reduction of 71%, while others have experienced reductions closer to 80%, such as China and Italy (77% and 78% respectively). India was estimated to have the greatest reduction, estimated at 80% [3] (See Table 2).

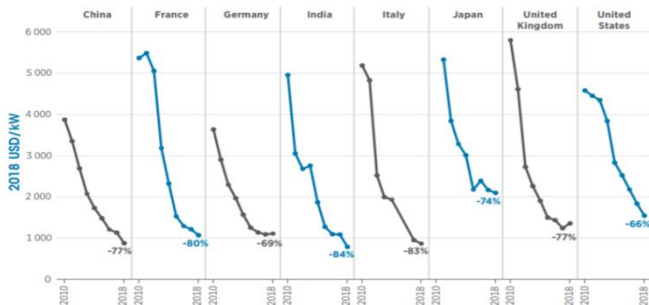


Table 2. Total Installed Cost of Utility-Scale Solar PV

For instance, if we talk about Belarus according to the local law, the state is obliged to connect devices that produce energy from renewable sources to the general grid and

purchase energy from them. In the case of solar energy, the purchase price is three times the price for which energy is sold to consumers. However, as a rule, low-efficiency solar power plants are installed by private enterprises of various forms of ownership for personal consumption with partial consumption from the grid or without electricity use of the general grid at all. The power of such stations rarely exceeds 500 kW.

To sum up, the use of solar energy is an inexhaustible source of electricity, which in the future will take a large part of alternative generation. The industry has attracted considerable interest from investors, and the cost of installation has decreased significantly between 2010 and 2018. Over the same period, the power factor increased from an average of 14% to 18%.

References:

1. Solar. Strategic Insight [Electronic resource]. – Mode of access: https://www.worldenergy.org/assets/images/imported/2013/10/WER_2013_8_Solar_revised.pdf. – Date of access: 09.02.2021.
2. Global Renewable Energy Investment Trends [Electronic resource]. – Mode of access: <https://www.irena.org/Statistics/View-Data-by-Topic/Finance-and-Investment/Investment-Trends>. – Date of access: 27.01.2021.
3. Future of the Solar Photovoltaic [Electronic resource]. – Mode of access: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Nov/IRENA_Future_of_Solar_PV_2019.pdf. – Date of access: 13.03.2021.